

**DAME JUDITH HACKITT ON THE
NEW BUILDING SAFETY REGIME**

**THE VALUE OF BEING A
STEM AMBASSADOR**

**COLLABORATIVE GROWTH
IN CIBSE IRELAND**

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Change for good



October 1 sees an important milestone in the rollout of the new Building Safety regime. On that date, a raft of new and amended regulations will come into force that will see the Building Safety Regulator (BSR) control all work on Higher-Risk Buildings (HRBs) and the introduction of a new regime for the management of all occupied HRBs.

However, the changes will affect everyone working in the industry, not just those involved in HRBs. Part 2A of The Building (Amendments etc) (England) Regulations 2023 introduces a series of new regulations – 17 in total – covering the duties, competence and behaviour of clients, designers and contractors.

Now under the HSE, enforcement of the regulations will be robust, and building control will be keen to see whether any problems with buildings originated from issues of competence or a lack of compliance with the new duties.

Two of the key figures behind the overhaul of Building Safety regulations were made honorary Fellows of CIBSE at the end of July – Hywel Davies and Dame Judith Hackitt.

Hywel, CIBSE's chief technical officer, has worked around Building Regulations for more than 30 years and is the chair of the HSE's new Building Advisory Committee, which replaced the Building Regulations Advisory Committee (also chaired by Hywel). To help CIBSE Members digest the latest updates, Hywel has written a summary on page 16, as well as a further five articles online at *CIBSE Journal*, covering the most pertinent parts of the regulatory changes.

It is testament to the rigour and excellence of Dame Judith's *Review of Building Regulations and Fire Safety* that all her recommendations on reforming the industry have been adopted by government and made law through the Building Safety Act.

In our interview on page 18, Dame Judith says the deaths of the 72 people at Grenfell Tower motivated her to ensure that the changes she recommended were followed through. She is still closely involved in the process and is chairing the transition board that is setting up the BSR. She's also working on product safety.

While Dame Judith has been critical of the traditional construction culture of cost cutting and shirking of responsibility, she is optimistic the next generation of engineers will transform building into an industry of which we can all be proud.

'This is a really great time for young people to be entering the sector and challenging the old and outdated practices in the industry,' says Dame Judith, adding: 'Young people driven by purpose and the moral imperative of wanting to do the right thing can drive this culture change.'

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A summary of the various changes and updates to Building Regulations that will come into force on 1 October



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A deep-dive analysis of the data submitted for the 2023 CIBSE Building Performance Awards Project of the Year entries



Lucy May

Cundall's head of diversity, equity and inclusion on her new role and experience as a top women's football referee



Tim Dwyer

Net zero buildings and the key points of the recently published ASHRAE Standard 228-2023



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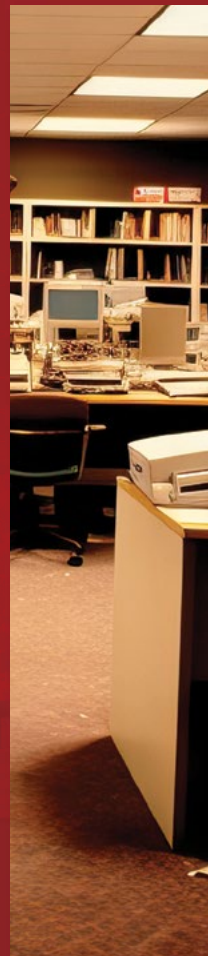
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1980s



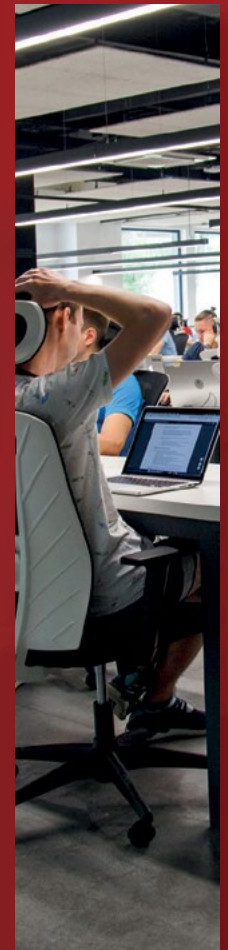
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Race to register Higher-Risk Buildings ahead of deadline

Thousands of owners of buildings risk breaking law, says Dame Judith Hackitt

Dame Judith Hackitt has expressed concern about the slow pace of registrations of high-rise residential blocks following the publication of new Building Regulations.

The Building Safety Regulator is expecting around 15,000 occupied Higher-Risk Buildings (HRBs) – defined as containing more than seven floors or at least 18 metres in height – to comply with a new legal requirement to register with it by the beginning of October.

However, in an interview with *CIBSE Journal* (page 18), the chair of the government-commissioned Independent Review of Building Regulations and Fire Safety, said only 30% had done so by the middle of August.

‘If anyone thinks that, by not registering, they are going to avoid [regulation], they are being naive,’ said Dame Judith. ‘It’s a sad reflection of the culture of the industry that rather than [registering] because they know they should, people are waiting to see if enforcement happens.’

Dame Judith made her comments as the government published new regulations for HRBs alongside major changes to the Building Regulations.

The Building etc (Amendment) (England) Regulations 2023 introduce the new duty holder and competence requirements for both practitioners and clients. Part 2A launches a total of 17 new regulations, covering the duties, competence and behaviour of clients, designers and contractors.

It also creates new roles and duties for the principal designer and contractor. Regulation



Dame Judith Hackitt

38 on the provision of fire safety information is also strengthened.

New regulations for HRBs introduces requirements on Accountable Persons to hold accurate, up-to-date electronic information about their buildings.

They must keep this information up to date and use it to make a safety assessment, and then demonstrate the control measures/management systems they have in place.

All these regulations will come into force on 1 October.

● Read Hywel Davies summary of the Building Regulations update on page 16 with more detail at www.cibsejournal.com

IN BRIEF

STEM Ambassador scheme success

The new STEM Ambassador scheme launched by President Adrian Catchpole attracted 48 new ambassadors in its first six weeks (see page 27).

Figures reveal that during that period 2,809 volunteer hours were logged and 29,749 students were reached across 235 schools. The scheme uses the STEM Learning portal to match volunteers' skills with school's requirements.

Catchpole urged more members to sign up: 'If you're passionate about building services, and enjoy what you do, then share that enthusiasm.'

To register interest visit www.cibse.org/stem

Apply now for £6m air quality grants

Applications have opened for the latest round of the government's Air Quality Grants. Councils across England can apply for a share of £6m of funding from the Department for Environment, Food and Rural Affairs to deliver projects to improve air quality.

Funding will be prioritised towards projects that tackle particulate matter, improve public awareness of the impacts of air pollution and help local authorities to bring down levels of nitrogen oxide (NO₂) and other pollutants to below legal limits.

The window for applications closes on 29 September.

New £10m renewable project fund launched

The government has announced a new £10m fund to support community renewable energy projects across England.

The Community Energy Fund will open to applications in the early autumn for projects, such as small-scale wind farms and rural heat networks, which have been proposed, designed and are owned by local people.

It builds on the former Rural Community Energy Fund with an expanded remit to include renewable energy investment in urban areas as well.

Surplus money generated from the projects can go back to the community through local initiatives such as community gardens and youth employment groups.

Government proposes new regulation to counter gender neutral toilets

In response to a growing trend towards 'gender neutral' toilets, Government has published a consultation on a new Part T of the Building Regulations that deals with toilet provision.

The proposed new Part T in Schedule 1 of the Building Regulations will require the provision of separate single-sex restrooms for men and women in new non-domestic structures, with either shared single sex or individual washing facilities. It will also require that where universal toilets are provided, they are fully enclosed for both privacy and safety reasons.

Importantly, these changes won't alter the current guidance for accessible toilets or sanitation provisions. The government's aim is to clarify toilet specifications and counter the rise of gender-neutral facilities.

The proposals are for new non domestic buildings to have separate single sex toilets and accessible toilets, with the option of 'universal' toilets in addition.

These regulations are prospective, impacting new construction work rather than existing structures.

Read an online article on Part by Hywel Davies HonFCIBSE at www.cibsejournal.com. The consultation is at bit.ly/CJPartTPr

Skea elected chair of UN climate panel

UK academic Jim Skea has been elected chair of the United Nation's Intergovernmental Panel on Climate Change (IPCC). The panel assesses the science related to climate change and produces authoritative adaptation and mitigation reports. A founder member of the UK's Climate Change Committee, Professor Skea was elected as head of the IPCC on 26 July and will oversee its upcoming Seventh Assessment Cycle.

London 4.5°C hotter than rural areas

Temperatures in London are up to 4.5°C hotter than in surrounding rural areas, according to research by Arup. The consultancy used its digital analytics tool, UHeat, to map the most extreme hot spots on the warmest day in a 150km² sample of Cairo, London, Los Angeles, Madrid, Mumbai and New York. Arup said the snapshot highlights how city design is driving up urban temperatures.

Legionella bacteria found on immigration barge

Tests are carried out after bacteria found in water pipes of Bibby Stockholm

Asylum seekers housed in an accommodation barge had to be evacuated after Legionella bacteria were found in the vessel's water pipes.

The first group of people arrived on the three-storey Bibby Stockholm - moored in Portland, Dorset - on 7 August. However, a test of the water system showed levels of legionella bacteria, believed to have emanated from the vessel's pipes, that required further investigation.

While tests of the water at the point of entry to the vessel had shown no indication of Legionella, the UK Health Security Agency (UKHSA) advised the Home Office on the evening of 10 August to remove the six asylum seekers who had arrived that day.

As a further precaution, the Home Office announced on the following day that all 39

asylum seekers would be disembarked to contingency accommodation.

The results of follow-up tests on the water system, being carried out by Dorset Council environmental health officers, were awaited when *CIBSE Journal* went to press. The UKHSA will provide additional advice once these have been received.

The Home Office blog said none of those on board had presented with symptoms of Legionnaires' disease, and the samples taken related only to the water system on the vessel itself. Legionnaires' disease is a rare form of pneumonia caused when a person breathes in air containing the bacteria in droplets of water. The aerosols can be spread through air conditioning systems, showers and spa pools.

The Home Office has hired the Bibby Stockholm vessel to accommodate up to 500 men while they await the results of their asylum applications.

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Industry demands more clarity on CE marking

CPA says government should be consistent on allowing CE marking

The government has been warned that a continued lack of clarity over the future of the UK's construction product safety kitemark scheme is damaging industry.

The Department for Business and Trade (DBT) announced earlier this month that recognition of the European Union's CE mark will be extended indefinitely for most goods. These include some that are used in construction, such as lifts and low-voltage electrical equipment.

The DBT said it wanted to prevent a 'cliff edge' in December 2024, when the government's post-Brexit UK Conformity Assessed (UKCA) mark was due to come into force.

However, most construction products lie within the scope of the Department for Levelling Up, Housing and Communities (DLUHC), which has yet to follow DBT's lead in announcing an indefinite extension of recognition for the EU scheme. DLUHC announced last December that the CE mark on construction products will

be recognised for another two and a half years.

Peter Caplehorn, chief executive of the Construction Products Association (CPA), said: 'The CPA has long argued that every day that manufacturers have to wait for clarification from government causes more damage. This uncertainty has exacerbated product availability issues, led to UK and foreign manufacturers pulling products from the UK market, diminished investment and R&D, and negatively impacted jobs and the ability of the product sector to support the UK construction industry every day.'

Caplehorn's comments were backed up by Nick Mellor, managing director of the Lift and Escalator Industry Association.

'We have had some excellent engagement with DBT, and its announcement of recognition of CE marking for placing goods, including lifts machinery, on the market in Britain indefinitely beyond December 2024 is a very welcome relief for industry. However, we understand this is only for products under the DBT scope and we would like to see a comprehensive strategy on UK product-testing regulations.'

UCL researchers call for healthier LEDs to nourish human cells

Most LED lamps do not nourish the human body's mitochondria, which are crucial for health, according to research, which has yet to be published, by UCL.

The findings, which emerged in a report in *RIBA Journal*, show that mitochondria are highly sensitive to the wavelength of light.

Researchers state that most of the white LEDs that have proliferated as a source of lower emissions lighting are dominant in the blue part of the light spectrum. However, they are lacking in the longer-wavelength near infrared (NIR) part of the spectrum. Researchers say the body's transparency to the red part of the spectrum means this is able to penetrate and nourish mitochondria in the cells beneath the skin.

Emeritus professor Robert Fosbury, of the UCL Institute of Ophthalmology, told *RIBA Journal* that more NIR light can be introduced into buildings by adding windows and positioning green vegetation outside of windows. In addition, white lamps must be developed with reduced blue content.

Hoare Lea project director and past SLL President Ruth Kelly Wascott MCIBSE FSLL said: 'This would only be a risk if someone spends all their time in an artificially lit environment. This seems like another reminder of the importance of exposure to natural light as part of a healthy lifestyle.'



White LEDs lack the NIR part of the light spectrum

IN BRIEF

Neurodiverse conditions affect 1 in 4 workers

Around one in four construction workers considers themselves to have a neurodiverse condition, according to a survey of 1,000 employees commissioned by the National Federation of Builders. The resulting *Neurodiversity in construction* report, carried out in conjunction with the Construction Industry Training Board and the People's Partnership, says there is room for progress. Around a third (36%) of neurodiverse construction workers have not told anyone at work about their condition, while 38% believe there is little or no empathy for workers in the industry with the condition. Of respondents who had informed their employer they have a neurodiverse condition, 80% reported that reasonable adjustments had been made.

Air pollution a factor in rising resistance to antibiotics

Air pollution is helping to increase resistance to antibiotics, according to research published in the latest *Lancet Planetary Health* journal. The analysis, using data from more than 100 countries spanning nearly two decades, indicates that increased air pollution is linked with rising antibiotic resistance. The study is the first to examine worldwide the association between concentrations of fine particulates and clinical antibiotic resistance. It estimates that reaching air quality guidelines in 2050, set by the World Health Organization for concentrations of PM 2.5 particulates, would reduce antibiotic resistance by 16.8%. It would also prevent 23.4% of premature deaths attributable to antibiotic resistance.

Protection for heat network customers

Consumer protections for people on traditional gas and electricity contracts will be extended to those on heat networks under proposals unveiled by the government. The remit of industry regulator Ofgem is due to be extended to heat networks from 2025. In addition, heat network operators will have to keep a register of vulnerable customers, such as the elderly or those in poor health.

Ideal Heating launches its first UK heat pump production line

A new heat pump production line forms part of a £60m investment programme by Ideal Heating at its headquarters in Hull.

The programme also includes an expanded distribution hub and a research and development centre to pioneer future heating technologies.

Ideal has already invested more than £2m in its flagship training centre, where up to 5,000 installers can gain skills installing and servicing heat pumps every year.

And it has now been granted full planning permission for the new £12.5m research and development facility at the site.

Construction of the UK Technology Centre is due to be completed in late 2024 and operating by early 2025.

Michael Gove blocks demolition of M&S

Michael Gove has refused controversial plans by Marks & Spencer to redevelop its flagship store in Oxford Street, London.

The Secretary of State for Levelling Up overturned his planning inspector's recommendation to approve the retailer's application to replace its existing store with a 10-storey retail and office block.

In his decision letter, Gove said he was not convinced that M&S and its architects had thoroughly explored the alternatives to demolition of the existing building, and that he refused permission partly on the grounds that the scheme would not encourage the reuse of existing resources, including conversion of buildings.

Dame Judith Hackitt and Dr Hywel Davies awarded CIBSE's highest honour



Dame Judith Hackitt



CIBSE's Dr Hywel Davies

CIBSE President Adrian Catchpole presents CIBSE's highest accolade

Two of the key architects of the government's new building safety regime have been awarded CIBSE Honorary Fellowships.

The recipients are Dame Judith Hackitt, who chaired the Independent Review of Building Regulations and Fire Safety, and Dr Hywel Davies, CIBSE's long-standing chief technical officer.

Honorary Fellowships are the highest accolades that can be presented by the institute to non-CIBSE members, to recognise their lifetime contributions to the construction and building industries.

The fellowships were awarded to both

recipients by CIBSE President Adrian Catchpole at an event attended by CIBSE members and patrons in London on 27 July.

Dame Judith's 2018 report, *Building a Safer Future*, formed the basis for the fundamental and systemic reform of building safety legislation introduced through the 2021 Fire Safety Act 2021 and Building Safety Act 2022. It also paved the way for the establishment of a building safety regulator for England.

'It was an honour to receive the award,' Dame Judith said in her acceptance speech. 'I've been particularly grateful to CIBSE over the past five years for the support they've given to my recommendations.'

Prior to taking on the building safety review, Dame Judith had chaired the UK Health and Safety Executive. She is also the chair of the manufacturing trade body Make UK, formerly the Engineering Employers' Federation.

The fellowship for Dr Davies is the first awarded to a serving member of CIBSE staff. He became technical director of CIBSE in 2007, following more than a decade working for the Building Research Establishment and a further 10 years as an independent consultant.

Davies also headed the expert group responsible for reviewing the use and structure of the Approved Documents following the Grenfell tragedy.

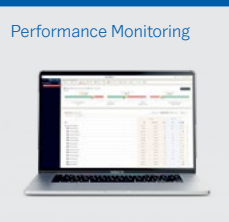
He advised on the Covid-19 pandemic response and coordinated advice and guidance notes on 'emerging from lockdown', which have been downloaded more than 60,000 times and are recognised across the world.

Read Hywel Davies' column on page 16 and an interview with Dame Judith on page 18.

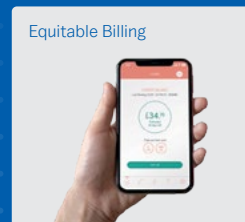
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Mandatory safety and sustainability CPD from 2024

The building services industry is undergoing a paradigm shift, as it strives to improve the energy efficiency of new and existing buildings and make them inherently safer.

This change is being driven by two factors: the government's target to reach net zero by 2050 and the introduction, in April 2022, of the Building Safety Act.

As a result, and after consultation with CPD panel members and other CIBSE groups, from January 2024, all CIBSE Licentiates, Associates, Members and Fellows members will be required to undertake and reflect on two mandatory semi-structured activities, one each in the subjects of sustainability and building safety.

Semi-structured activities include supplier webinars, CIBSE events, or internal company presentations.

This will help focus learning and development on these two key industry issues, ensuring building services engineers deliver more efficient building designs and stay informed on the latest technology and techniques in building safety. This will not only improve engineers' competence, but will also be beneficial to our clients and, ultimately, the future occupants of the buildings we design.

CPD can be carried out under many guises, and activities include structured courses, semi-structured webinars, mentoring, reading, or simply learning on the job.

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

The activities undertaken each year should be planned around development objectives, and often the easiest way to set these objectives is to base them on your company's internal development reviews.

Course writers and reviewers wanted

CIBSE is looking for experts to create and update content for the CIBSE Training on-demand platform (see bit.ly/3QEAOkb).

The content ranges from 20-minute training to seven-hour courses.

Experience of e-learning would be useful for this paid role. Please email mylearning@cibse.org to express your interest.

President addresses ASHRAE Conference

Adrian Catchpole emphasises role of CIBSE guidance in targeting net zero

CIBSE President, Adrian Catchpole, highlighted the role CIBSE guidance and knowledge play in helping members lead on delivering better building performance at the ASHRAE Conference in Galway last month.

Addressing the conference, Catchpole drew on his Presidential Address, *Taking a Lead*, to emphasise the need for a robust route to net zero, driven by industry and leadership. This linked to the conference title *Achieving net zero*, which referred to the summer wildfires across Europe as evidence

that action on climate change is required.

He referenced the update to Part L of the Building Regulations – committing to carbon emissions reduction of 27-31%, with further amendments promised in 2025 – as well as changes to EPC requirements as having a positive change. He said he was encouraged by the new Part O for Overheating, which CIBSE has been calling for.

He highlighted how CIBSE is leading the call for embodied carbon to be addressed in the Building Regulations. To be truly carbon neutral, he said, the carbon created in the manufacturing process of the materials used to construct the buildings must also be considered. For this reason, CIBSE guidance, such as *TM65: Embodied carbon in building services*, and CIBSE's role in the developing the UK Net Zero Carbon Buildings Standard are so important.

Other publications, such as *Guide M*, launching in September, also demonstrate the importance of CIBSE's role in bringing knowledge and guidance forward, enabling CIBSE members to lead on delivering better building performance. Adrian Catchpole attended the ASHRAE Conference in August, together with CIBSE CEO Ruth Carter.

● For details of the *Guide M* launch visit: bit.ly/CJGMlaunch23



Left to right: Ashish Rakheja, managing partner at AEON Consultant; CIBSE President Adrian Catchpole FCIBSE; ASHRAE President Ginger Scoggins; Gary O'Sullivan MCIBSE, President of the ASHRAE Ireland Chapter; and Conor Deane, Graduate of the Year 2022 runner-up

SAVE THE DATE: YEN GALA



Join the CIBSE Young Engineers Network as it gathers for a night to remember in Newcastle on Friday 3 November.

For more information, and to be notified when tickets are released, contact YEN@cibse.org. Sponsorship opportunities are available.



Dame Zaha Hadid's Bee'ah Headquarters in UAE

Stellar buildings make SFE's façade shortlist

Zaha Hadid's last building is among 29 projects up for an award in November

The last personal project of the late architect Dame Zaha Hadid – Bee'ah Headquarters in the United Arab Emirates (UAE) – as well as London's Battersea Power Station and Elizabeth Tower, home to Big Ben, are among the buildings shortlisted for the Façade 2023 Design and Engineering Awards.

Run by the Society of Façade Engineering (SFE) and CIBSE, the awards recognise excellence in façade engineering, and help to raise the profile of this discipline.

The full awards shortlist consists of 29 projects, 13 young engineers, and seven products. It showcases the vast global expertise in this area of engineering, with 15 international schemes – from seven countries and three continents – making the cut in the four international project categories: refurbishment, new build, innovation and sustainability.

Notable shortlisted international projects include the Bee'ah Headquarters in Sharjah's Al Sajaa desert, in the UAE – entered by Buro Happold – and the Google Bay View campus in California, USA, entered by Arup, which features 90,000 dragonscale solar shingles.

Among the 14 shortlisted entries in the UK project categories is the refurbished Battersea Power Station – one of the largest refurbishment and urban regeneration projects in the UK.

Completing the 2023 awards line-up is the 13-strong shortlist for the 2023 Young Façade Engineer of the Year.

Chris Macey, chair of judges, said: 'The diversity of shortlisted projects demonstrates the range of skills and expertise within façade engineering. The young engineers making the list demonstrate that we have the growing competence and skills for the future, assisted in no small part by the innovations of the shortlisted products.'

Nominations are sought for the Lifetime Achievement Award, open to anyone who has made an outstanding contribution to promoting the art and science of façade engineering. Nominations should be made by email to sfeawards@cibse.org. A maximum of 100 words should be included to support the nomination.

The awards, sponsored by Reynaers, take place on 8 November, at Hilton Park Lane, London, and will again be co-located with the Zak World of Façades London conference.

- View the full shortlist: bit.ly/CJFA23
- Book your place: bit.ly/CJFEA23

Lead authors open to questions at launch event for new Guide M

The new *Guide M: Maintenance engineering and management* will be launched at Sodexo, London, on 28 September.

The launch event for the latest edition of the industry-leading resource for facilities management professionals will include introductions and discussion from the lead authors and contributors to the guide, covering crucial updates. There will also be an opportunity for the audience to ask questions.

Guide M is aimed at those responsible for the design, installation, commissioning, operation and maintenance of building services. It identifies current good practice and addresses topics of particular interest and relevance to those involved in engineering services maintenance at all levels – including designers, manufacturers, installers, maintainers, building owners, occupiers, operators, professional advisers and specialist providers.

For more information and to book a place at the event, visit bit.ly/CJGMLaunch23

IN BRIEF

Circularity central to new TM66 training

New CIBSE-endorsed TM66 online training courses, delivered by the Lighting Industry Association (LIA), are now available. They provide early adopters of circular economy with the knowledge and tools to design circularity into their work.

The courses, structured in two modules, are presented by Bob Bohannon, head of policy and academy, LIA. They set circular economy in general – and TM66 and Circular Economy Assessment Method specifically – into the wider space of sustainability, including Life Cycle Assessment and net zero. Attendees can expect to acquire an in-depth understanding of the delivery, practice and communication of sustainability in building services. For more information, visit: www.thelia.org.uk/page/Circular_economy

Call for entries to Ready Steady Light

The Society of Light and Lighting's (SLL's) flagship Ready Steady Light competition will take place on 17 October.

Run in association with Rose Bruford College, Kent – which also hosts the event – the competition involves teams designing and setting up temporary exterior lighting installations, with a limited range of equipment, in only three hours.

Returning to basic engineering and design, teams must light their site in its natural state with the kit provided. They have to overcome challenges without a budget and within the time constraints.

Teams of up to five people are encouraged to enter, and each will be led by an SLL member.

For more information and to enter, visit bit.ly/CJSLLRSL

CIBSE Certification up for national award

CIBSE Certification has been shortlisted in the National Quality Management, Compliance and Training Company of the Year category at the National Energy Efficiency Awards, which take place in Birmingham later this month.

CIBSE Certification runs personnel schemes within the built environment and certifies management systems ISO 9001, ISO 14001, ISO 45001 and ISO 50001. See www.cibsecertification.co.uk

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Alison, Technical Co-ordinator

Time to comply

The Building Safety Act paved the way for new regulations on buildings and duties and competence for those who create them. Hywel Davies summarises the various changes that will come into force on 1 October

On 17 August, the government made new regulations for Higher-Risk Buildings (HRBs), along with major changes to the Building Regulations. These create new dutyholder roles and duties, and require certain competences and appropriate behaviours.

The government also laid new procedures for the Building Safety Regulator to control work on HRBs, and set out a new regime for the management of all occupied HRBs. For those who have followed the development of building safety law since 2018, there are few surprises.

Before anyone raises their hand and says these regulations are far too complicated to implement in such a short time, they are hardly a surprise. They were first called for by Dame Judith Hackitt's review more than five years ago, then confirmed when government accepted all her recommendations at the end of 2018. Further indications were contained in the consultation on implementing the report in 2019, before the passage of the Building Safety Act introduced the enabling powers for these procedures in 2022.

The finer points of the dutyholder and competence regime that Dame Judith called for were first set out in November 2021, when draft regulations for competence and dutyholders were issued to give industry early sight. They were discussed in some detail in the consultations on implementing Parts 3 and 4 of the Building Safety Act last summer. All that is happening now is that they are being implemented, as long foretold.

In practice, those who are confident that they are already competent and comply with Building Regulations should not have a major problem complying with these regulations and adapting to the changes. They will be most challenging for those who have been operating at the margins of compliance and who will have to change the way they work.

The government has held its nerve and delivered the regulations as it said it would. Anyone who bet on a U-turn may find it was a costly wager. The regulations are here and come into force on 1 October, and they will fundamentally reform the way that design and construction appointments are made.



“Before anyone says these regulations are far too complicated to implement in such a short time, they are hardly a surprise”

They will rebalance responsibilities for building work and are likely to be accompanied by much more robust enforcement, especially where problems emerge on a site. Building Control can be expected to work back from problems to identify how they arose. That, in turn, is likely to call into question the competence of all concerned and compliance with the new duties and competence requirements set out in the new regulations.

Not knowing what the new dutyholder roles, duties and competency requirements are will almost, by definition, demonstrate inadequate knowledge of the regulations and be evidence of inappropriate behaviours, and so a failure to be competent or compliant.

The Building etc. (Amendment) (England) Regulations 2023 introduce the new dutyholder and competence requirements for practitioners and clients. Part 2A introduces a whole series of new regulations – 17 in total – covering the duties, competence and behaviour of clients, designers and contractors.

Part 2A also creates the new roles and duties of the principal designer and contractor for every project. That is correct – they are for every project, because these requirements apply to

all buildings.

Anyone familiar with Dame Judith Hackitt's 2018 report into Building Regulations and Fire Safety will know that she recommended creating specific roles and responsibilities for clients, designers and contractors doing building work. It should surprise nobody that the first major change to the Building Regulations is the introduction of the new Part on dutyholders and competence.

The regulations revise the rules for deposit of plans and further embed energy-related procedures into UK law. They also strengthen Regulation 38 on the provision of fire safety information, which applies to all building work. If you deal with Building Control in any form, you need to know what these regulations require, starting this October.

If you are responsible for managing an occupied HRB, or for managing building work in, or to create,

a new HRB, there are two new sets of regulations. The Building (Higher-Risk Buildings Procedures) (England) Regulations 2023 set out the new Building Control system for HRBs in detail, implementing Part 3 of the Building Safety Act. These regulations will come into force in October, with a transitional period of six months for work already under way. These are explained in more detail in a series of articles on the *Journal* website. It will explain the major changes to Part 3 of the Building Regulations as they apply to all building work, and summarise new procedures for control of works to HRBs.

The Higher-Risk Buildings (Management of Safety Risks etc) (England) Regulations 2023 apply to all HRBs in occupation. They implement many of the provisions enabled by Part 4 of the Building Safety Act 2022, covering the operational management of HRBs. They introduce requirements on Accountable Persons to hold accurate, up-to-date information about their building(s) in electronic form, to keep it up to date and use that information to make a safety assessment about the building and then demonstrate the control measures/management systems they have in place to proactively manage the risks.

The regulations also have a firm focus on resident engagement, making sure that those responsible for resident safety are actively talking and listening to residents, and that they have a complaints procedure should issues arise. Again, there is nothing here that has not been well signalled over a period of years.

It is becoming a cliché, but this really is the biggest change in Building Regulations since World War II. These reforms will change the way the industry is regulated. The onus will fall on everyone to demonstrate compliance and maintain the evidence, not on a Building Control officer to find non-compliance.

While there are new and more rigorous rules for HRBs, the Building Regulations are for all building work, without exception. The industry now has a huge opportunity to demonstrate a willingness to embrace these reforms and rebuild public trust in what we do. It will not be easy or quick, but it needs to be done.

Bodies such as CIBSE will be working with the Construction Leadership Council and its constituent bodies to provide further guidance on these regulations, and on how clients, principal designers, contractors and Accountable Persons can meet the new obligations in a safe, reasonable and proportionate manner.

It is another step on the road to rebuilding trust in the construction and operation of our high-rise building stock, and another step on the road to building a safer future.

- Read more new articles on the regulations, including a new Part on dutyholders and competence, at bit.ly/CJSafety
- A CIBSE conference on *Delivering the Golden Thread* is being held on 28 September from 9am to 5pm, at The Royal Society in London. This conference will cover the new Building Regulations requirements, details of the regime for the Golden Thread and key information that will apply to those who are accountable persons for a Higher-Risk Building. Register at bit.ly/GoldenThread1

Is your smoke shaft safe?

Insufficient specification for smoke shafts is leading to unsafe systems, says **Colin White**, of the Smoke Control Association

The term 'smoke shaft' is commonly referenced in smoke and heat exhaust ventilation (SHEV) systems in tall buildings.

It plays a critical role in enabling the SHEV to perform effectively in a fire emergency. Failure can compromise the entire smoke vent system.

Typically, the smoke shaft is a vertical work duct that is constructed on site and rises through a building to extract smoke from the lobbies.

The smoke shaft must provide and maintain a clear and unobstructed pathway in its role of ducting fire and smoke to the outside safely.

However, smoke shafts are currently specified with little or no mention of sealing. This leads to instances where plasterboard shaft systems, for example, are built without proper specification for effective sealing. Tests to identify leakage issues are often conducted only after excessive use of mastic.

Plasterboard systems that have only been tested to BS EN 1364-1 are not suitable for constructing smoke shafts used in SHEV systems and neither are systems that are only tested to BS 476 parts 20 and 22 1987. Systems tested to these standards don't have any meaningful leakage test evidence at ambient or at elevated temperature and no evidence of maintenance of opening.

SHEVs can experience negative pressures of -1,500Pa at ambient temperature, and -500Pa at elevated temperature, so it is wise to rely on smoke shaft constructions that have been subjected to a 20Pa furnace pressure at least – or, at best, a site leakage test at 50Pa.

Shaft systems without proven integrity and leakage data for hot and cold smoke should not be deployed. There needs to be an increased focus on the design, construction and installation of smoke shafts, because – without appropriate test evidence – plasterboard systems, in particular, cannot prove their worth as dedicated smoke shafts for use in SHEV life-safety systems.

The fact that smoke shafts are used in SHEVs to duct fire, smoke and other products of combustion out of a building means that testing to BS EN 1366-8 should be required and the construction should be classified to BS EN 13501-4.

The smoke shaft is always the main link between the smoke control dampers and the extracting fan sets. Using untested, unclassified constructions for smoke shafts is akin to connecting a sprinkler system with garden hose and jubilee clips.

If the smoke shaft fails, so does the smoke vent system.

- **COLIN WHITE** is a director of SCA member company Smoke Control Dampers



'A WAKE-UP CALL TO SAY QUALITY MATTERS'

With new Building Regulations coming into force on 1 October, Dame Judith Hackitt warns that those wedded to traditional ways of working risk falling foul of the law, and says a new generation of engineers have the chance to sweep away unacceptable practices. She tells **Alex Smith** why she won't stop working until change happens

Dame Judith Hackitt was made an Honorary CIBSE Fellow in July



Young engineers are in the ideal position to challenge dangerous and outdated ways of working in the construction industry, according to Dame Judith Hackitt, who was made an Honorary Fellow by CIBSE last month.

The author of *Building a safer future: Independent review of Building Regulations and fire safety* says: 'This is a really great time for young people to be entering the sector and challenging the old and outdated practices in the industry. Most people come into the industry to improve the lot of society. Young people driven by purpose and the moral imperative of wanting to do the right thing can drive this culture change.'

In her review, which looked at building safety in the wake of the Grenfell Tower fire, Dame Judith concluded that the current system is not fit for purpose and that a culture change was required to support delivery of safe buildings. The report's recommendations form the bedrock of the Building Safety Act, which has resulted in the biggest overhaul of Building Regulations in a generation. Last month the government announced secondary legislation for the Building Safety Act, which included new regulations for higher-risk buildings (HRBs) and major changes to the Building Regulations, focusing on required duties and competencies. These come into force on 1 October (see 'Competencies and duties' on page 16).

The newly formed Building Safety Regulator (BSR) will oversee the safety and standards of all buildings from April 2024, help the built environment industry improve competencies, and lead the implementation of a new

regulatory framework for HRBs. Young engineers can turn to the BSR if they are concerned about unsafe practices. 'What the new framework does is create space for young people to challenge the old and unacceptable practices they see in industry and say "I don't think we should be doing it like that any more";' says Dame Judith.

A confidential reporting system aimed at structural safety has been extended to cover fire safety, and can be used by anybody to report incompetence and poor practice. The Collaborative Reporting for Safer Structures UK (Cross-UK) publishes examples of bad safety practice anonymously, so lessons learned can be shared widely.

In her review, Dame Judith found that poor practice around fire safety was endemic. 'What I regard as standard practice in any other sector isn't being followed in construction,' she says. 'It really, really surprised me the extent to which things are done on the hoof. There is no proper record of what's been changed and why, making it impossible for anyone managing a complex building to know what they are working with.'

She is clear on the main reasons for the fundamental failure – lowest-price procurement and the lack of responsibility for the project outcome. 'Buildings are done on the cheap, so the whole procurement process is set up in such a way that whatever is built probably doesn't have sufficient funds allocated to do the job. Whoever wins the contract on the lowest price is looking to cut corners from the outset.'

A diffuse system of responsibility means no-one feels accountable for a project outcome, adds Dame Judith. 'People come in, do their work and leave. The overall sense of who is responsible for providing a building that is fit for purpose is missing.'

She is concerned that the industry will not be ready for the legally enforceable changes due on 1 October. This includes the registration of occupied high-rise buildings, which will be managed by the BSR (see panel,

'The role of the Building Safety Regulator').

The BSR is expecting around 15,000 HRBs to be registered, but only 30% had been by mid-August, says Dame Judith. 'If anyone thinks that, by not registering, they are going to avoid this, they are being naive,' she adds. 'It's a requirement of the law. I expect there will be some enforcement action and that will trigger people to think "OK, I need to do it now". It's a sad reflection of the culture of the industry that rather than [registering] because they know they should, people are waiting to see if enforcement happens.'

Dame Judith is focusing on getting the new safety regime up and running. For the past four years she has been chairing the Industry Safety Steering Group, which is responsible for supporting industry and reviewing and challenging the progress and action it is taking in improving safety. She also chairs the transition board that is setting up the BSR.

Construction products regulations

In addition, Dame Judith is closely involved in another area critical to building safety – construction products regulation. 'We have a big chunk of work to do around ensuring that the right materials are specified and used, properly tested, and fit for purpose,' she says.

In May the government published an *Independent review of the construction product testing regime*. Written by former government chief construction adviser Paul Morrell and barrister Anneliese Day, it said the current Construction Product Regulation (CPR) only accounts for about one-third of products, leaving 20-30,000 unregulated, and that many standards are outdated, inconsistent or non-existent. The review proposes bringing all construction products within the scope of the CPR through a 'general safety requirement', and the introduction of a new safety regulator, which will work with the BSR. It also calls for honesty from manufacturers

HIGHER-RISK BUILDING REGISTER

CIBSE's Technical Team, supported by CIBSE members, has been involved in the review and consultation with government on the Building Safety Act. The Institution also established a Building Safety Working Group that has been supporting the Engineering Council with developing the competences required for its Higher-Risk Building (HRB) Register. This new standard sets out the competences and commitments expected of engineers and technicians who work in the built environment sector, in particular on higher-risk buildings. CIBSE is in the application stage to offer assessments against this register and you can find out more by visiting www.cibse.org/hrb.

and 'full disclosure' when submitting products to assessment bodies.


Dame Judith has been focusing on best practice in construction regulation around the world and chairs the International Building Quality Council (IBQC), which recently published *Building product performance part 2 – Good practice regulatory framework*.


'There are things we can learn from other countries,' she says, referring to the US' structured code system for product specification and Germany's robust interpretation of the EU CPR. The Morrell and IBQC reviews can be used together, she adds: 'If you overlay the work, you'll see a lot of consistency. It enables us to look at where the gaps are.'

Why all buildings are in scope

The BSR has responsibility for all buildings, not just HRBs, which means no-one can ignore the changes. 'Fire safety is, clearly, extremely important, but whatever you are working on – be it acoustics or thermal insulation – if it's not done properly the building will not be fit for purpose,' says Dame Judith. Which is why she has pushed so hard to change the culture of the industry. 'It's a wake-up call to the whole industry to say quality matters. You have to think about how you go about this work and it has to be a continuum.'

Dame Judith's review is not the first on tackling dysfunction in the construction industry. Her commitment to tackling the whole process, however, and her ability to convince government of the changes necessary mean the sector will finally be made culpable for its failings and be given the opportunity to deliver safe, sustainable buildings of which it can be proud.

Throughout the process, she has never forgotten what led to the fundamental changes. 'People have asked me, "what makes you think people will do anything this time?" I tell them "I'm going to stick around and make sure it happens", because this is important – we owe it to the 72 people who died in Grenfell Tower.' 

 A CIBSE conference Building Safety: Meeting the Building Regulations and delivering the Golden Thread is on 28 September in London. For details visit: bit.ly/goldenthread1

Dame Judith with CIBSE President Adrian Catchpole



THE ROLE OF THE BUILDING SAFETY REGULATOR

The BSR will have three main functions: overseeing the safety and standards of all buildings; helping the built environment industry and building control to improve competence; and leading implementation of the new regulatory framework for high-risk buildings.

It will regulate buildings with seven or more storeys or that are 18 metres or higher, and that have at least two residential units, are hospitals or care homes.

The building safety reforms introduce a new regulatory framework for high-risk buildings, which includes: making the building Health and Safety Executive a statutory consultee for planning applications; the BSR becoming the building control authority for high-risk buildings; decision points during design and construction; clear accountability and statutory responsibilities for dutyholders; the requirement for a golden thread of building information; and mandatory reporting of fire and structural safety occurrences to the BSR. There will also be registers of occupied high-risk buildings, and of building inspectors and building control approvers.

WHAT THE DATA REVEALS

The quality of data submitted alongside project entries for CIBSE's Building Performance Awards improves each year. **Julie Godefroy** analyses the 2023 entries and signposts potential information requirements for the future



Cranmer Road won Project of the Year (non-domestic) at the 2023 CIBSE Building Performance Awards

In the past two years, CIBSE has been reviewing entries to the Building Performance Awards to assess building performance across the projects, as well as the quality of the information provided. The review helps identify best-performing projects and where they sit against industry targets – for example, RIBA 2030 Challenge, LETI, emerging UK Net Zero Carbon Buildings Standard – and against benchmarks for the existing stock.

The first review¹ led to a new data entry form for the 2022 awards, to provide more clarity on the information needed, a clearer and fairer basis for judges to assess the entries, and more value to industry, as the submitted data can contribute to analysis.

Last year's review² led to further changes, requiring more information to be provided rather than being optional. Data on energy supplied by onsite generation (not just from the electricity and gas networks) was required, so that *all projects have to submit enough data to assess the project's total energy use.*

Airtightness test results, where available, also had to be submitted. This recognises the importance of airtightness as a key building performance parameter and the fact that information is often available, as a test is carried out on new buildings and many extensive retrofits.

Quality of the data

This year's analysis confirms that the quality and scope of building performance data keeps increasing, through better gathering and reporting of the data, as well as through increased post-occupancy evaluation (POE) activities.

A lot of the ambiguity of past submissions has been removed from the forms – for example, on the type of floor area measurement, the time period covered by the meter data and whether it represents 'normal' occupancy and so on. Some uncertainty does remain, particularly around metering of onsite generation systems and batteries: the data being reported is often not sufficient to assess the building's total energy use, or the data is inconsistent.

This highlights common issues with metering and insufficient checks on data quality as part of building performance evaluation. For example, do meters add up? What are the energy flows between grid, building, onsite PVs, and batteries? Some projects also had electric vehicle (EV) charging on site, often without sub-metering, which meant it was not possible to assess energy used by the building itself, out of the total.

What the data reveals

This year's awards data shows trends in delivery processes and design solutions similar to last year, illustrated right.

As expected, projects set energy targets beyond regulatory compliance and paid attention to energy performance modelling, often using Passive House Planning Package (PHPP), both in domestic and non-domestic building projects.

They carried out POEs and, this year, there was significantly more attention to factors beyond energy use, such as indoor air quality, temperature monitoring, and interviews or surveys of building occupants. In design teams, the large majority of projects have ambitious airtightness and space-heating demand targets, most are all-electric, and most have onsite generation systems – in some cases deliberately producing more than the building's annual energy use for export.

The two retrofit projects – with

		Project performance	Existing stock	Industry targets
Cranmer Road student residences, King's College, Cambridge (Max Fordham)	New build	71kWh-m ² GIA/yr (average across two buildings, for 59 students) All energy use is supplied from the electricity grid. There are no onsite renewable energy systems. Airtightness: 0.17 and 0.31 m ³ .h ⁻¹ .m ⁻² at 50Pa for each building	The project's energy use intensity (EUI) is well below (better than) the UK NZCBS best practice benchmark for student accommodation in the existing stock, of 94kWh-m ² GIA/yr.	There is no industry target available yet, with the UK NZCBS bottom-up analysis still in development for this sector.
Swansea bungalows (Cardiff University)	Retrofit	70kWh-m ² GIA/yr (average across six homes). Around 60% of that annual energy use is supplied by PVs, which, in addition, export a significant amount to the Grid. Airtightness: 5.05 m ³ .h ⁻¹ .m ⁻² at 50Pa	The project's EUI is well below (better than) the UK NZCBS best practice benchmark for all-electric bungalows in the existing stock, of 106kWh-m ² GIA/yr.	The NZCBS bottom-up analysis is still in development for retrofitted buildings. The project's EUI meets the draft LETI, 'basic' level of 70kWh-m ² GIA/yr, but it is higher than the LETI Climate Emergency Retrofit Guide EUI for unconstrained retrofits - that is, 'best practice' of 50kWh-m ² GIA/yr and 'exemplar' of 40kWh-m ² GIA/yr.

Table 1: Energy performance of CIBSE Building Performance Award winners compared with existing stock and industry targets

comparable uses pre- and post-retrofit and with energy use data pre- and post-retrofit – demonstrated energy use reduction of between 60% and 83%. Most projects had done some form of embodied carbon assessment, either of specific building elements or whole buildings.

This year's two Project of the Year awards winners – Cranmer Road, Kings College Cambridge and the Low Carbon Built Environment Team, Welsh School of Architecture, Cardiff University – illustrate these trends. Both carried out whole building embodied carbon calculations. Neither followed a formal Soft Landings process, but they did carry out similar activities, such as liaising with residents on the systems that would be installed and their operation, and having at least two years of POE.

Both carried out energy performance >>

Analysis of entries to 2023 CIBSE Awards



46%

of projects followed Soft Landings or similar activities



69%

of projects had energy performance targets at the design stage, some of them contractual. Many also had Passivhaus certification or airtightness targets



62%

of projects had carried out energy performance modelling (most often, PHPP)

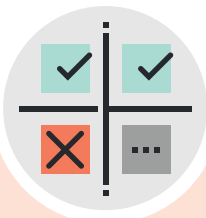


85%

of projects had carried out some form of post-occupancy evaluation (e.g. user surveys, IEQ monitoring) beyond just energy use

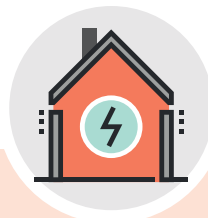


Bungalows retrofitted by the WSA with Swansea Council



30%

of entries had an energy use intensity (EUI) considered to be based on reliable and complete information; 62% had an EUI, but with some uncertainties



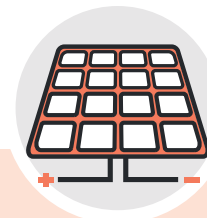
54%

of projects were all-electric, and one was served by district heating



New build Retrofit

UK new build and some retrofits had air permeability test results. Projects in Dubai and the US did not because there is no local requirement for these tests



54%

of entries had onsite renewables, all of them PVs. A further 15% had them on the wider site (eg campus), and 10% were considering installing them

» modelling and set energy use and/or space-heating demand targets at the design stage (but not contractual). Their energy performance compared with the existing stock and industry targets is in Table 1.

No changes were made to this year's forms – remember, the deadline to submit your project is September 5. Small changes are being considered for next year's forms, including:

- **Asking applicants to submit the building footprint:** this would allow the projects' PV output to be compared with emerging UK Net Zero Carbon Buildings Standard (NZCBS) targets for onsite renewable generation, which are currently proposed to be in kWh-m² per year of building footprint
- **Modifying the language for reporting on batteries:** the form currently asks for annual energy 'used by the battery', which does not seem to be understood consistently and could incorporate energy that transits through the battery but is used in building operations, as well as energy lost in storage
- **Automating some checks on energy breakdowns,** especially those relating to how onsite energy generation is used. [C](#)

■ If you have any questions or comments about the entry forms or would like to contribute project exemplars to inform industry net zero targets, contact Julie Godefroy, CIBSE head of net zero policy, at jgodefroy@cibse.org. For a full list of 2024 Awards categories and to enter visit www.cibse.org/bpa

References:

- 1 'Making data count', *CIBSE Journal*, April 2021 bit.ly/CJMDC
- 2 'Fuller disclosure', *CIBSE Journal*, June 2022 bit.ly/CJBPAdata22



Cranmer Road student accommodation in Cambridge



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MUTUAL BENEFIT

Following the launch of the CIBSE Mentor platform earlier this year, Aecom's **Jennifer Cox** and **Mary-Ann Clarke** share insights from their mentorship journey, and how it has fostered a culture of continuous learning and development

Learning from a mentor opens up a multitude of avenues. You'll discover opportunities you'd never even thought about,' says Jennifer Cox, ACIBSE, discussing the many benefits of mentor schemes for young engineers with her mentor Mary-Ann Clarke FCIBSE.

Mentoring has become an integral part of professional development in many industries. Its ability to empower individuals, enhance skills, and foster career advancement, presents an opportunity for both mentors and mentees to engage in a relationship that propels personal and professional growth.

Earlier this year, CIBSE launched a pioneering programme aimed at cultivating a culture of mentorship within the organisation. The initiative seeks to encourage more professionals to embrace the role of mentors while inspiring others to step forward as mentees.

Cox, an electrical engineer at Aecom and Clarke, a director at Aecom, are great examples of the positive impact mentoring can have on both parties. They interviewed each other for *CIBSE Journal* on how the mentor scheme has enriched their professional lives.

Jennifer: How long have you been a mentor?

Mary-Ann: I've been in the industry for 20 years and been mentoring for about 15 of those. Currently, I'm mentoring you and one other. I also do quite a bit of sponsorship, mentoring people going through the last stages of their chartership.

Jennifer: What led you to being my mentor?

Mary-Ann: You joined us from Edinburgh in 2019. It was a whole new experience for you, but you slotted well into the team, and I really saw something in you. I thought you had fantastic potential, so nominated you for CIBSE Graduate of the Year in 2020. That was when I started properly mentoring you.

Jennifer: It started with me asking questions about how to get involved, and then, when you nominated me for the



Jennifer Cox (left) and Mary-Ann Clarke

award, we went through it step by step together, looking at what I had done with Aecom and with CIBSE.

Mary-Ann: It was amazing when you won and got to go out to the States for the ASHRAE conference. We'd spent hours going back and forth over your presentation until it felt perfect. I really wanted to push you forward. We got you involved with the CIBSE channels; you are now chair of CIBSE YEN London and committee member for Youth Engagement of CIBSE Patron, really getting your name out there.

Jennifer: What changes have you seen in me since you became my mentor?

Mary-Ann: I genuinely see how you've become so much more confident in your own ability. At the start, you were a little unsure but, over the years, I've watched you grow. Now, rather than coming to me to ask what to do, you'll say: 'I'm thinking of doing this, what's your opinion?' The dynamics have changed, and that shows great progress.

Jennifer: Being able to talk to you and have that relationship grow so naturally has been great. Having that back-and-forth dynamic has really helped me grow with the confidence side, but also in understanding what opportunities are out there and what I can achieve with my career. We often talk about my future and what I want my job to look like five years from now; our continuing conversation has helped me develop those plans.

Mary-Ann: Yes, we've spent a lot of time exploring your options and what feels right for you. If you're not sure something is pointing you in the right direction, you're able to come to me and we've been able to figure out what experiences would be better suited. We'd rather you have the room to grow into your career at Aecom than leave for another job; being able to evaluate those choices together is so important.

Jennifer: I've been very fortunate to have you there to guide me towards certain people or projects, pushing me to become more proactive and engaged in what I'm interested in.

Jennifer: Why did you want to be a mentor? What have you got out of the process?

Mary-Ann: I've always had this need to help people to be the



best version of themselves. If I can support people, give them the confidence to become that best version, then that's what I want to do.

I feel immensely proud seeing my mentees succeed. Watching you win Graduate of the Year in 2020 and then the Women in Construction & Engineering (WICE) Best Young Women Engineer award in 2021 was amazing. I'm very lucky to be able to tell everybody that I am your mentor.

Looking at another side of it, being a mentor has helped me progress in my own career; it's been very beneficial to my learning, it keeps me asking questions. We learn from each other. It's important to stay in touch with that younger generation and understanding what's changing in the industry. For me, mentoring is like sticky toffee pudding. Even if I'm full from my meal, when dessert comes out and sticky toffee pudding is on the menu, I'll always find space. At work, people are like my sticky toffee pudding – it doesn't matter how busy I am, if someone needs my help, I'll always make the time.

Jennifer: It's very much a philosophy you've instilled in me too. I've

benefited very greatly from what you've done for me and want to pass that on and share what I've learned with my team and with the YEN groups. As my career progresses, communicating with the young engineers coming into the industry and looking at what they can learn from my own experiences has become a passion of mine as well.

Jennifer: What would you say to others who are thinking of being a mentor?

Mary-Ann: I'd say do it. You have to want to put in the time and the effort, and make sure you are mentoring the right person. But, if the relationship's natural and you can see potential in somebody, then you should absolutely mentor them, the benefits for all involved are worth it.

Mary-Ann: Would you recommend having a mentor?

Jennifer: Absolutely. It's important to seek out someone in your sector who you aspire to and can support you in the areas you are interested in. Just reach out and see if they have the time and are willing to help. Being able to ask questions and learn from others opens up so many different avenues, and having that encouragement and engagement really facilitates you getting to where you want to be. You'll discover opportunities you'd never even thought about.

Mary-Ann: What have the highlights been for you throughout our relationship as mentor and mentee?

Jennifer: Getting the Graduate of the Year award and the WICE award is up there, with you supporting me through that. Having someone behind me throughout my chartered status was also a massive help, and now just generally in my career. Getting to learn from you and share my progress with someone has really helped me.

And generally, it's great to have fostered a relationship. It's nice to feel comfortable to come and ask you about anything; we don't have to formalise it. You've always got a minute for me to give me an opinion or advice, or point me in the right direction. **CJ**

■ CIBSE members can connect with a mentor, based on expertise and skills, through the online CIBSE Mentoring directory. www.cibse.org/training/cibse-mentoring



VISIT THE YEN CAREERS FAIR

CIBSE Young Engineers Network (YEN) is curating the programme for this year's Careers Fair, taking place at International Students House, London, on 12 October 2023 between 11am and 4pm.

Following the success of last year's talks and workshops, members of the YEN London Committee will be returning to deliver presentations and workshops designed to share knowledge and experience about starting your journey as a building services engineer.

Sessions will include a First Steps into Industry presentation and panel discussion, with YEN members sharing their experiences and journey to date.

There will be three workshop streams during the afternoon: top tips on preparing your CV and covering letter; starting your journey towards Professional Registration and becoming a Chartered Engineer; and developing your presentation skills.

The final session will be a discussion between YEN and an industry leader, providing an opportunity for attendees to ask questions.

For more details visit: bit.ly/CareersFair23

There will also be members of the CIBSE YEN on hand to discuss the benefits of signing up, upcoming events, and how you can get involved.

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SHARE YOUR ENTHUSIASM

Attracting young engineers into the industry is essential to close the industry skills gap. The new CIBSE STEM Ambassador programme, launched by CIBSE President Adrian Catchpole, connects professionals to schools and colleges, and aims to inspire students with insights into building services. **Molly Tooher-Rudd** talks to three engineers who have taken up the challenge

In his Presidential address, Adrian Catchpole FCIBSE said that an additional 200-300,000 building services engineers are required to tackle the net zero agenda.

The skill shortage issue isn't new, notes Catchpole, with records showing CIBSE discussions on attracting young talent dating back to 1923. The central challenge is the declining proportion of students entering the construction sector, specifically building services, despite consistent school leaver numbers.

To combat this, Catchpole says there needs to be more early engagement with potential engineers in schools and colleges.

'It's pivotal in shaping career decisions,' he says. He launched the new CIBSE STEM Ambassadors programme in May, challenging each CIBSE region to have 10 active STEM Ambassadors within 12 months. 'We were already doing some great stuff with our ambassador programme, but I want to turbo-boost that,' he says.

The aim is to bolster existing efforts to inspire young minds by increasing the number of ambassadors going into schools and colleges promoting building services engineering degrees and apprenticeship courses.

The programme is leveraging an online portal run by STEM Learning to collaborate with schools beyond the current network. Ambassadors specify their skills and interests while schools list their needs, streamlining the matching process.

STEM Learning provides a suite of training, and the CIBSE STEM ambassadors portal gives volunteers access to presentations and activities for use during school visits.

Since its launch, Catchpole says the programme has garnered significant interest, with 48 new ambassadors joining in the first six weeks, and 2,809 volunteer hours logged, reaching 39,749 students across 235 schools.

'It's such a key part of shaping the industry,' Catchpole says, urging new members to sign up. 'If you're passionate about building services, and enjoy what you do, then share that. It's not a major commitment. Volunteering can be very rewarding – we all need to pitch in.'

To register, visit www.cibse.org/stem. Members are also asked to register with STEM Learning, which facilitates the registration, including DBS checks. **C** >>

“Really know your topic, because someone will always ask a detailed question; I treat this as one of the best forms of CPD” – Blane Judd


STEM AMBASSADOR: SOPHIE HANSON
 SENIOR MECHANICAL ENGINEER AT ARUP

What are the benefits of being a STEM Ambassador?

For young people, interaction with STEM Ambassadors is a brilliant opportunity to be exposed to all kinds of careers. Particularly with vocations such as engineering, where many young people don't know what it is, or even know an engineer. It's an opportunity for them to discover potential career paths. I am particularly passionate about doing events with young girls, as it gives them an opportunity to see someone who 'looks like them'. It helps them realise they can do anything and don't have to conform to gender stereotypes.

What are the challenges?

Not being able to say yes to every event! There are so many great opportunities advertised needing STEM ambassador support, but it's never possible to do

them all, as fun as it may be. There is also an exciting challenge in taking big complex topics and projects and explaining them at a level that is comprehensible and exciting to all audiences.

What have you learnt from being an ambassador?

Being a STEM Ambassador has given me the opportunity to see my job and the world of work through a child's eyes, and really appreciate how exciting it is. It also massively helped with my communication and presentation skills, and generally become more confident and passionate about my job. To anyone interested, I would definitely recommend signing up. You can get involved with as many or as few events as you desire, and will have fun during the process.

STEM AMBASSADOR: BLANE JUDD FCIBSE
 CHIEF EXECUTIVE OFFICE, INSTITUTE OF RAILWAY SIGNAL ENGINEERS

Why did you become a STEM Ambassador?

Sharing my experiences with future STEM candidates helps me feel like my time in the sector has been well spent. I have amassed a large amount of knowledge and experience, which, had I been able to access at the start of my career, may have moved me further on or developed more quickly.

What are the challenges?

You need to understand your audience, which varies every time. Younger STEM learners, in my experience, want to see things happen, not hear about them. The older audiences like to hear anecdotes as well as get involved in experiments where possible.

I have been lucky in the experiences I have had both with different technological developments and also the

places around the world where I have worked. Giving young people the understanding that STEM is an international activity is important as many will not think that broadly.

What have you learnt from being an ambassador?

Really know your topic because someone will always ask a detailed question; I treat this as one of the best forms of CPD. I've found that young learners are not constrained by the bias that many of us develop over the years, which is something I'm improving in myself. Becoming a STEM Ambassador has made me think about how I present ideas and given me a greater sense of contributing to the growing knowledge base for a better-engineered environment.

STEM AMBASSADOR: ROB REDFERN, MCIBSE
 GROUP ENERGY MANAGER (RENEWABLES & LZC), TESCO

What are the benefits of being a STEM Ambassador?

As a Scout leader of 25 years, my passion lies in supporting the development of other people. Teachers often say that having professionals come into school from industry is a much more powerful tool than just discussing careers in class. It helps open students' eyes to opportunities they may never have heard about.

Personally, I've been able to develop my presentation and communication skills, and I always feel energised after an event.

If I come out of each session helping even one person, I've achieved something.

What are the challenges?

The biggest challenge is delivering your content correctly for the age of your audience.

Always ask what the STEM co-ordinator is looking for; it could be a presentation, a discussion, or even activity. Whatever it is, it needs to be fun and inspiring.

What have you learnt while being a STEM Ambassador?

There are several skills I feel I've developed: adaptability because of how much your audience will vary, you will have to deal with different circumstances and questions you've may not have considered; resilience, because there are tough times where your patience is tested; and communication, because explaining engineering subjects in a non-technical manner can be challenging.

What would you say to others thinking of becoming STEM Ambassadors?

Absolutely, yes. We've all been in their shoes at some point, and a little of bit of guidance when making career choices can go a long way. Working in Tesco, I've encouraged a number of colleagues to join me on STEM activities. They have always been a little apprehensive at first, but always finish the day with a smile.



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ROUTE TO JET ZERO

With aviation accounting for 2.5% of global carbon emissions, it is vital that the sector prepares for the decarbonisation of air travel. **Molly Tooher-Rudd** finds out how Atkins is decarbonising airport infrastructure and gearing up for a new generation of electric and hydrogen-powered flight

The aviation industry is on a path of profound transformation. Accounting for 2.5% of all global carbon emissions, it is under intense pressure to decarbonise. In July 2022 for example, the UK published its 'Jet Zero Strategy', which sets out a vision for net zero emissions in the sector by 2050, and a 2040 target aimed just at aviation buildings.

With the rise of electric and hydrogen-powered aircraft, as well as the emergence of advanced air mobility solutions, there is a vital need to redesign existing airspace infrastructure for this new generation of aircraft. Collaborations between airlines, original equipment manufacturers, infrastructure operators, and other key stakeholders are essential to establishing the necessary infrastructure for new forms of flying, such as the electric vertical take-off and landing aircraft (eVTOL) vehicles that will soon be filling our skies.

Existing airport operations and infrastructure need to undergo vast changes to decarbonise while accommodating new flying technology. Atkins is applying its Decarbonomics tool to airports, in a bid to create a roadmap towards net zero for them, and has established a dedicated multidisciplinary Future Flight team to look at what infrastructure is required for new forms of aviation.

'We're actively engaged in decarbonising existing aviation, whether

it's retrofitting airports, introducing new propulsion systems to traditional aircraft, or spearheading genuinely sustainable electric propulsion flight,' says Andrew Caughey, head of sustainable aviation at Atkins' Future Flight team.

Decarbonising airports

Atkins' Decarbonomics tool has gained significant traction in the aviation industry, particularly in the realm of airport operations. Launched in January 2022, the tool was created as a way of tackling the energy use of large portfolios of existing buildings, using data to help make decisions around investment.

The initiative has demonstrated impressive results; it is estimated to have saved 300,000 tonnes of carbon. Initially devised as a strategy for retrofitting housing, its success has prompted an expansion into the industrial sector, including the airport space.

The concept builds a framework for clients that benchmarks their current carbon footprints, devises strategic roadmaps for intervention, oversees implementation, and ensures long-term measurement

“Airports represent such a small percentage of aviation carbon, but they are the enabler to unlock the rest of it”

and verification of decarbonisation efforts. Isabelle Smith MCIBSE, technical lead for Decarbonomics and a director of engineering net zero at Atkins’ parent company SNC-Lavalin, says the approach to airports presented a new set of challenges, with very different types of interventions.

A holistic approach was taken to meet the distinctive demands of airport infrastructure. As well as optimising building fabric and energy usage, the tool delves into the complexities of airport infrastructure and the ground-fleet operations needed to support the transition to zero carbon flight.

‘We know we are going to have to make significant changes to electricity generation and distribution in airports, so we have to ask what that looks like from an embodied carbon perspective, as well as an operational carbon perspective,’ says Smith.

Scenario modelling is used to anticipate how new technologies, policy shifts, climate change and costs will affect a site. In this way, the development of the roadmap is fully informed and allows planning for resilience and the mitigation of risk as far as possible. This includes assessing the electrification readiness of ground-fleet vehicles, future-proofing infrastructure for energy transitions, and strategising to mitigate stranded asset risks.

‘We’ve had some great engagement with clients and incredibly positive feedback,’ Smith says. ‘The initiative actively engages with clients, inviting their input and insights to refine and customise the platform.’

This ensures that the developed solutions are aligned with the clients’ unique goals and challenges.

Smith stresses that, throughout the process, it is crucial to leave room for future opportunities for renewables.

‘A lot of it comes down to technology readiness of the fleet vehicles and determining the point at which electrification is going to be available,’ she says. ‘We want to make sure these airports are future-proofed.’

Decarbonomics extends its impact beyond emissions reduction to encompass financial and risk considerations. Evaluating the economic viability of interventions ensures that investments today will yield long-term benefits and maintain asset value, says Smith. ‘The key question is what is the cost of intervention, and at what point does it become uneconomical? We map that risk and look at ways to mitigate it.’

For example, 25% of the world’s busiest airports are situated less than 10 metres above sea level, at critical risk of sea-level rise, so the risk of that asset stranding is major, says Smith. Engagement ensures that financial and insurance sectors are equipped to support sustainable endeavours while managing the future risks effectively.

From an infrastructure perspective, it’s crucial to decarbonise because people will still be flying in the future.



An artist's impression of what landing pods for small drones might look like

‘Airports will look and feel totally different from what we are used to today, but they will exist,’ says Smith. ‘From a financial and social perspective, the sector is very aware that it needs to do this to remain viable; it’s at the top of everyone’s agenda.’

Evolving air mobility

The growing interest in fully electric and hydrogen aircraft, including eVTOL and drone taxis, is also reshaping the aviation landscape. Atkins’ Future Flight team has been created to expedite the decarbonisation of aviation and brings together professionals from building services, infrastructure, architecture, and structural and civil engineering.

‘Whether you are talking about sustainable aviation in its broadest sense or narrowing it down to emerging eVTOL technology, for example, the change to established transportation networks will be massive,’ says Caughey.

‘We’re looking beyond traditional air travel. Urban air mobility hubs and vertiports are emerging to facilitate short-range travel. They require scalable eVTOL reception facilities, energy efficiency, and advanced technology, such as biometrics for passenger journeys,’ Caughey says.

eVTOLs will operate like air taxis, and their potential promises greener, safer and faster travel. ‘Air mobility is a really exciting area,’ says Daniel Jones, director at Atkins, who oversees the company’s work in the airport sector. ‘We’ve investigated the application of eVTOL drones in various case studies, including passenger transport, cargo, and last-mile logistics.’



Atkins used the latest in data-driven, digital engineering to help maximise investment, future proof, and decarbonise Dublin airport

» The team's first project, the Advanced Mobility Ecosystem Consortium, comes under the UKIR Future Flight Challenge, and aims to demonstrate real-life mobility scenarios in the southwest of the UK. It involves demonstrating the eVTOL ecosystem in the region to showcase key use cases and address challenges such as integration with existing traffic and ground support. 'We're enthusiastic about our role in this project, collaborating with partners such as Vertical Aerospace, Virgin Atlantic Sky Port, and various airports, including Heathrow and London City. We're continuously learning, progressing, and moving towards the outcomes funded by Innovate UK', Caughey says.

Andrew Querée, associate at Atkins, has been collaborating with Atkins' eVTOL partners on the innovative projects, and with county councils, helping them to establish transport hubs in park and ride

facilities. 'The focus is on developing air mobility solutions with a range of up to 100 miles, connecting various places, such as airports, eVTOL hubs and venues,' he says.

The infrastructure needed to support these new transport systems is also something Querée's team has explored. Rapid charging facilities are essential to ensure commercial viability and efficient passenger movement between hubs. The emphasis is on enhancing the passenger experience, using modern construction methods, and optimising energy efficiency in hub design.

'Multimodal connectivity is crucial too; there's no sense in everyone driving diesel cars to an airport parking lot that negates the progress of decarbonising,' Caughey said.

Caughey is keen to stress, however, that the zero carbon vision for aviation isn't just about hydrogen jet planes and drone taxis, but about the improvement to existing buildings and infrastructure.

'It's important to inject a dose of reality when working with clients to create a roadmap for their developments,' he says. 'Our shared goal is clear: achieving truly sustainable, emission-free aviation while preserving the essential connectivity that aviation provides.' **C**

"Our shared goal is clear: achieving truly sustainable, emission-free aviation while preserving the essential connectivity that aviation provides"

TAKING HEALTHCARE TO NEW HEIGHTS

Atkins' Future Flight team is supporting the infrastructure component on a project led by AGS Airports to deliver vital medical supplies via drones. Project Caelus (Care & Equity Logistics Unmanned Air Systems) is a partnership with NHS airports in Aberdeen, Glasgow and Southampton. Already operational, it looks at how drones can be used to transport blood tests from GPs to hospitals and deliver cancer therapies to patients in remote locations.

Infrastructure development is a key challenge, particularly the creation of specialised housing for the drone fleet operating within the network. This involves the testing and development of next-generation systems to support the network effectively. A variety of drones are already operational across different distances in Scotland. Climate-controlled units are also being designed to securely house these systems.

The goal is to use drones to eliminate the need for individuals to take lengthy ferry rides or taxi journeys to access essential medical treatment. 'If we can safely deliver medications while adhering to pharmaceutical parameters, it's an avenue worth exploring,' says Andrew Caughey.



Scottish First Minister Humza Yousaf (centre) visits the Project Caelus drone project

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JOIN THE
NET ZERO
JOURNEY

The CIBSE Ireland Region is committed to inclusivity, professional development and collaborative growth. Chair **Stephen Weir** MCIBSE highlights the region's successes, including the workshare initiative that allows engineers to switch between contractors and consultants



CIBSE Ireland Region chair Stephen Weir



CIBSE IRELAND: COLLABORATION, INNOVATION AND PROGRESS

The CIBSE Ireland Region is steeped in history and, in our 55th year, is in as strong a position as ever. With an exceptional committee comprising individuals with diverse expertise across energy management, consultancy, education, contracting, design, and supply, the organisation has played a pivotal role in shaping the industry and promoting excellence in every aspect of building services engineering in Ireland.

This article explores ongoing initiatives of the CIBSE Ireland Region, highlighting its commitment to inclusivity, professional development, and collaborative growth.

Diverse expertise and technical excellence

The CIBSE Ireland committee contains an impressive array of knowledge and technical excellence, and its diversity highlights the collaboration and significance of each segment within our industry.

With such a wealth of expertise, CIBSE Ireland Region is well equipped to tackle the multifaceted challenges and opportunities that arise within the field.

Empowering women in engineering: WIBSE Ireland

One of the most encouraging developments in recent years has been the success of the Women in Building Services Engineering (WIBSE) Ireland initiative.

The committee's proactive approach to organising networking events and promoting women in the industry has resulted in increased visibility and recognition for female professionals.

The recent success of the Women in Engineering event at the Sustainable Energy Authority of Ireland show and networking evening, in June, is a testament to the growing influence and impact of WIBSE Ireland.

By fostering a supportive and inclusive environment, CIBSE Ireland Region is committed to promoting gender diversity

and empowering women to thrive in building services engineering.

Nurturing young talent: CIBSE YEN committee

Recognising the importance of supporting young engineers, our Region actively engages with its Young Engineers Network (YEN) committee. Through events and technical information sessions, the committee helps young professionals build meaningful connections and gain valuable insights into the industry. A recent YEN touch rugby event was hugely successful.

Promoting collaboration: Workshare initiative

Promoting collaboration and fostering a deeper understanding of different perspectives in the industry, CIBSE Ireland has reintroduced its Workshare initiative. This programme facilitates an exchange of engineers between contracting teams and M&E consultants working on a specific project. By spending three months on the



CIBSE Ireland Region members with chair Stephen Weir (front left), vice-chair Laura McMahon (front centre) and former chair Michael Curran (front right)

“The committee’s proactive approach to promoting women in the industry has resulted in increased visibility and recognition for female professionals”

alternate side of a project, participants gain invaluable insights into design and installation aspects. This initiative strengthens the bond between consultants and contractors, and encourages a collaborative approach to project delivery.

Support and development for members

CIBSE Ireland is dedicated to supporting its members throughout their careers. Through various channels, such as the upcoming autumn webinar series, networking events, and the successful golf outing, the committee ensures that members have access to continuous professional development opportunities and a vibrant community for knowledge exchange. The Christmas lunch, attended by almost 600 industry representatives, is set to take place once again at Croke Park on 1 December.

Newly appointed STEM Ambassador for the region, Laura McMahon MCIBSE – who is also the current vice-chair of CIBSE Ireland – plays a vital role in promoting building services engineering as a promising career choice to school students. Supported by CIBSE, this initiative aims to inspire the next generation and encourage more young talent to pursue careers in the industry.

In June, the CIBSE Ireland committee organised a fascinating and insightful tour of Google Flour Mills in Dublin’s Barrow Street. The tour consisted of design and contract team representatives offering insights into the design, installation and delivery of excellence in engineering and new technologies that were employed within this historic building. We shall be organising a site tour of another prominent building services project in the coming months.

The region is proud to support the benevolent fund and, indeed, our own

almoner, who is always a support to members. We are proud to provide help to those going through their chartership and encourage anyone who is seeking information or assistance to reach out to us. Our recent briefings on membership and routes to chartership have provided many with the information they require to move forward with this.

Inclusivity and career development

As the organisation looks to the future, its vision emphasises inclusivity and long-term career development for trades and engineers alike. With a focus on diversification, CIBSE Ireland Region aims to create a welcoming environment for all individuals to thrive.

By collaborating closely with consultants and contractors, the organisation seeks to develop clear pathways to membership and chartership, providing employees with a roadmap for professional growth.

Collaborative industry development

To drive the overall development of the construction industry, CIBSE Ireland Region recognises the importance of working closely with other industry groups.

By fostering collaborative relationships with stakeholders across the sector such as Engineers Ireland and Royal Institute of Architects Ireland, the organisation ensures that building services engineering remains at the forefront of technological advancements, sustainability practices, and industry standards.

To date, we have spearheaded a number of all-industry events. We have also contributed to standards development in post-Covid ventilation regulations.

A trailblazer in building services engineering

In its 55th year, CIBSE Ireland remains a pioneering force. With its vast knowledge, technical excellence and commitment to inclusivity, the committee is continually leading the industry towards a sustainable and prosperous future.

From empowering women in engineering to nurturing young talent and supporting its members, CIBSE Ireland’s initiatives highlight its dedication to building a diverse, collaborative, and innovative community.

Our committee is always seeking new and exciting talent, along with support to our members. We can be contacted through the links below. [C](#)

- www.cibseireland.org
- www.linkedin.com/groups/2947696



The CIBSE Ireland Region visited Google’s Bolands Mill development in Dublin, which is due to open in 2024



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BOXING CLEVER

With Dublin planners now requiring that building re-use is considered over demolition, innovative office retrofits will soon become the norm. **Andy Pearson** looks at two: Tom Johnson House and the Tropical Fruit Warehouse

Tropical Fruit Warehouse

A warehouse building, formerly used for tropical fruit imports (and more recently as a studio by U2), on the quays of the River Liffey in Dublin, has been redeveloped as an office building.

Owned and developed by IPUT Real Estate, designed by architect Henry J Lyons, built by Dutch design and build contractor Octatube, with a façade designed by Arup and building services by O'Connor Sutton Cronin, the scheme comprises three interconnecting elements: a restored 1890s warehouse with a new lightweight cantilevered glass box extension above and a new seven-storey office building behind.

Reuse of the fabric of the double-bay existing warehouse reduced the carbon embodied in the project. A two-storey glass-box extension appearing to float above these is the most eye-catching part of the project.

The early involvement of Arup's façades team ensured that the lightweight, transparent box could be delivered in keeping with the architectural aspirations.

The double-skinned façade features an outer skin of 8.5m high, 2.5m wide giant laminated glass panes, that reach full height of the two-storey box. The inner double-glazed skin, forming the building's thermal envelope, is a bespoke steel and glass module. It is recessed top and bottom to give it the appearance of being frameless; all the occupants see is a thin black silicone 24mm- >>

As buildings are required to become more operationally efficient and produce less carbon, embodied carbon is accounting for a greater share of their life-cycle carbon production.

The retention and reuse of a building can limit additional carbon production and policy makers across the UK and Europe are increasingly requiring developers to justify their decision to demolish existing buildings.

Dublin City Council's 2022-2028 development plan, for example, requires 'robust justification' for demolition and reconstruction works and that re-use should always be considered as a first option.

The policy appears to be having an impact, with property agent Savills saying that 'emerging evidence points to [the retention and reuse of buildings] as best practice,' for many developments in its 2023 review of the Dublin office market.

The following contrasting schemes show how consultant engineers in Ireland are helping to trailblaze the reuse of two very different types of office building.

Tropical Fruit Warehouse: a restored 1890s warehouse with a new lightweight cantilevered glass box extension and seven-storey office building



» wide vertical joint between units. The double-skin façade has a U-value of $1.1 \text{ W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$.

A series of glass fins, positioned in line with the joints on the outer leaf, separate the outer leaf from the inner unit. The fins are hung from the building's roof. The weight of the outer glazed skin is supported on a bespoke stainless steel frame fixed back to the bottom floor slab.

'We worked diligently with the contractor to develop bespoke toggled connections that allowed accommodation of the differential vertical movements with the fins providing horizontal restraint to both skins,' explains Lee Corcoran, senior façade engineer at Arup.

An additional movement challenge was that the cantilevered structure onto which the façade was attached was predicted to deflect under imposed loads.

Corcoran says: 'We worked closely with Octatube and structural engineers Torque Consulting Engineers to fully understand the movements associated with the structure at façade connection points so that we could design the system to accommodate the anticipated racking movements and minimise the joint sizes with minimal visual impact.'

The glazed corners of the outer skin were carefully considered through extensive structural calculations and detailing. The final solution to 'lock' the corner units incorporates a closed loop structural solution; the large glass panels transfer the lateral load into bespoke stainless steel connections and

concealed stainless steel tension rods hidden within the silicone joints at the head and base of the units.

'It is a fantastic, discrete solution that no-one will ever see, which is aligned with the essence of the project,' says Corcoran.

Arup used a low-iron glass for enhanced clarity in both the inner and outer units.

In the drive to maintain transparency, the architect was keen that the office floors were kept free of window blinds and that the double-skinned façade remained uncluttered by interstitial maintenance walkways.

A high-performance solar control coating on the outer skin of the double-glazed unit combined with a solar control PVB interlayer on the laminated single-layer outer skin and ventilation to the interstitial cavity removes excess heat.

To finalise the glazing and PVB selection, Octatube built a series of small-scale mock-ups at its Delft HQ. Once the selection was confirmed, a full-scale mock-up was built and subjected to the CWCT sequence B weather performance test.

Access for cleaning within the cavity is provided by a single walkway concealed at the

base of the façade. To enable personnel to move between the two skins, Arup worked with Octatube to shorten the glazed fins so that they stop 1.6m above this walkway. A bespoke abseiling solution was developed to allow for cleaning of individual bays in between the glass fins.

The location of the glass box above the existing warehouses meant that when it came to constructing it, sequencing was key. As part of the restoration of the warehouses, all of their roof trusses were removed and taken off-site for restoration. This allowed construction of the core and structure to support the glazed box. The box was pre-assembled as far as possible to minimise work at height, ensure build quality and to complete the installation before the warehouse roof trusses were reinstalled.

'What made the project so successful was our involvement at such an early stage, which meant the design was well considered quite early in the process and that allowed us to engage with a specialist contractor very quickly,' Corcoran says.

The 85,000ft² office is now entirely leased to TikTok. »

"The location of the glass box above the existing warehouses meant that when it came to constructing it, sequencing was key"

Tom Johnson House is a five-storey 1970s office that will become home to Ireland's Department of the Environment, Climate and Communications



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» **Tom Johnson House**

The retrofit of Tom Johnson House, Dublin, is set to turn a five-storey over-basement, 1970s office building into one of the most sustainable buildings in Ireland, ready to become the new headquarters for the Department of the Environment, Climate and Communications (DECC).

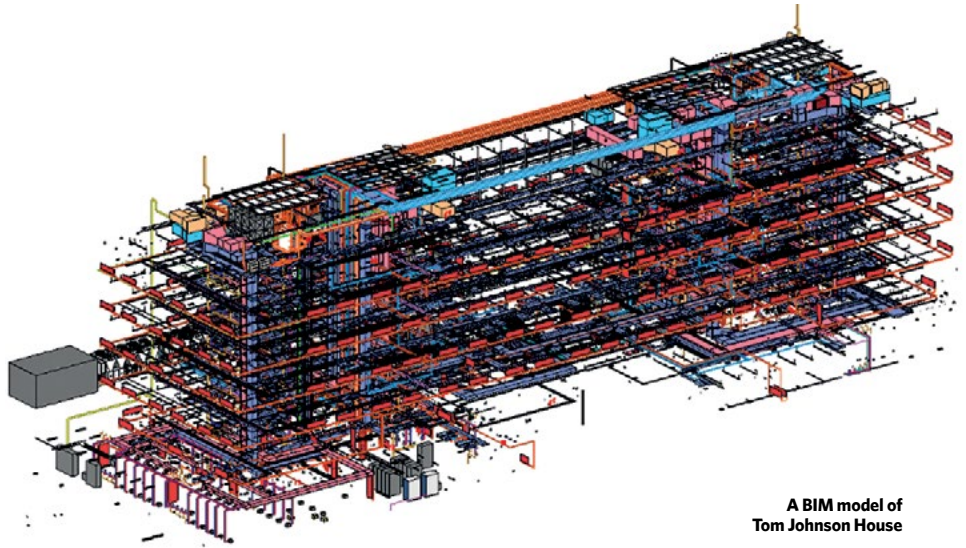
The Irish Government has made it a top priority to decarbonise public sector projects and drive the green transition to help mitigate climate change. This project, funded by the EU under Ireland's National Recovery and Resilience Plan 2021 as part of the European Union's response to the global pandemic, is intended to be an exemplar.

It will demonstrate that the project's client, the Office of Public Works (OPW), is helping lead that transition. As such, Tom Johnson House has been designated a Public Sector Retrofit Pathfinder Project by the OPW.

Designed in-house by the commissioners of public works in Ireland and engineered by Lawler Consulting, the refurbishment is designed to take the building from a C3 Building Energy Rating to an A2, which the OPW predicts will reduce primary energy use by 75%, greatly extending the building's useful life. 'The OPW brief was for the building to be A2 energy rated; that set strict criteria for what we had to achieve in terms of both fabric and MEP systems' energy performance,' says James Long, associate director at Lawler Consulting.

Application of the OPW's Green Procurement Policy will further mitigate the project's carbon impact as will the requirement for compliance with EU rules for material input and waste management, re-use and recycling.

The retrofit retains the existing 1970s concrete structure and external brick façade



A BIM model of Tom Johnson House

“The biggest modification by far is the introduction of a new atrium punched through the centre of the building, to allow daylight to enter”

to minimise the carbon embodied in the refurbishment. 'We've reused the existing window openings and fitted new glazing to enable the office to be naturally ventilated,' explains Long.

Internally, the existing cellular office layout has gone, to be replaced by a predominantly open plan office arrangement.

The biggest modification by far, however, is the introduction of a new atrium punched through the centre of the building, from roof to ground floor, to allow daylight to enter deep into the building's core and to further facilitate natural ventilation.

The new atrium divided the existing rooftop plantroom into two halves. As a result, Lawler Consulting's scheme now serves each half of the building from its own dedicated rooftop plant. 'We've lost a third of the plant space and yet we're going to deliver enhanced levels of comfort,' says Long.

Lawler Consulting's all-electric design includes removal of the existing boilers. These are being replaced by two, 600kW multifunction chiller heat pumps to provide both heating and cooling to the offices.

A smaller high-temperature heat pump boosts the heating water temperature to heat the domestic hot water. There is no fossil fuel on site.

Office floors are heated by radiators on a low-temperature hot-water system. High occupancy areas, such as meeting rooms, all incorporate active cooling, primarily provided by fan coil units.

Additional carbon reductions are provided by a 50kW roof-mounted solar PV array. The scheme also incorporates a large number of EV charging stations. These are controlled to ensure the building's electrical demand remains within the capacity of the site's existing 600kVA transformer. **C**

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Empowering and inspiring the public sector to transition to a low carbon future

At Salix, we're passionate about delivering decarbonisation projects across the UK

Working alongside the government's commitment to reach net zero by 2050, Salix Finance has supported more than 21,500 projects to date, saving more than 1.1 million tonnes of carbon dioxide annually.

Here at Salix we administer various types of funding schemes across the UK working alongside our partners to make a great contribution to the UK's decarbonisation agenda. These include the Public Sector Decarbonisation Scheme, which focuses on delivering heat decarbonisation and energy efficiency projects across England. This scheme supports various technologies, such as air, ground and water source heat pumps, LEDs, electric heaters, solar photovoltaics (PVs) and insulation measures.

We also deliver the Low Carbon Skills Fund, and this year took on the role of delivery agent for Wave 2 of the Home Upgrade Grant and the Social Housing Decarbonisation Fund, on behalf of the government.

Across Salix, we have expert teams working with public sector organisations to help them achieve net zero ambitions, from finance and audit to delivery.

Our Energy and Carbon Technical team

In the Energy and Carbon Technical team at Salix, we conduct technical due diligence checks on government-funded decarbonisation projects, aiming to guard against unfeasible projects by looking at them holistically. We take into consideration a 'whole building' approach and aim to help public sector bodies reduce their buildings' heating demands by installing various types of insulation measures. In the context of the ongoing energy crisis, implementing these measures has never been more important, as we look to accelerate the transition to a net zero economy, while also saving our grant recipients - and the taxpayer - money on their energy bills.

When a public sector body applies for a grant award, Salix will assess the design of the project and guide it to consider all elements of its building. With our support



and advice, an organisation might consider options to reduce its energy demand, such as building management systems, or to supplement electricity-based heating systems with electrical energy efficiency measures, such as solar PV.

Our goal is to ensure the public sector gets the best value for money on its projects, so that the public purse gets the best possible value for its investment. Using our technical proficiency and wealth of data analysis from previous schemes - as well as our internal database and benchmarking - we can provide the best advice to ensure projects are environmentally friendly and cost-effective, and maximise savings. In the Energy and Carbon Technical team, we do our very best to ensure clients are being more socially responsible while reducing carbon footprint.

Looking at the deliverability of the project, we help the public sector body plan timelines that best suit its needs. In addition, expert advice on important matters such as distribution network operator engagement is presented to our clients, ensuring they consider what could affect their lead times and possibly delay getting their project off the ground.

We run regular webinars, giving people the chance to have their queries answered live, offering key information about our schemes in a more digestible way. We are currently running our Phase 3c Public Sector Decarbonisation Scheme webinars and in October we will continue our series of specialist Distribution Network Operator events. See our website events area for the latest sessions.

At Salix, we are committed to delivering grant funding to good-quality projects up and down the country. With a wealth of talented and inspirational people, we are empowering the public sector to decarbonise, and pushing the UK economy towards cleaner, renewable energy.

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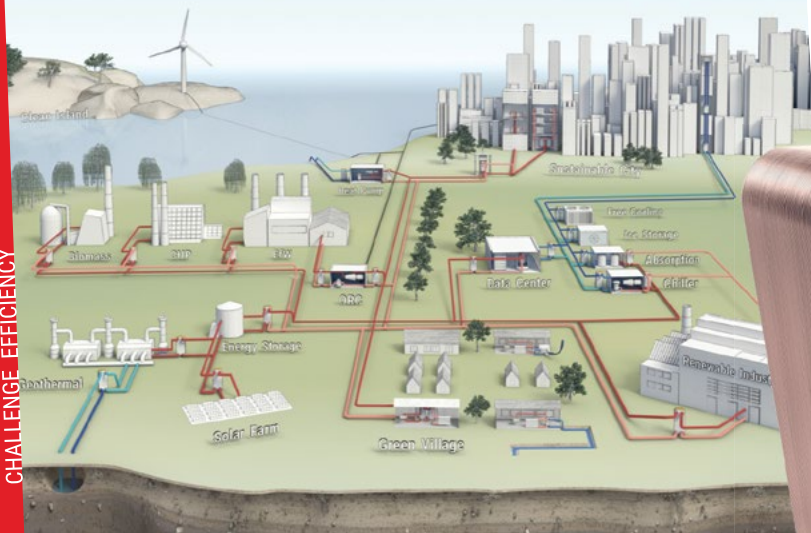
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Improve or demolish?

The difficult development decisions when minimising lifetime carbon

September 2023

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**CPD: Whole life
carbon for built
systems**

With a new development at 100 Gray's Inn Road, in central London, set to become the UK's largest full-timber, net zero carbon office building, **Phil Lattimore** finds out how the building's whole life-cycle carbon impact has been assessed



Whole life carbon was considered carefully at 100 Gray's Inn Road

The big picture

Embodied energy is becoming increasingly important for anyone planning a project. Consultants are now having to calculate whole life carbon of buildings to meet planning requirements and the expectations of clients.

In June, planning permission was granted by Camden Council for an office redevelopment on the corner of Gray's Inn Road and Clerkenwell Road, London, for what is believed to be the UK's largest full-timber, net zero carbon office building.

Building services engineer Max Fordham has used whole life carbon modelling to calculate the embodied and operational carbon of the project. It aims to exceed RIBA 2030 Climate Challenge and Greater London Authority (GLA) planning energy performance targets.

The designs for the eight-storey project, by architect Piercy & Company, will result in the construction of an 8,826m² (95,000ft²) office building on the site of the former Holborn Town Hall, in central London, for Global Holdings. The eight floors will include contemporary workspaces and a communal rooftop garden and restaurant.

A second 1,115m² (12,000ft²) building – currently known as 88 Gray's Inn Road – will also be developed on the site, and is expected to include six affordable buildings and a ground-level affordable workspace.

The team aims to outperform the UK

Green Building Council's (UKGBC's) Net Zero Office target, with the design seeking to lower operational carbon emissions by up to 82% compared with a typical office building. It is also targeting a Nabers UK 5.5* energy rating for the main building.

One of the headline-grabbing aspects of the development is the main building's full-timber structure. This will result in a much lower embodied carbon compared with a typical office building using concrete or similar materials, explains Max Fordham's Edmund Chan, principal engineer and lead project engineer for the 100 Gray's Inn Road project.

'Everything in terms of superstructure will be timber, made from highly sustainable glue-laminated (glulam) timber beams and cross-laminated timber slabs as part of the overall design,' Chan adds.

According to Andy Heyne, director at project structural engineers Heyne Tillett Steel, the timber structure, combined with its high-performance façade, should outperform the UKGBC's *Building the case for net zero* office baseline target by more than 50%. 'With more than 2,400 tonnes CO_{2e} stored within the timber, the structure is effectively carbon negative during its lifetime,' he says.

The reinforced-concrete basement walls of the existing buildings will be repurposed for the development. 'While the basement will be dug deeper [for the new building], we are reusing the foundation on the perimeter. We will be using as much as possible down at that substructure level,' says Chan.

FUTURE-PROOFING AIR DISTRIBUTION

Part of the strategy was to look at on-floor services rather than having a big AHU on the roof, ducting down via lots of horizontal and vertical distribution. Instead, horizontal AHUs were used in voids under each office floor.

'We are not installing lots of ductwork,' says Chan. 'We are employing underfloor cooling using five conditioned air module units sitting in the cores, which blow conditioned air into the floor plenum.'

Reusable floor plenum materials mean future tenants can adapt space without having to pull out ductwork.

'We're enabling the reduction of waste and embodied carbon from Cat A to Cat B fit-out' says Chan.

'The design strategy also allows us to keep the timber structure exposed, and it maximises floor-to-ceiling heights, creating that impression of space.'

The Max Fordham team has gone through a process of identifying, assessing and pre-auditing the existing buildings in terms of soft-strip and deconstruction of building elements. 'There is a lot of material that can be reused from soft-strip, such as raised access floors, lighting and MEP strip-out material,' says Chan.

Delivering performance

Ensuring the materials selected for the building are as suitable as possible for future deconstruction and reuse is also key. 'Our retained role is to be part of that strategic approach moving forward, using expertise in these areas and working with the contractor and their supply and delivery chains to make that happen,' says Chan.

In terms of operational carbon, the building will use 100% renewable grid electricity, rooftop photovoltaic panels, an all-electric heating, hot water and cooling system, and demand-driven displacement ventilation for the office floors.

'This is one of our first large office projects that went through the updated GLA set of requirements for sustainability and energy efficiency, which includes whole life carbon and circular economy statements,' says Max Fordham's principal sustainability consultant and partner, Henry Pelly. Knowledge from the firm's first Nabers UK 5.5-star project at 11 Belgrave Road (see 'Ratings winner', *CIBSE Journal*, February 2023) was fed into 100 Gray's Inn Road.

A key challenge in such a project is to ensure that lifetime embodied carbon calculations are realised. Avoiding compromises that might change aspects of the design – which could impact energy performance and, therefore, embodied carbon – is crucial, says Pelly.

'One of the things about embodied carbon is that everything comes as a package and it all fits together,' he adds. 'It's not like you can just pull out one element because everything's been designed to work together. The timber structure, for example, is prefabricated off site and assembled on site, reducing carbon inputs.'

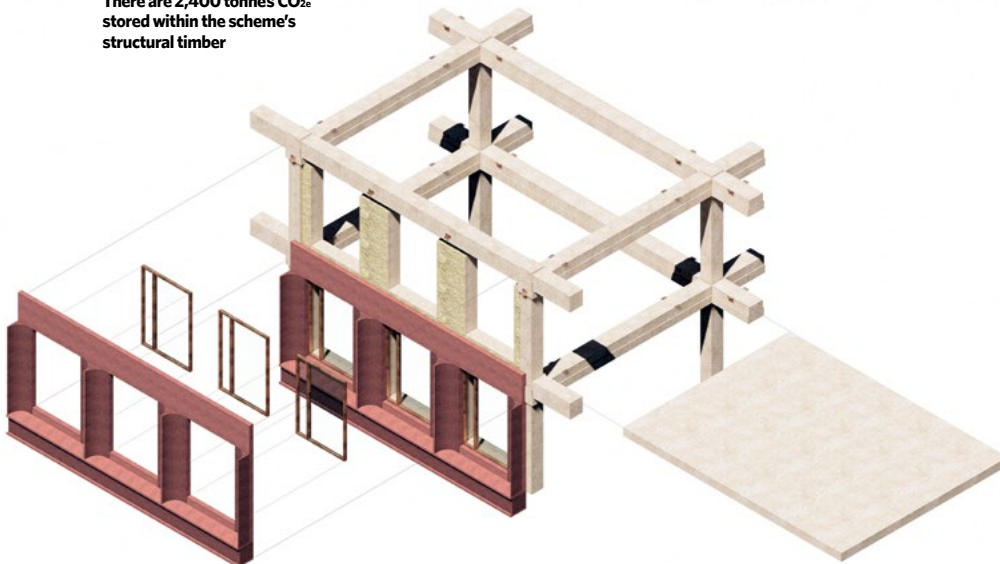
Max Fordham's approach to embodied carbon and energy performance modelling is to be conservative about potential savings rather than assuming best-case estimates. 'It is quite helpful to adopt a kind of "worst case" embodied carbon modelling approach so that, at every stage of the process, there are opportunities for improvements,' Pelly explains. 'Instead of taking potential opportunities for savings early on in the process – for instance, the raised access floors we are reusing – we don't assume them for the modelling until they are written into the documents and we know they are definitely going to happen.'

This is important to avoid overestimating savings, Pelly adds, and focus on where improvements can be made to the building.

Similarly, while estimating the carbon impact of future deconstruction at end of life is a challenge, the team's model includes only what is technically possible now, rather than assuming the potential impact of future technologies.

The design decisions reflect potential reconfigurations in the future and the

There are 2,400 tonnes CO_{2e} stored within the scheme's structural timber



Embodied carbon in future refits has influenced design

consequent embodied whole life carbon impact. For example, the team looked to minimise ductwork by having more air handling units (AHUs) at each floor level, rather than having multiple vertical ducts running from one centralised AHU. (See panel, 'Future-proofing air distribution').

Enabling works on the project are expected to start imminently, with work starting on site in early 2024. Completion is anticipated for the first quarter of 2026.

Responsibility for keeping to embodied carbon budgets will be held by each of the parties under contractual arrangements for individual packages of work, says Chan. 'For example, in the concrete work package, they may be able to choose to use lower carbon solutions in different parts of the construction sequence, but they can't pass down any carbon budget "overspend" to the next contractor to make up somewhere down the line.'

Ultimately, achieving net zero carbon requires a 'whole building' approach to design, adds Chan. 'We've driven down the building's operational energy demands by prioritising passive principles and optimising the façade, engineering efficient active systems, and supplementing through low and zero carbon energy sources.'

Max Fordham is committed to having the in-use performance realised and verified by others. 'We want to show that low energy design is not a concept, but a reality in our lifetime,' he says. **CJ**

Make do and mend or end?

When should a building be demolished? Max Fordham's Kiru Balson examines the thinking behind retaining or removing structures and services

Increasingly, whole life carbon optioneering is part of the strategic design decision-making for commercial developments. Approximately 60% of construction output is new-build, while 40% is refurbishment and maintenance, but there is growing recognition of the benefits of retaining structures and repairing or refurbishing façades.

Local authorities are also making embodied carbon reporting a prerequisite for planning, and industry bodies are doing the same for professional awards.

It is inevitable, however, that some buildings will be demolished, driven by factors including commerciality, land use, estate agents' requirements for lettable, and the adaptability of buildings to deliver the required functional spaces to current regulations. At the early stages of a project, strategic optioneering should explore the potential for refurbishment and retaining structures before considering substantial demolition.

In some refurbishment projects, where there is higher retention of the façade, core and structure, building services can contribute up to 40-50% of the upfront embodied carbon impact. Overcoming the constraints of an existing building and developing a low carbon mechanical, electrical and plumbing (MEP) strategy is the challenge. The starting point should be to look at reducing the mass of the MEP equipment required, followed by specification of low carbon refrigerants and application of remanufactured and rewarranted fittings.

Max Fordham recently compared centralised vs floor-by-floor air handling units for an office refurbishment. Ductwork for the distribution of conditioned air



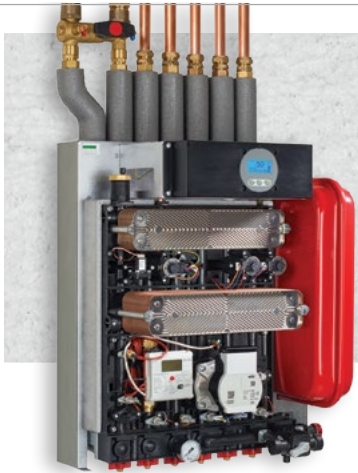
contributed to more than 65% of MEP upfront carbon. This required the development of a ventilation solution to overcome site constraints and reduce the amount of ductwork, to maintain the floor-to-ceiling requirements for offices.

In one of our deep-retrofit schemes, the Rylands Building in Manchester, we enabled the recovery and remanufacturing of more than 600 LED lights. This resulted in a saving of 14tCO₂e, while 644kg of electronic waste was prevented by recovering and remanufacturing lights.

MEP optioneering at early design stages usually involves assumptions, using minimal detailed design information. For guidance, it is possible to make indicative estimates of equipment mass per m² and a carbon rate. This can only be an approximation of the quantity that would be installed on completion. Typical MEP design scopes for RIBA Stages 2 and 3 do not produce the detailed equipment schedules and product-specific data to generate a comprehensive embodied carbon model.

It is also a challenge to ensure robustness in measuring and reporting the actual embodied carbon for all elements as proposed and installed. Product-specific environmental information is limited. An Environmental Product Declaration (EPD) might be in place for one supplier, but not for others, or there may be a generic EPD that covers all similar products on the market. This makes it difficult to compare low carbon solutions. Embodied carbon calculations for MEP systems are even more challenging for the above reasons. As more publicly available CIBSE TM65 and EPDs for MEP equipment become available, comparisons should be more meaningful and useful.

KIRU BALSON is principal sustainability consultant, Max Fordham




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Eco Flex lights feature in a case study on the Grand Hyatt Kuwait hotel

Shining a light on embodied energy

Calculating embodied energy in lighting equipment can now be done more accurately thanks to the new CIBSE TM65.2 guide, which, say co-authors **Kristina Allison** and **Irene Mazzei**, is targeted at manufacturers and lighting designers to lower whole life carbon

The conversation around sustainability, embodied carbon and the circular economy has accelerated rapidly. Not long ago, it was commonplace for specifiers of lighting equipment to recommend luminaires with halogen or metal halide light sources, and fluorescent lamps were only banned from sale in the UK and Europe this year.

The lighting industry is in a different, healthier place now, and has been leading the conversation on the circular economy with the release of two timely CIBSE guides: *TM66: Creating a circular economy in the lighting industry*, published in 2021, and *TM65.2 – Embodied carbon in building services: lighting*, which came out last month. The original *TM65 – Embodied carbon in building services* (aka ‘the parent’ document) and accompanying carbon calculator is already a widely accepted methodology for calculating CO_{2e} in build services equipment. It does so without having to submit products for full Life Cycle Assessments (LCAs), a process that is lengthy and expensive.

The TM65 methodology offers a route to evaluating and understanding the amount of

embodied carbon within materials that make up products. It can even be used as a tool for development during the product design phase because of the process’s fast turn-around. Lighting manufacturers have been very responsive to industry demands for this data and the 18 case studies within TM65.2 demonstrate this. The methodology enables material data, including manufacturing process data, to put a CO_{2e} value on lighting equipment. The more data that becomes available the more ‘environmentally aware’ the decisions that lighting designers and specifiers can make for projects.

Why a lighting version of TM65?

Manufacturers of lighting equipment were so keen to calculate the embodied carbon in their products that they were using the ‘parent



document' and the earlier version of the carbon calculator. Although this was a good place to start, it showed that the process was not created for this purpose. As a result, lighting equipment was showing higher values of CO_{2e} than it actually had as some materials used in lighting equipment were not in the tool. This could lead to similar materials being used that weren't similar at all in reality, but are used as a substitute for the calculation.

We are finding that the results of assessments using the TM65.2 approach are closer to that found using a LCA.

There is no difference in the 'core' TM65 methodology in the new document – it simply makes the calculation process easier and clearer for the lighting industry. To achieve this, two things happened: less importance was given to some generic features that characterise the built environment (such as information on refrigerant charge and leakage), while features that are more relevant to the impact associated with lighting products were highlighted and made clearer for the users.

Changes to the carbon calculator

TM65.2 includes more comprehensive guidelines on using the calculation to better capture the complexity of lighting products, while keeping the simplicity of the TM65 approach. This was possible thanks to the involvement of several lighting manufacturers, who shared information on the material content of their products

“The inclusion of more material coefficients will allow for a higher level of accuracy in the embodied carbon values”

and allowed the authors to build a list of new embodied carbon coefficients to be added to the TM65 database. However, because of data availability, it was not always possible to find exact matches for material coefficients. To solve this, guidelines on what to do with components and materials that are not included in the TM65 database were added, such as indications on how to choose alternative materials from the database.

One of the new database additions of TM65.2 relates to the embodied carbon coefficients for aluminium from 100% recycled and 100% virgin sources: these have been added to the aluminium coefficients already in the database, and there are indications on how to account for materials that have intermediate recycled aluminium content. Another important feature is the inclusion of clear indications of what is needed in the calculation to represent a luminaire, and guidelines on how to account for external/integral light sources and control gear, and other auxiliary components.

Meaningful comparisons

The inclusion of more specific rules regarding the calculation of embodied carbon in luminaires allows for a higher level of consistency among products made by different manufacturers. This gives more meaningful comparisons and a higher degree of harmonisation in the industry.

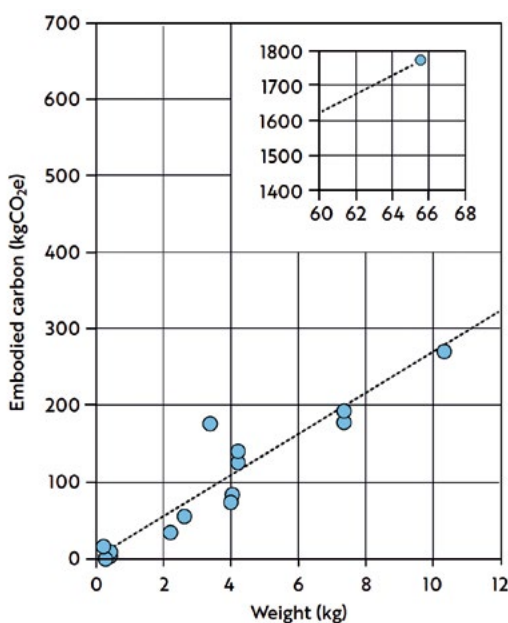
One of the aims is to make sure the methodology can be applied in a consistent way, with less room for subjective choices by those doing the calculation. Additionally, the inclusion of more material coefficients will allow for a higher level of accuracy in the embodied carbon values. It will enable the selection of personalised recycled aluminium content, which will lower the embodied carbon of products and reflect the sustainability efforts of the industry.

Who should use TM65.2?

The document is suitable for all who would like to learn about embodied carbon in lighting equipment, including lighting designers who would like to understand the impact of a product, or manufacturers seeking to evaluate the carbon performance of their existing ranges. It features a decision tree to show who should use the tool at each stage – for example, if a lighting designer would like to incorporate products with low CO_{2e}, they might instigate the calculation assessment, but the next step is for the manufacturer to gather the data for the materials, processes and locations that are required for the assessment. The designer won't have access to all this data without the manufacturer's involvement.

Plans for future versions are touched on within the document. As more reliable material data becomes available, we would like to add it to the carbon calculator so that lighting equipment can be well represented and calculated as fully as possible. Of course, the purpose of this document is to enable faster calculation of CO_{2e} in lighting equipment and not to replicate or replace a full LCA.

We believe TM65.2 will attract more users to the TM65 methodology because of the improved accuracy. Lighting manufacturers will be able to carry out the calculation with clearer guidance and rules, and will see embodied carbon results that better capture their sustainability efforts. Lighting designers and specifiers will be able to advise their clients knowing that the embodied carbon of products was calculated following robust guidelines and, as a consequence, they can more accurately compare products based on their embodied carbon values. [C](#)



Overview of embodied carbon results obtained with TM65 basic level calculation, plotted by product weight. The figure shows that the results follow a linear correlation of embodied carbon values, increasing as the product weight increases

KRISTINA ALLISON MSL is project lead for TM65.2 and senior lighting designer at Atkins Global; **DR IRENE MAZZEI** is a TM65.2 co-author and KTP Associate Stoane Lighting/Edinburgh Napier University. The two other authors of TM65.2 are: technical lead **JONATHAN RUSH**, director at Hoare Lea Lighting, and **SIMON FISHER**, director at F Mark

Reshaping aluminium for a low carbon future

The use of recycled materials is critical to minimise embodied energy in aluminium systems. However, industry demand is outstripping supply, which means the sector has to find other ways to reduce aluminium's impact on the environment. John McComb, of Reynaers Aluminium UK, reports on the latest low carbon innovations

Aluminium, with its lightweight structure and resistance to corrosion, offers some important performance benefits, which have led to it being specified on some of the world's highest-profile buildings.

It also has excellent recycling properties, retaining performance characteristics, but as with all construction products, we are not able to produce a perfect product with no environmental impact. As is the case with many different materials, the energy-intensive production process of aluminium is an area that the industry has sought to improve.

Optimising the use of recycled aluminium is, of course, a critical route to reducing embodied carbon. Using only a fraction of the energy needed to produce the primary product, recycled aluminium has a far lower level of embodied carbon, averaging around 0.5 tonnes CO_{2e} per tonne.

As aluminium can be infinitely recycled without incurring any loss in quality, this is a sound proposition, and 92-98% of aluminium used in the building industry in Europe is recycled in some way. However, availability is an issue as recycled material becomes a victim of its own popularity, with demand outstripping supply.

This means that, to meet the volumes construction projects need, primary aluminium remains a key source. Let's take a closer look at what is being done to ensure an increasing supply of lower carbon aluminium.

Evolving production methods

In Europe, primary aluminium is typically produced with a carbon footprint of around 9.34kg CO_{2e} per kg aluminium, including extrusion – although, across the world, this can be higher, depending on how the power used for production is generated. As this is the principal source of carbon, changes to how manufacturers power their processes –



John McComb says united action will cut CO₂ emissions

“How manufacturers power their processes – such as switching to renewable energy – can have a dramatic impact on carbon footprint”

such as switching to renewable energy – can have a dramatic impact on carbon footprint.

In some countries, aluminium production is already moving to renewables, which is helping to cut embodied carbon. For example, hydropowered plants are producing aluminium with embodied carbon levels of 4kg CO_{2e} per kg aluminium.

Innovation is playing an important part in identifying ways to cut emissions even further. Where changes to the Hall-Héroult process – the main method of aluminium production – have been put in place, this has increased efficiency, further helping to cut emissions. Broadening the use of these changes will create an even bigger impact.

Other developments include replacing carbon anodes in the production process with a ceramic material that leads to only oxygen being emitted. Using this method in combination with sustainable energy will have a significant impact on driving down carbon levels in aluminium.

While changes are being introduced to support low carbon aluminium, supply remains limited. As a member of European Aluminium, Reynaers is committed to supporting work to reduce carbon in aluminium and to find sustainable solutions.

In 2022, the weighted average carbon footprint of the aluminium billets used to extrude our aluminium profiles in Duffel, Belgium, amounted to 3.96kgCO_{2e}. In 2022, we had a 44% share of low carbon primary aluminium and a 32% share of recycled aluminium. We are on a continual path to improve our carbon footprint, to achieve science-based targets, as outlined in *Reynaers Act*, by 2030.

As awareness grows of where carbon levels are an issue, the focus on making the necessary changes to support sustainable building design will intensify. Innovation and investment are central to making efficient, lasting change in the production process to create more low carbon aluminium.

Reynaers has taken a strong position in implementing more sustainable practices. *Reynaers Act* sets out our commitment as a company to develop more circular products, improve thermal efficiency and cut the company's direct carbon emissions by 46% – and indirect carbon emissions by 55% – by 2030, as well as to source low carbon aluminium. Through determined and united action, the carbon footprint of the built environment will continue to decrease. **CJ**

JOHN MCCOMB is technical services director at Reynaers Aluminium UK

References:

- 1 Reynaers Act, Reynaers Aluminium website bit.ly/CJRayAct

By applying the CWCT embodied carbon calculation methodology to a Croydon office, Patrick Ryan Associates estimated whether selecting a new high-performing façade is better for reducing whole life carbon than retaining elements of the original. **Anri Doda** and **Jill Wang** explain

Clear decisions



The façade at 69 Park Lane, Croydon, was the subject of the embodied energy analysis

According to a 2019 study by the World Green Building Council, buildings are responsible for 39% of global energy-related carbon emissions.

A further study by the World Business Council for Sustainable Development in 2021 found that a façade can contribute up to 31% of the total embodied carbon of a building.

To advocate for a better understanding of the environmental impact of façade designs, the Centre for Window and Cladding Technology (CWCT) launched a methodology for embodied carbon calculation of façades (see bit.ly/CJCWCTMeth).

As façade designers, engineers and consultants, we play an important role in the construction of the façade, providing advice and assumptions about façade design. Cutting carbon emissions while achieving better performance in façade is an important part of this process.

In 2017, Patrick Ryan Associates was involved in the 69 Park Lane, Croydon, project. We acted as the façade consultants during RIBA design stages 3, 4 and 5 for the total refurbishment and recladding of the whole curtain wall façade. The decision was made to maintain the original curtain wall steel frame, built in the 1980s, and replace the vision modules and spandrel panels.

This article evaluates the cost implications and embodied carbon reduction of the choices made following CWCT's guidance published in September

KEY ASSUMPTIONS

- Representative area (bay study) A: 3m x 3.376m = 10.128m² FSA
- Façade surface area (FSA) = 6,680m²
- Gross internal area (GIA) = 7,500m²
- Façade form factor (FFF) = 0.89
- Reference study period (RSP): 60 years
- Raw materials procurement: Europe
- Manufacturers' location: London
- Factory: London
- Distance between factory and site: six miles
- Site: Croydon, London

of 2022. We also analysed the environmental impact and cost implications if a full replacement of the entire curtain wall system had taken place.

The whole life-cycle of a façade is divided into five stages: product stage, construction process, in use, end of life, and benefits and loads beyond the building life-cycle, as illustrated in the CWCT methodology.

Representative area and assumptions

To assess the embodied carbon, a representative area of the buildings façade system was selected. The total embodied carbon of a project can be assessed by multiplying the results of each façade system, referring to the methodology.

After finding a representative area (see Figure 1), some key assumptions >>

	Partial replacement	Full replacement
Mullion window	5.39	1.8
Transom window	4.62	1.8
Mullion: spandrel panel	5.64	2
Transom: spandrel window	4.62	2
Window	1	1
Spandrel panel	0.33	0.33
Curtain walling	1.4	1.04

Table 1: Partial vs full replacement. U values (W·m⁻²·K⁻¹) replacement'

» are made (see panel, 'Key assumptions' on page 51).

Partial vs full replacement

Two separate scenarios were studied and analysed for the purposes of this case study: partial replacement - the curtain wall mullions, transoms and bracketry will remain in situ; full replacement - the existing curtain wall is to be replaced in its entirety. Thermal calculations were carried out at an early stage to ensure the design team complied with Approved Document Part L in both scenarios. The U-values achieved have been highlighted in Table 1.

Results

The results are summarised in Table 2.

The embodied carbon emissions for product stage and construction process (A1-A5) in the partial replacement option are 50% lower than for a full replacement. There is also a considerable cost saving,

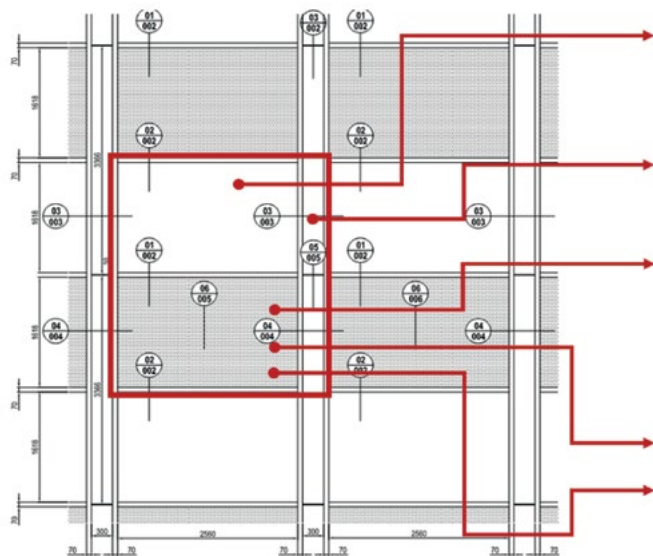
	Partial replacement	Full replacement
U-value	1.4W·m ⁻¹ ·K ⁻¹	1.0W·m ⁻¹ ·K ⁻¹
Construction cost	£5.65m	£10m
Embodied CO ₂ emissions	1,328 tonnes	2,000 tonnes
CO ₂ emissions due to operational use PA	286 t CO ₂ e per year	204 t CO ₂ e per year
Estimation of the CO ₂ emissions due to electricity in the next 20 years	5,720 t CO ₂	4,080 t CO ₂
Total CO ₂ emissions for whole life carbon cycle as per CWCT guidance	7,048t CO ₂ e	6,080t CO ₂ e

Table 2: Results of the analysis - partial vs full replacement

with the partial replacement being nearly half the cost of the full replacement. However, the picture changes when operational carbon savings are taken into account. The full replacement solution improves the U-values by 40%, and reduces carbon emissions from operational energy use by a third annually.

Over a 20-year period the reduction in carbon emissions because of a better-performing façade in the full-replacement option more than compensates for the higher embodied carbon emissions - 6,080t CO₂e vs 7,048t CO₂e. **CJ**

■ **ANRI DODA** is an associate and **JILL WANG** a façade engineer at Patrick Ryan Associates



Vision glass panel:

Outer pane: 8mm Sunguard SNX60 HT on Guardian extra clear
Cavity: 22mm black warm edge spacer, 90% argon-filled
Inner pane: 8.8mm clear annealed laminated

Recess:

Insulation
Aluminium cladding

Spandrel glass panel:

Outer pane: 8mm Sunguard SNX60 HT on Guardian extra clear toughened
Cavity: 12mm black warm edge spacer, 90% argon-filled
Inner pane: 8mm clear ceramic-coated glass (Face 4) matt toughened and heat soak tested

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Figure 1: A representative of a façade system at 69 Park Lane, Croydon



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Embodied carbon: from a wider perspective

The PAS 2080 framework for managing the decarbonisation for organisations has been updated to include the built environment. **Alex Smith** reports

PAS 2080 provides a framework for managing carbon for organisations delivering projects and programmes across buildings and infrastructure. It offers a systematic way to integrate carbon into decision-making and includes everyone in the value chain at all work stages. According to the co-author Arup: 'It's absolutely central to the transition to a net zero economy by 2050.'

Earlier this year, the standard was expanded to cover the entire built environment and not just infrastructure, which was the focus of PAS 2080 when it was first published in 2016.

The revision aims to help organisations across the built environment reduce whole life carbon emissions. Currently, the design and construction of buildings and infrastructure is responsible for 40% of annual global CO₂ emissions.¹

The standard specifies requirements for the management of whole life carbon in buildings and infrastructure – in the provision, operation, use and end of life of new projects or programmes of work, and the management or retrofit of existing assets and networks. (See panel for 2023 updates to PAS 2080).

Arup was one of the co-authors of PAS 2080 at its inception in 2016 and on this revision. PAS 2080 technical author and Arup associate director Dr Heleni Pantelidou says PAS 2080 promotes collaborative working and systems thinking on carbon reduction.

'Working in silos and focusing on individual assets will not get us where we need to be,' she says.

The building industry should think more holistically about carbon emissions from developments and its thinking on decarbonisation should not be confined to the boundaries of its projects, she believes.

The industry has focus on the energy used by the buildings. 'Energy generation has always been looked at separately from consumption,' she says.

She gives an example of the carbon produced by vehicles. 'Road building has a high carbon content but, when you compare the carbon generated by the building and operation of the infrastructure, it is only 1% of the total carbon emissions; 99% sits with the users of roads,' she says.

In the guidance document accompanying the standard, there is a 'building retrofit at scale' case study, which highlights the difficulty of achieving net zero carbon at the wider scale.

Researchers from the University of Sheffield and University College London estimated the operational energy baseline for UK building stock in England and modelled a range of retrofit interventions using the Government's National Household Model.

Combining the energy modelling with the embodied carbon benchmarks of eligible building fabric and system interventions allowed the whole life carbon emissions of retrofit measures to be compared with the Climate Change Committee 'carbon budget' estimate for the sector.

Analysis showed that retrofitting in England would require a mass deployment of heat pumps to achieve emissions that were less than the available carbon budget for the sector. In a scenario with heat pumps (ground or air source), the operational energy is more than halved, but it results in twice the load being placed on the National Grid.

According to the case study, even in this scenario, the operational energy of the building sector does not reach net-zero emissions, with some residual emissions remaining due to the grid not fully decarbonising and the continued use of fossil fuels in buildings not suitable for heat pumps.

The case study concluded that retrofit solutions compatible with the CCC carbon budgets rely not only on an ambitious National Grid decarbonisation scenario, but also an almost doubling of the grid electricity supply. **C**

■ PAS 2080 is published by the British Standards Institution (BSI), with sponsorship from the Institution of Civil Engineers (ICE) and the Green Construction Board (GCB).

■ PAS 2080: 2023 is available at bit.ly/CJPAS2080. The Guidance document for PAS 2080 is at bit.ly/CJPAS2080G.

References:

- 1 IEA (2022) Buildings, International Energy Agency, Paris

MAJOR 2023 UPDATES TO PAS 2080

- **An integrated approach to the built environment: widening the scope of PAS 2080:2016 beyond infrastructure to the built environment**
- **Ways to adopt systems thinking: integrating the transition to net zero into the standard and bringing the rigour and power of systems thinking throughout**
- **A whole life carbon view: addressing the urgent need to retrofit existing stock and balance capital carbon investment with operational and user benefit**
- **Nature-based solutions: reflecting their value to both carbon reduction and climate change resilience**
- **Collaboration: PAS 2080 highlights the importance of working together across the value chain.**



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Determining whole life carbon for built systems

This module explores the concept of whole life carbon, considers its components, and reflects on the current guidance for the built environment

As governments and businesses around the world commit to net zero targets, whole life carbon (WLC) assessments are becoming increasingly important as a metric to help inform decisions in the construction and operation of built environments.

This CPD article will consider the concept of WLC, the relative impact of its constituents, and will reflect on current guidance that may be used to steer the building services community towards systems that have a more carefully considered impact of the future environment.

Whole life carbon (WLC) is a measure of the total carbon emissions associated with a building over its entire life-cycle, from the extraction of raw materials through to the demolition and disposal of the building. WLC is increasingly being used to assess the environmental impact of buildings and to inform decisions about design, construction, and operation. The components of WLC are embodied carbon and operational carbon. Embodied carbon is that emitted during the construction of a building – including the extraction, processing, and transportation of materials; the construction process, which includes the fabrication of components, transport and construction; and the post-hand-over maintenance, repair and replacement, demolition, dismantling and ultimate disposal of the building materials. Operational carbon is the carbon emitted during the operation of a building, such as the direct and indirect emissions resulting from the energy consumed by heating, cooling, lighting, and the use of appliances. In building services applications, there is likely to be a complex relationship between the embodied and operational components, which will be influenced by the performance of the thermal envelope, occupancy patterns and building use, the loads in the space, and the design of components, systems and sub-systems. WLC assessments provide a tool to benchmark and minimise a building's environmental impact across the entire life-cycle of a building

– and they can help to improve the value of buildings, by demonstrating that efforts have been made to reduce its environmental impact while also complying with corporate social responsibility (CSR) goals, which include reducing environmental impact.

As highlighted by the 2017 RICS *Professional statement on whole life carbon assessment for the built environment*,¹ embodied carbon can make a larger contribution than that of the operational carbon across the building's life when considering the whole building. The RICS document includes an illustration of the constituents of modelled whole life carbon over a 60-year building life-cycle for several examples including those for a London speculative office development, as shown in Figure 1.

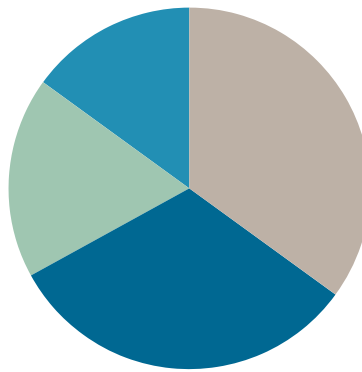
When considering the whole building, as reflected in this data, the embodied carbon accounts for a significant proportion – approximately 70% – of the total over a building's lifetime, and undoubtedly is an important consideration when assessing the design options for fabric and systems. However, it is inappropriate to draw the conclusion that embodied energy is so dominant that it eclipses the need for careful consideration of operational performance of specific elements, particularly those



» designed by the building services engineering (BSE) sector (which encompasses sub disciplines including those often referred to as mechanical, electrical and public health (MEP), and heating ventilating, air conditioning and refrigeration (HVAC&R) – as well as the optimisation of the hygro-thermal performance of building envelope and structure). As illustrated in the example in the boxout ‘Simplified whole life carbon assessment’, the values of embodied carbon in the example heat pump and gas condensing boiler application are swamped by the operational carbon in less than a year of operation. This does not negate the need to understand the embodied energy but emphasises the requirement to carefully assess the WLC when comparing solutions. For example, an increase in a manufactured product’s embodied carbon (for instance, by using a more effective but heavier heat exchanger or more complex and extensive controls) may improve its operating performance (by even a relatively small amount) so that over the building’s life-cycle there is a significant reduction in carbon emissions.

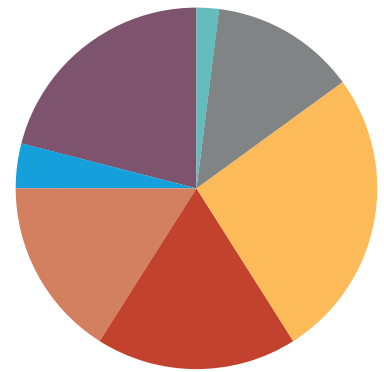
The BSE design process has historically developed to minimise the environmental impact, as well as cost, of installed systems through optimising the operational aspects. BSE operational performance may be assessed and predicted by employing one of the many mature modelling tools. As noted² by Dougherty in the UK, the ‘best methodology we currently have for calculating operational energy is set out in CIBSE Technical Memorandum 54 (TM54)³ ... based on the intended use and operation of the building’. An indication of the impact of BSE that might be expected on the whole building’s life-cycle is provided by the London Plan Guidance,⁴ where the benchmark for offices sets BSE as being responsible for 21% of WLC, as shown in Figure 2.

As noted by the recent UK House of Commons report,⁵ the Building Regulations do not address embodied carbon emissions from buildings or the embodied carbon costs of actions to reduce operational energy use. However, it observes that the ‘primary gap preventing consistent assessment across the sector is not a lack of underlying standards or guidance but the lack of prescriptive assessment boundaries and defaults that are typically prescribed within a national methodology’. A calculation method to assess the whole life environmental performance of buildings is described by British Standard BS EN 15978:2011.⁶ The standard breaks down the life-cycle of a building into life-cycle modules, as shown in



- Carbon emissions to practical completion 35%
- Carbon emissions in use 32%
- Operational emissions - regulated 18%
- Operational emissions - unregulated 15%

Figure 1: Whole life carbon for an example speculative London office development ('regulated' energy is that which is core to the building use and limited by building regulation, while 'unregulated' refers to all other, potentially significant, energy uses)
(Data source: RICS professional statement)



- External works 2%
- Substructure 13%
- Superstructure 26%
- Façade 18%
- Internal finishes 16%
- FFE 4%
- Services/MEP 21%

Figure 2: Greater London Authority WLC benchmarks for a typical office

Figure 3, but its detail is not sufficiently precise or informative to undertake a clear WLC assessment.

The Royal Institution of Chartered Surveyors (RICS) 2017 *Professional Statement on Whole Life Carbon* was developed in response to the inconsistent application of BS EN 15978 in the UK, and aims to provide principles and practical guidance for whole life carbon assessment to be adopted across UK industry. Alongside the Whole Life Carbon Network (WLCN) and LETI (Low Energy Transformation Initiative), who have developed a methodology for calculating whole life carbon, CIBSE broadly supports the RICS methodology. Despite the general acceptance of the RICS framework, last year’s RICS sustainability survey⁷ points to a lack of industry engagement in the measurement of embodied carbon, with half of the global respondents reflecting that there are either no assessments being undertaken or, if they were, they had minimal impact on the selection of materials and components.

Many respondents agreed that it was the lack of established standards, tools, databases, benchmarks and guidance that was preventing greater application of WLC assessments. Currently, there is no globally standardised methodology for calculating embodied carbon for products, components and building elements. However, some manufacturers do produce environmental product declarations (EPDs), as described in BS EN 15804,⁸ for their products. These provide information on the embodied carbon of a product, as well as other environmental impacts – such as ozone emissions, acidification, water use and waste generation. For MEP products and sub-systems where EPDs are not available, CIBSE TM65⁹ provides guidance on how to measure and report embodied carbon. This includes

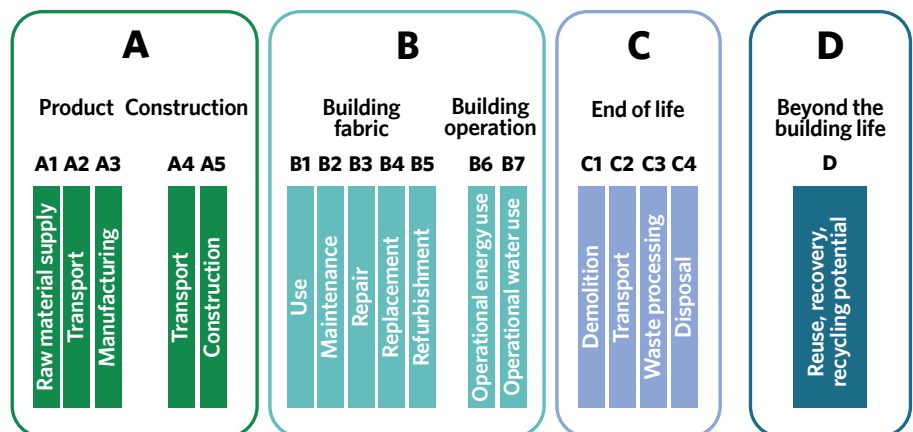


Figure 3: Life-cycle stages based on the definitions of BS EN 15978:2011

two alternative approaches – a ‘basic’ calculation method requires less information and includes a scale-up factor to cover further life-cycle stages; and a ‘mid-level’ calculation method requires more information, thus is more comprehensive, but is still not as robust as the information available in an EPD. TM65 emphasises the importance of ‘lean’ MEP, where the building is designed and constructed to reduce the need for services such as heating and cooling. A large proportion of embodied carbon from MEP products is associated with the product stage (as in Figure 3) owing to the majority of MEP components being made of metals, electronics and plastics, as well as their complex supply chains. Bagenal George et al provide extensive worked examples (in their freely downloadable paper¹⁰) that investigates the WLC of four types of heat-generation equipment by applying the methodologies of TM65: gas boiler; gas-fired combined heat and power (CHP); air source heat pump (ASHP); and variable refrigerant flow systems (VRF). Among other findings, their work concurs with TM65 that for those systems employing refrigerant cycles the WLC is strongly influenced by the global warming potential (GWP) of the refrigerant and, in some situations, refrigerant leakage has a higher impact than operational carbon emissions. As such, if refrigerants with a relatively low GWP are employed, this can be significantly reduced.

The UK Parliament POSTbrief 44¹¹ includes a useful commentary on practical strategies to reduce the whole life carbon impact of buildings, which emphasises the importance of exploring opportunities to reuse, repurpose and refurbish existing buildings and systems to avoid the need for the construction of new built systems. Principles that are particularly pertinent to BSE include optimising the use of materials and products and their associated whole life emissions – this requires a holistic approach, since improving the operational efficiency of a building may be directly achieved by, for example, installing energy-efficient equipment and systems (including systems for renewable energy) or, more obliquely, by improving the building’s fabric performance or operational management, so that



Figure 4: Example of ASHP employing R32 with a standard-based SCOP of 3.43 at 55°C flow temperature

the heating, cooling, and electrical loads are minimised. It highlights the benefit of assessing the embodied carbon of materials and products for maintenance purposes (and potential retrofit) and their potential to reduce operational carbon. The principles of the circular economy should be maintained, regardless of the route that is followed. This includes considering the reuse, recovery, recycling, and prospective recovery of embodied energy from materials. While this ‘stage D’ activity may be easier to theorise about than to practically complete at the moment, it is important to continue to explore and develop the methods and techniques in order to better understand the complete whole life carbon of a building.

As concluded by the House of Commons Environmental Audit Committee,⁵ there is no UK government policy requiring the assessment or control of embodied carbon emissions from buildings. As a result, no progress has been made in reducing these emissions within the built environment. However, there is a broad cross-section of the construction industry willing and able to undertake whole life carbon assessments, and in the absence of an approved UK national methodology, the committee suggests that the RICS Professional Statement on WLC is used as the accepted industry methodology. In any case, building professionals will increasingly need to consider the whole life carbon emissions of their designs in order to meet the needs of clients, buildings and society. This is a challenge, but through employing the growing range of lower-carbon and energy-efficient equipment, professionals will need to seize opportunities to deliver a lower-carbon future.

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Turn to page 58 for references

SIMPLIFIED WHOLE LIFE CARBON ASSESSMENT

Figure 5 illustrates the relative impact of embodied and operational carbon by illustrating the application of a condensing gas boiler and an air source heat pump for an office type development that has a peak space heating load of approximately 400kW, and an approximate annual space heating requirement of 800,000kWh per annum.

This is based on the following basic calculations where the heating flow water temperature is assumed as 55°C for this simplified example.

A modular gas boiler delivering circa 400kW of capacity with an efficiency of 90%, has a mass of approximately 500kg. Using the CIBSE TM65 average data sets for embodied energy, $7\text{kgCO}_2\text{e}\cdot\text{kg}^{-1}$ for a gas boiler. So, $500\text{kg} \times 7 = 3,500\text{kg} = 3.5\text{tonnes CO}_2\text{e}$ embodied carbon for the gas boiler. 90% efficient condensing gas boiler = $800,000/0.9 = 888,889\text{kWh}$ gas consumption per annum at $0.18254\text{kgCO}_2\text{e}\cdot\text{kWh}^{-1}$ (BEIS June 2022) = 162 tonnes CO_2e per annum

An air source heat pump installation capable of delivering circa 400kW heat capacity (based on five modular heat pumps similar to that shown in Figure 4) with a SCOP of 3.43 at 55°C flow temperature. The manufacturer supplied assessment¹² employed a CIBSE TM65 mid-level calculation to determine the embodied carbon as $13,915\text{kgCO}_2\text{e}$ per module, resulting in a total of $69,575\text{kgCO}_2\text{e} = 70\text{tonnes}$ embodied carbon for five units.

Heat pump with SCOP 3.43 = $800,000/3.43 = 233,236\text{kWh}$ electrical consumption per annum at $0.19338\text{kgCO}_2\text{e}\cdot\text{kWh}^{-1}$ (BEIS June 2022) = 45 tonnes CO_2e per annum.

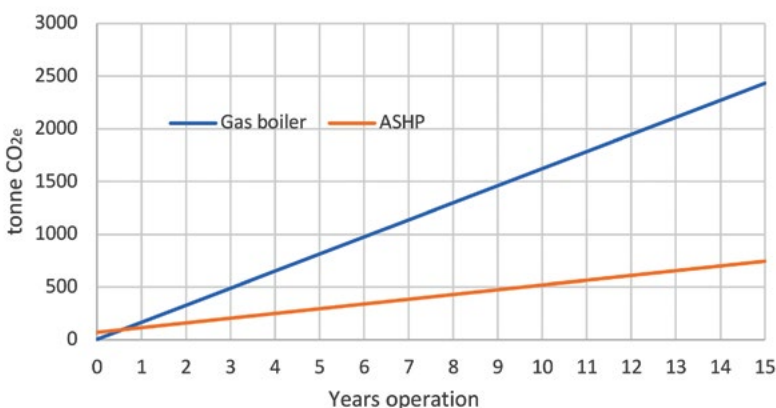


Figure 5: Example of simplified WLC calculation





Module 220

September 2023

» 1. **What proportion of the WLC was associated with regulated operational emissions for the RICS example speculative London office development?**

- A 15%
- B 18%
- C 21%
- D 32%
- E 35%

2. **Which publication sets out the basic calculation method to assess the environmental performance of buildings?**

- A BS EN 15804
- B BS EN 15978
- C CIBSE Guide A
- D CIBSE Technical Memorandum 65
- E POSTbrief 44

3. **Approximately, on average, how long would it take for the heat pump installation in the 400kW peak load office example before operational carbon was greater than embodied carbon?**

- A Around one month
- B Around six months
- C Just over one year
- D Just over one and a half years
- E Over two years

4. **Which of the documents was cited as stating that there is a lack of prescriptive assessment boundaries (for WLC assessment) that would typically be in a national methodology?**

- A 2017 RICS *Professional statement on whole life carbon assessment for the built environment*
- B CIBSE Technical Memorandum 65
- C London Plan Guidance
- D UK House of Commons *Building to net zero: costing carbon in construction*
- E UK Parliament *POSTbrief 44*

5. **Which of the life-cycle stages is noted as being one of the most challenging to practically assess at the moment?**

- A Stage A
- B Stage B
- C Stage C
- D Stage D
- E Stage E

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This month: Cave 'living lab', thermal storage innovation, air movement and contamination

IOR calls for enhanced waste heat recovery

The Institute of Refrigeration (IOR) has highlighted the importance of expanding the recovery, reuse and storage of waste heat in efficient, greener building design.

Issued among a series of recommendations for enhancing temperature management in buildings, the statement was in response to a recent inquiry by the UK parliament's Environmental Audit Committee.

The *Heat resilience and sustainable cooling* inquiry, which closed last month, aims to enhance strategies for temperature reduction and management in buildings.

The IOR urged the integration of policies to adapt building standards for cooling and improve waste heat recovery in the country's plans to mitigate overheating.

It stressed the need for sustainable cooling and reduced energy consumption, advocating nationwide understanding of cooling options, streamlined policies for building adaptation, and improved maintenance of mechanical cooling systems.

Recommendations by the IOR included comprehensive guidance and training for those involved in cooling system specification, design, installation, and servicing.



Heat recovery VRF to help Milton Keynes office hit sustainable targets

Plans are under way to develop 'the most sustainable office building' in Milton Keynes.

The RO Group has announced that it will shortly start work on the renovation of Silbury House, to complement the city's goal to be carbon-neutral by 2030.

Heat recovery VRF air conditioning, alongside on-site PV solar power generation and Reset air quality monitors will be used to help the building achieve its target of being awarded Breeam Excellent and EPC A.

Completion is expected in early 2024.

UCL completes 'living lab' for research into air quality

'Cave' will enable holistic study of climate and airborne hazards

University College London has completed a full-scale laboratory for researching climate and airborne hazards.

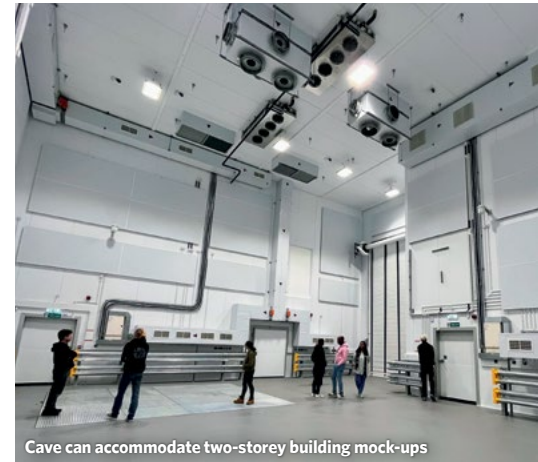
The Controlled Active Ventilation Environment (Cave) laboratory is a 206m² space in Dagenham where the climate and ventilation can be controlled to mimic external environments with temperatures ranging from -5°C to over 40°C.

According to UCL, the 9m-high facility is the first for carrying out research at full-scale into air quality and ventilation challenges in buildings. Researchers will be able to analyse indoor air in urban environments and monitor the effects of traffic pollution, infectious diseases or other airborne hazards.

'Living labs', such as two-storey modular buildings or large vehicles, can be constructed inside Cave to enable experiments on the relationship between external environmental factors and indoor air quality.

Cave enables researchers to explore how real indoor environments function when they are occupied, and how spaces can be made safer, healthier and more resilient.

The inspiration for Cave came from the Covid-19 pandemic. UCL said the disease highlighted the need to



Cave can accommodate two-storey building mock-ups

improve ventilation standards across the building and transport sectors, 'following years of poor design, focused solely on energy efficiency, and scant consideration of the consequences for health and wellbeing'.

The £9.4m Cave project was designed by architect Perkins&Will and built by construction company VolkerFitzpatrick at the LondonEast-UK Business and Technical Park, Dagenham.

The facility is due to be officially launched in early 2024 and is part of a suite of experimental facilities at LondonEast-UK - which includes the £40m Person-Environment-Activity Research Laboratory (Pearl), completed in 2021.

Liora Malki-Epshtein, Cave director



When the idea for Cave emerged during the Covid-19 pandemic, we quickly realised how little real-world air quality data we have in all sorts of contexts, from keeping medical and public spaces clean and safe from infection transmission, to ventilating homes to reduce illness.

Air quality is affected by everything that we build and has not received enough attention until, sadly, people lost their lives or were seriously at risk. The criteria that we've been using to evaluate ventilation efficiency and performance have been

imprecise and inadequate up until now.

I hope that the data that Cave generates will have a positive impact on industry standards and contribute to a more joined-up approach to design.

We've already had interest from the National Protective Security Authority, the Arts Council England, Transport for London and the English National Ballet among others. Building services are at the nexus between air quality, thermal comfort and energy use. We can look at all those parts of the problem holistically. That's what makes it so exciting.

- Liora Malki-Epshtein is associate professor (UCL Civil, Environmental & Geomatic Engineering)

Poor aircon performance 'deters hybrid workers'

Malfunctioning cooling keeps office workers at home, survey finds

A recent survey commissioned by Samsung has underlined the critical role of efficient air conditioning and building management in office and commercial settings, particularly for hybrid workers.

The study involved 500 adults engaged in a hybrid work arrangement, splitting their time between home and the office. The research found that 64% of respondents plan to spend more time in the office in 2023 compared with 2022. However, 66% of these individuals expressed that malfunctioning air conditioning would deter them from going to the office.

In addition, 46% of respondents said they would use office air conditioning during a UK heatwave.

Disputes over air conditioning within the

office were also highlighted, with 42% having experienced conflicts about its settings. Nearly a quarter said they complained about fluctuating and inconsistent temperatures caused by colleagues changing settings.

The survey also showed the importance of efficient cooling management in commercial spaces, with 56% avoiding gyms and 45% steering clear of restaurants or pubs with inadequate air conditioning.

Just over half (55%) said their office used a single control system to manage temperatures.

Samsung recently introduced its WindFree cooling system, which is designed to evenly distribute cool air, aiming to make work and social spaces more comfortable.

The company's research advocates the significance of advanced cooling technology in adapting to evolving work patterns and changing weather conditions.

Domus Ventilation expands HRXE MVHR

Domus Ventilation has enhanced its HRXE Mechanical Ventilation with Heat Recovery (MVHR) lineup by introducing the HRXE-ZEUS. This addition caters to the ventilation needs of larger residential properties, offering a robust solution to meet Building Regulations Part F airflow requirements.

The system efficiently recovers up to 95% of heat from waste air using an advanced heat exchanger, ensuring optimal indoor air quality. It features a 100% thermal bypass, automatically introducing fresh, filtered air when temperatures rise, making it ideal for well-sealed properties prone to summer overheating.

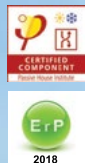
With four models now available, including options with integral humidistats, HRXE-ZEUS aims to cater to diverse specifications and on-site needs.

New Ranges Available

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Elta Fans launches prefabricated solutions

Elta Fans has introduced a new 'prefabricated solutions' service in response to the growing demand for offsite construction and prefabricated building systems.

The service covers a wide array of fans and ancillaries, and aims to reduce installation costs, speed up construction projects, ensure compliance, and enhance on-site safety. It is expected to benefit specifiers and contractors involved in commercial building projects of all sizes.

Fans, acoustic equipment, mounts, panels, flexible connections, and more are assembled offsite into compliant units, which are then crane-lifted into place, streamlining installation.

Elta Fans guarantees the service will deliver high-quality units manufactured in controlled environments. With ISO 9001 quality management accreditation, the company assures reliable, durable, and timely products.

The approach aligns with sustainable building trends, simplifying compliance while minimising disruptions.

Gilberts Blackpool reveals hybrid ventilation system

MFS-HR system claims a 75% heat recovery rate

Gilberts Blackpool says its new hybrid ventilation MFS-HR system will achieve up to 75% heat recovery rate and substantial energy savings.

The company said the performance translates to significant cost savings, particularly for institutions such as schools, where recovered heat is harnessed to maintain indoor air quality and comfort.

Gilberts said the system aligns with BB101, DFE Output Specification, and TM52 comfort compliance, while adhering to BB93 noise guidelines, even for special educational needs.

The MFS-HR operates by using natural air movement for cooling, backed by a low-energy fan to regulate temperature

and maintain indoor air quality. In colder conditions, it extracts heat from exhaust air and transfers it using an exchanger.

Separate chambers for supply and return air avoids the risk of cross-contamination and ensures the incoming air is Covid-safe.

With heating and cooling capacities of up to 4kw and 2kw, respectively, and airflow rates of up to 378l/s, the system remains efficient. An optional LPHW coil can provide heating, potentially eliminating the need for a separate heating system.

The MFS-HR range has air leakage rates of $3\text{m}^3\text{h}^{-1}\cdot\text{m}^{-2}$ @ 50 Pa, and a U value of less than $1\text{W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$.

Gilberts claims the system will push projects towards better sustainability and energy reduction targets, contributing to low/zero carbon strategies and eco certifications like BREEAM.

SOME THINGS ARE WORTH SHOUTING ABOUT....



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

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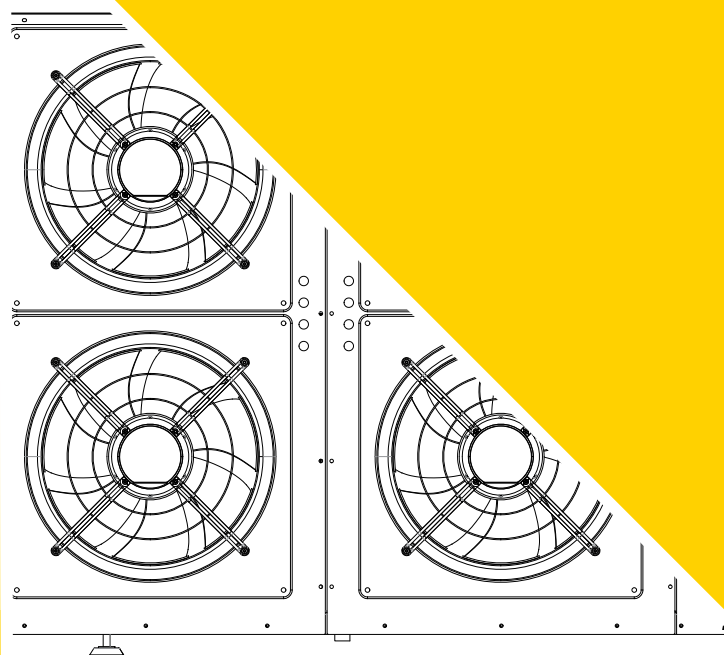
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WHAT'S IN STORE?

Researchers at the universities of Bath and Swansea claim to have made a breakthrough in thermal storage using a material derived from renewable seaweed.

Molly Toohar-Rudd talks to Swansea University's Jack Reynolds and Jonathon Elvins to hear how it could be used to store recovered heat in buildings

Researchers have developed a material for thermal storage, derived from abundantly available seaweed, which they claim is easily scalable and can be sized and shaped to fit multiple applications.

The Specific Innovation and Knowledge Centre and Coated M2A programme at Swansea University collaborated with the University of Bath to develop the material using alginate, an inexpensive, non-toxic seaweed derivative. Sodium alginate is dissolved in water, before expanded graphite is added and one of two methods is chosen to create the material.

Under the first method, the solution is transferred to a mould for freezing. After being kept at -20°C for more than two hours, beads form and are transferred to a saturated calcium chloride solution. The second method uses a drop-cast technique, with the mixture dropped into thermochemical calcium salt, causing gelation on contact. Once sufficient salt diffusion has occurred, the

synthesised beads are filtered and dried at 120°C .

Compared with its previous carrier material, vermiculite, the Specific team says the alginate-based beads formed by both methods offer a remarkable improvement in heat-storage capacity. The beads have increased salt capacity and achieve up to four times greater energy density than the vermiculite carrier. This is facilitated by their efficient packing in a fixed bed that maintains good airflow. As a result, the new material can achieve the same heat energy storage capacity in a quarter of the volume.

CIBSE Journal put questions to Jack Reynolds, who led the research as part of his doctorate degree at Swansea University, and Dr Jonathon Elvins, a senior technology transfer fellow and co-author of a paper on the material, published in the *Journal of Materials Science*.

How does the new alginate-based material compare with other materials in terms of heat storage capacity and efficiency?

The new alginate beads can hold up to three



times more salt per unit volume, which will improve the overall energy density of the final system significantly. (The heat is stored in the salt.) This is because the alginate is a binding agent, as opposed to a surface on which the salt can precipitate. This change gives our researchers an opportunity to blend and fine-tune the materials – for example, improving thermal conductivity through the



The graphite used in the mix. A few types are being investigated, some which are expanded, some expanded and milled, and others a fine powder



Manual mixing of the alginate/graphite paste to achieve the correct loading level of graphite within the alginate paste. Numerous investigations have been run to assess the viability of differing loading levels



Swansea University's Jack Reynolds (left) and Jonathon Elvins (right)

“By coupling the store with waste heat recovery or solar thermal generation systems, we are using energy that would otherwise be wasted”

addition of graphite – and reduces the chance of salt being lost through deliquescence [dissolving in moisture from the atmosphere] while in operation. These factors will improve the efficiency of heat capture during the charging cycle and heat release during the discharge cycle, consequently improving the overall material and system efficiency.

How does this material recover and store waste heat?

The salt is the work-horse of the system when it comes to heat storage, and the operating principle is quite simple.

Hot air streams are highly energetic. As they pass over the salt, they break bonds that hold moisture within the crystal structure. This results in energy being stored (endothermically) within the salt and the moisture being removed within the airflow. If we can direct a hot industrial wastestream through our materials, a portion of available energy will be stored within the materials via this dehydration process.

Once the moisture is removed, the materials need to be stored in a dry, sealed environment, as there are no energy losses in a perfectly dry atmosphere – and this can be for a substantial period of time; we’re aiming for seasonal storage, ultimately.

To discharge the heat energy, we simply pass a humid airstream over the materials, which results in moisture being collected by the crystal structure and heat being emitted through an exothermic reaction. The heat is transferred into the airstream and transported to the point of use.

For building applications, we would look to develop a modular box where you could add and remove cassettes of material. The primary focus is use in heated air systems.

How might the material be integrated into a building system?

Hot air heating is commonly used in

warehouses, arenas and large open-plan buildings, such as shops – these are systems that lend themselves to the operational characteristics of these materials.

Our current thinking is on the development of a modular system that would integrate into an air handling system, very much like a HVAC system providing hot air on demand or a continuous low level ‘background’ heating. We are assessing scaled-up systems to test the effectiveness of this and are getting encouraging results.

The contribution to sustainable heating comes from the reduction in primary energy generation or gas consumption – and by coupling the store with waste heat recovery or solar thermal generation systems, we are also using energy that would otherwise be wasted.

What challenges are there in capturing and using industrial waste heat?

There are a few technical challenges that need to be addressed before these systems become commercially viable. Our focus within the heat recovery developments has been in the low-temperature region, which made sense because this is where traditional heat recovery is technically or economically limited.

The next stages of development will consider the higher-temperature applications and how we can use these materials. We are also looking at the longevity of the materials, determining whether their efficiency on day one is the same as on day 1,000 and beyond, and simple ways to manufacture them in bulk.

The commercial infrastructure for this type of heating doesn’t exist yet, and this is where the Specific Innovation and Knowledge Centre can support its development. With strong links to local and national government, we can seek guidance on future pathways and strategies.



Applying the Alginate/graphite paste into a silicon mould to create a consistent shape and size of bead.



This is a laborious process, so researchers are looking at simple ways to automate it



» **Are there specific design considerations for integration into building services?**

Yes, but we haven't got that far down the development trail yet. We are designing prototypes to scale up our laboratory-based systems into larger units and assess the performance changes this brings. The investigations will start with standalone units (akin to a 3kW heater) located within a temperature-controlled test chamber, giving information on the consistency of the materials and the impact they would have on a medium-sized room. Then we'll look at increased room sizes and full-scale integration. This will require designing systems with project partners who are more familiar with large-scale heating systems.

Could you elaborate on its environmental sustainability and its potential for reducing buildings' carbon footprint?

The alginate market is growing steadily because of its diverse applications in industries such as food, healthcare and cosmetics. Recent life-cycle analyses evaluated its environmental impact and

highlighted that improving the processing efficiency will reinforce alginate's status as a sustainable raw material.

Sugar kelp, composed of approximately 40% alginate, has a lot of promise, and its cultivation offers an efficient means of carbon capture, with substantial upscaling potential. Over approximately six months in the ocean, sugar kelp reaches its maximum CO₂ absorption capacity, signalling the optimal time for harvesting.

To store the captured carbon effectively, the kelp can undergo pyrolysis, transforming it into a soil-enrichment supplement, securing carbon within the soil. Alternatively, the materials can be stored directly on the deep seabed.

Applying this alginate to sustainable heat storage within building envelopes could yield meaningful results. We are calculating the embodied carbon of these materials and expect to complete this assessment after the upcoming trials. Once we establish the true in situ carbon-capture potential of the process, we'll have a better understanding of its overall environmental impact.

How will the trial at Tata Steel work?

We have developed a small cage that will be located above a waste exhaust stack from a smelting process. The initial trials will focus on small quantities of material (<10 kg) to gain confidence in the charge times and efficiency. The charged materials will be brought back to our laboratory, where the heat will be discharged and evaluated. Further studies will assess moisture content, salt redistribution, and the overall energy evolved. The trial will help us develop the process for capturing waste heat from the steel plant and using it for space heating.

Are there plans for further research and development?

Plenty! There are plans to: optimise the salt loading to get elevated energy density and maximised cyclic performance; optimise the graphite loading for best thermal conductivity; focus on the best bead size; and look at mixed salt systems. Within building services, we have a PhD candidate investigating the generation of domestic hot water from these and similar materials. **CJ**

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A WELL-MIXED COCKTAIL?

A paper on the mixing of air in a contaminated space examined the difference between modelling and real-world scenarios. **Tim Dwyer** examines the findings of Tom Smith's paper, which was presented at the ASHRAE conference

The difference between the theoretical and real-world profile of air contaminant levels across a room have been starkly demonstrated by Tom Smith, president and CEO at 3flow.

At the ASHRAE Conference in June, he reported on how models that assume 'well-mixed' room air can significantly underestimate levels of room-sourced contaminants at specific locations in the space. He demonstrated that spatial distributions of potentially harmful contaminants, are strongly influenced by ventilation supply and extract locations, geometries, and flowrates.

In his presentation based on his paper *Use of an air tracer to investigate air mixing: the truth behind the myth*, Smith explained that air quality in occupied buildings was determined by a complex integration of flows of contaminants that might include pathogens and particulate matter from outside, including wildfire smoke.

Activities such as food preparation, off-gassing from finishes, and allergens from flora and fauna add to the cocktail.

Smith noted that concern over a particular contaminant is related to the rate of generation; how much is in a particular space; and how long it remains. This is often referred to as the hazard emission scenario.

This might be explored using the dilution equation: Effective air change rate (ACR) = Effective volume flow (Q') / Room volume (V) where Q' = Q / K with Q being the actual ventilation flowrate and K the 'mixing factor' for a space and system.

The mixing factor K makes an allowance for incomplete mixing of the air and is likely to be between 2 and 5, depending on conditions and ventilation system. Lower values of K correspond to good ventilation mixing conditions with a value of 1, indicating contaminants are dispersed uniformly in the space. Under a well-mixed scenario, with a contaminant released in the space,

Smith said the ACR is simply Q/V that provides a reduction in concentration with an increase in airflow. The assumption is that the contaminant disperses into the space until it reaches a homogeneous concentration and then, once the generation stops, it begins to decay. However, the mixing factor does not account for dispersion or spatial variation in concentrations in the space and the decay that occurs after generation stops.

To compare theoretical with actual movement of air, Smith's team built a hybrid model for the University of California that uses a general dilution equation and other established modelling techniques, including those from the University of California and the US Environmental Protection Agency. The model (available at <https://smartlabs.i2sl.org>) has input parameters including space dimensions, airflows, and the hazard emission scenario in terms of the contaminant of concern – the model dataset includes 500 possible contaminants.

The outputs provide the individual dose, accumulation and decay at different air change rates and the accumulated 'dose' area under the curve.

To test how well this model performed compared to the real world, Smith's team undertook tracer gas tests to test for a 'well-mixed' scenario, how uniformly the contaminants disperse and decay and evaluate the results.

For the initial tests, they employed a 7.62m x 8.8m x 3.05m high test room and added contaminant at the centre, see Figure 2.

In the first test (Case 1), there were two 360-degree supply 'mixing' diffusers and two exhaust points at low level. A separate fan was added to mix the air. Using a methodology of 10 minutes of background ventilation, followed by 10 minutes of contaminant generation and 40 minutes of decay, they measured the tracer gas levels across the space and compared it with the model. Sampling points 1 to 5 provided the measured levels of tracer gas; the total doses are shown in the boxes (Figure 3).

The spatial distribution concentrations are dispersed and, comparing theoretical and measured data, they are all similar, except for close to the contaminant emission, where there is higher concentration.

To illustrate the effectiveness of the ventilation solution, Smith applied >>

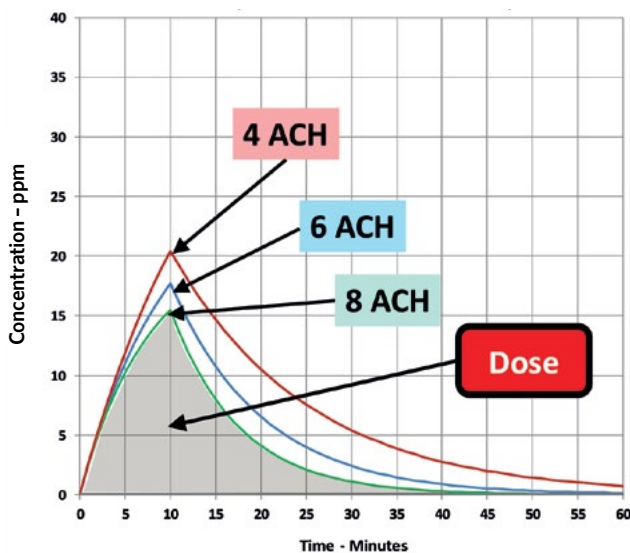


Figure 1: Example outputs in the hybrid emission model

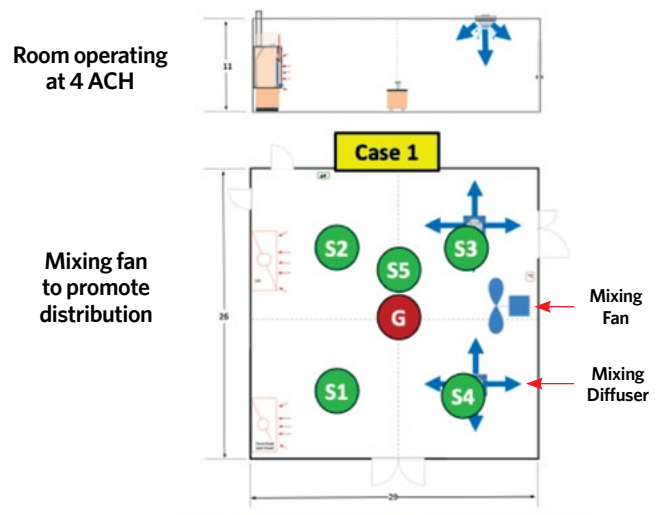


Figure 2 – The basic test room for the initial test 'Case 1' where G is the contaminant [Source: Tom Smith, 3flow]


» the industrial hygiene concept of 'effective flow' VEFF, although he noted that ASHRAE uses the inverse of this, the Ez Factor, to evaluate air distribution effectiveness in a room. The two terms are consistent and enable the calculation of an effective air change rate (ACR). So in Case 1, ACR was 3.4, which compares reasonably to the actual supplied ACR' of 4.1 (Figure 3 and Table 1).

He then removed the mixing fan and, making no other changes, repeated the test to provide results as shown in Table 1.

This indicates a different situation where, although 'mixing diffusers' are used, there is no uniformity in mixing and the effective air change rate is 1.5 – just 37% of the supplied air change rate of 4.1. Aside from the near field (S5), the most concerning result was that point S1 received a very high dose.

A training centre used by Smith's organisation was tested as a real application. The highest dose (of 62 compared with the average of 36) was experienced by those sitting underneath the exhaust point, which also compared unfavourably with the theoretical dose rate of 13. Everyone in the room would have been exposed at a higher level than had been theoretically predicted (that was likely due to stratification).

Smith's full presentation includes more examples showing startling spatial differences in contaminant concentrations and doses linked to the respective positions, flowrates and geometries of supply and extract points.

View the presentation (at a cost) at bit.ly/CJASHTS23 

Test concentrations for S1, S2, S3, S4, S5 and theoretical concentrations

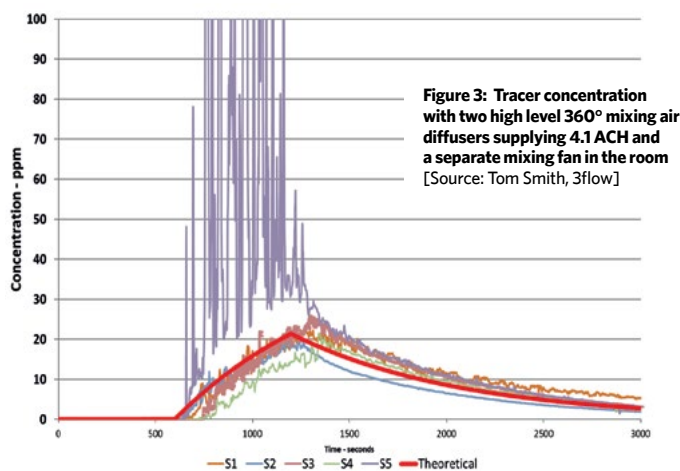


Figure 3: Tracer concentration with two high level 360° mixing air diffusers supplying 4.1 ACH and a separate mixing fan in the room [Source: Tom Smith, 3flow]

	Actual ACR (per hour)	Effective ACR (per hour)	Modelled average dose	Actual S1 dose	Actual S2 dose	Actual S3 dose	Actual S4 dose	Actual S5 dose	Average actual dose
With mixing fan	4.1	0.15	7.01	8.32	5.60	7.52	6.08	15.40	8.56
No mixing fan	4.1	0.12	4.98	19.43	8.74	2.32	7.64	29.34	13.47

Table 1: Actual and calculated air change rate, modelled and actual tested doses with and without mixing fan

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Setting the standard for net zero buildings

This module explores the drivers underpinning the call for net zero and considers the key points of the recently published ASHRAE Standard 228

With extraordinary climatic¹ and oceanic² events filling the headlines, arguments³ raging over the opening up of further North Sea oil reserves, the viability of carbon capture and storage remaining uncertain,⁴ and the global construction of 'low carbon' offshore wind farms stalling,⁵ the time of the net zero building is undoubtedly here. This CPD will explore some of the key drivers behind desperate calls for net zero buildings, and provides an overview of the recently published ASHRAE Standard 228 – which joins the increasingly congested knowledge space of how to guide and assure the swift move towards net zero built environments.

The existential threat of climate change is all around us. July 2023 was confirmed as the hottest month since records began in the 19th century, as United Nations (UN) secretary general Antonio Guterres proclaimed: 'The era of global warming has ended. The era of global boiling has arrived.'⁶ Buildings are considered an essential part in the overall plan to reduce anthropogenic impact in an attempt to steady the climate, since the 'burning of fossil fuels has emitted enough greenhouse gases to significantly alter the composition of the atmosphere and average world temperature has risen between 1.1 and 1.2°C'.⁷ The World Meteorological Organisation recently reported⁸ that the average global temperature in 2022 was about 1.15K above the 1850-1900 average (the benchmark period before the emission of greenhouse gases from human and industrial activities). Between 2023 and 2027, it is predicted to reach between 1.1K and 1.8K higher. Ninety per cent of the global warming occurs in the oceans, as has been measured⁹ in recent decades, causing the water's temperature to rise, so increasing its massive store of heat. The record-breaking 2023 temperature rises in the North Atlantic are seen as part of natural variation within the climate system coming together to elevate sea-surface temperatures, although Professor Albert Klein Tank, head of the Met Office Hadley Centre noted: 'It is not believed that

these factors represent a climate-change-induced tipping point that produces runaway temperatures. However, they will add to climate and weather impacts this year.'¹⁰

In 2015, the UN Framework Convention on Climate Change (UNFCCC) adopted the Paris Agreement, which set a goal of limiting global warming to well below 2K – preferably to 1.5K – above pre-industrial levels. To limit global warming to 1.5K, greenhouse gas emissions must peak before 2025 at the latest, decline 43% by 2030 and reach net zero by 2050.¹¹ To achieve this goal, the Paris Agreement, adopted at the 2016 UN Climate Change Conference (COP21), requires countries to submit their own national plans to reduce greenhouse gas emissions. However, seven years after the Paris Agreement – some two fifths of the way to 2050 – more than half the world's nations have not been able to go beyond pledging a set of net zero policies, and nearly a quarter have no evidence of even having a proposal for net zero target (as shown in Figure 1).

The 2022 UNEP report,¹² released at COP27 in Sharm El Sheikh, reported that in 2021 the buildings and construction sector accounted for more than 34% of energy demand, and around 37% of energy- and process-related CO₂ emissions, and that the sector's 2021 operational energy-related CO₂ emissions were up 5% over 2020 and 2% over >>

» the pre-pandemic peak in 2019. The report implores policymakers and decision-makers to ‘urgently implement definitive near-term actions that deliver the needed emissions reductions while achieving the objectives of a sustainable and resilient buildings and construction sector’.

The Global Buildings Climate Tracker¹⁴ (GBCT) tracks decarbonisation progress in the buildings sector, set at a value of 0 for 2015, the base year, and a target value of 100 in the year 2050, reflecting the maximum decarbonisation needed in the sector. As can be seen in Figure 2, the trajectory was not a promising one in the latest 2021 data, with a BCT value of 8.1 – under half what might be expected on the linear path to a net zero built environment in 2050.

In terms of delivering significant near-term benefit, the adoption of net zero standards also encourages the adoption of innovative technologies and practices that minimise environmental footprints and operational energy costs. They typically drive investment in renewable energy sources, while optimising building envelope efficiency and HVAC systems. Net zero buildings are likely to be more comfortable and healthier to live and work in, thanks to features like better insulation and more controlled ventilation. The financial investment in good quality net zero buildings has been shown¹⁵ to be sound, so it would appear that robust net zero building standards can deliver a win-win for the environment, public health, and the economy. So, although there are a number of net zero guides and standards in place, it would appear that none to date have wholly engaged the active interest of the professional teams – including the clients, owners and operators – who have responsibility for procuring and creating built environments.

In the UK, there is expectation that 2023 will see the publication of the first edition of the Net Zero Carbon Buildings Standard¹⁶ – a collaborative effort by leading professional organisations in the construction sector to create a single, agreed methodology. This standard aims to provide a comprehensive and accessible methodology to demonstrate net zero carbon performance in alignment with climate targets. The standard’s steering group has just completed an open consultation on the key metrics required for evaluation, including the development of performance targets for new and existing buildings; carbon accounting methods; renewable energy assessment; and the role of carbon offsetting to address residual emissions. Notably, the standard’s principles

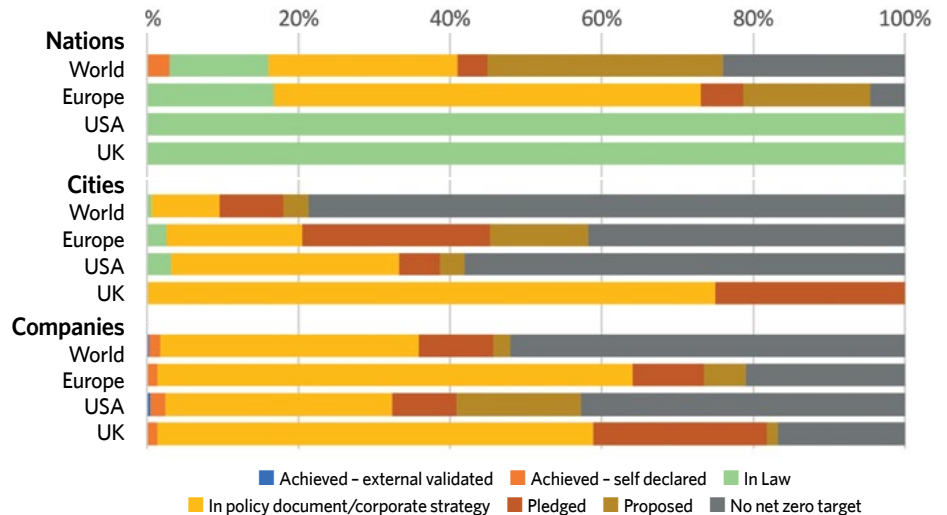


Figure 1: An indication of the status of net zero policies across the World, Europe, USA and UK as at 1 August 2023 (Data source: Oxford Net Zero Tracker¹³)

and many of the methods are likely to be applicable worldwide. ASHRAE holds a significant place in engineering built environments around the world. As such, the recent publication of ASHRAE Standard¹⁷ 228 *Standard Method of Evaluating Zero Net Energy and Zero Net Carbon Building Performance* has excited interest for its potential to be applicable as a global tool to determine if a building or site has achieved net zero. It provides a generally simple compliance pro forma, with supporting data tables that, when completed with relevant data for a specific application at a particular location, indicates whether a building or development is likely to operate at net zero. This generally uncomplicated approach could be extended beyond North America but, in this first edition, it is very much constrained to application in the US and Canada. In developing the standard, the committee took inspiration from ASHRAE Standard 105 (a standard that provides consistent methods for determining and reporting the energy performance of buildings); it decided to discourage the development of inefficient buildings that need significant amounts of onsite renewables in order to attain net zero – as well as acknowledging that many sites may not have sufficient opportunities for renewable energy production.

Notably, in a novel departure for ASHRAE, this standard relates to carbon equivalency as well as ASHRAE’s traditional realm of energy performance – in the many available global net zero publications, the focus is typically singularly on

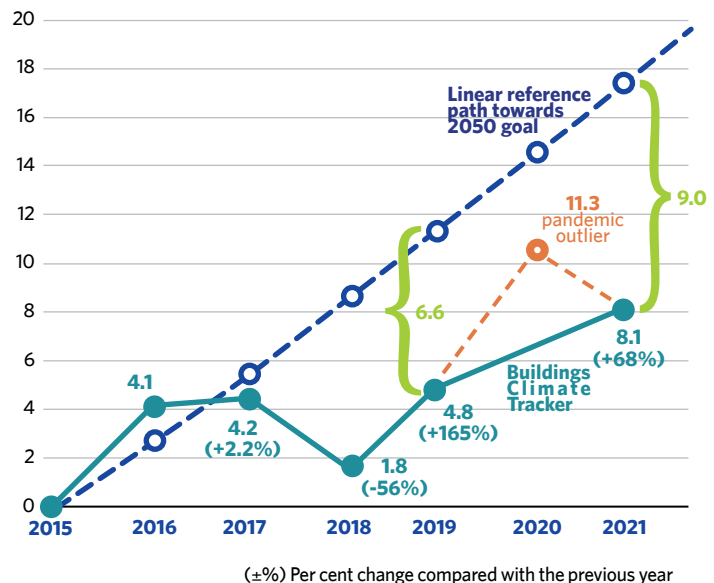


Figure 2: The observed Global Buildings Climate Tracker compared with the linear reference path to a zero-carbon building stock target in 2050 (Source: UNEP 2022 Global status report for buildings and construction)

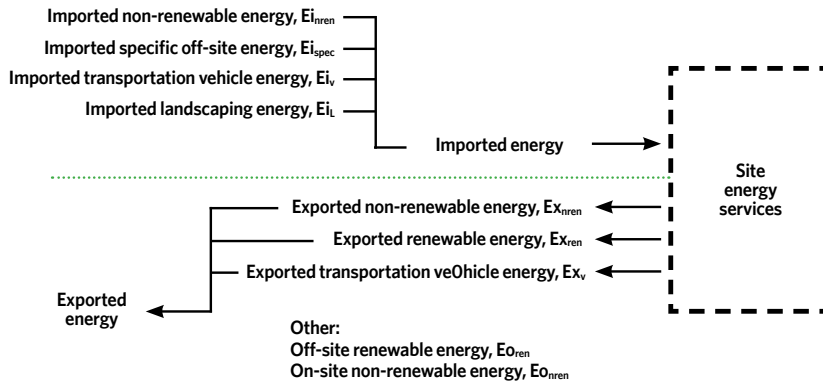


Figure 3: Energy flows across the site boundary (Source: ASHRAE Standard 228:2023)

carbon. The standard’s project committee has also chosen to diverge from most other worldwide guides and standards by choosing to go with the US Department of Energy (USDOE)-favoured decarbonisation term by referring to ‘zero net carbon buildings’ rather than rather more common nomenclature of ‘net zero carbon buildings’. As illustrated in Figure 3, net zero is set as being principally based on the energy balance – and the resulting equivalent carbon – flowing into a site being equal to, or less than, that being exported during the operation of a building or site. Offsets may be included in the balance – albeit only those offsets that meet very closely qualified requirements. For example, the amount of procured off-site renewable energy is limited based on the gross floor area, the type of building and the ASHRAE climate zone (zones 1A to 8), and this offset must meet a set of highly prescriptive requirements relating to proof of ownership and longevity of an appropriately certificated supply. And, as a final requirement, there must be evidence that any carbon offset projects will permanently sequester carbon for a minimum of 200 years. It would appear that offsetting is not considered as a frontrunner in the creation of a net zero development designed to meet this standard. The stringency of the offset requirements may in part be due to the somewhat unusual (and likely contentious) explicit inclusion of fuel oil and coal as a site energy source in the calculation tool, and the reality is such that such fossil fuels could practically only be used if there were some offset mechanism in place.

The project committee of ASHRAE Standard 228 has chosen not to include any embodied carbon in the assessment, although there is an explanatory appendix providing an introduction to embodied energy and carbon calculations. As discussed in CIBSE TM65,¹⁸ refrigerant leakage, throughout the building life-cycle, can have a significant impact on embodied carbon emissions and so will adversely impact the net zero aspirations of a building. In recognition of this potential net zero disruptor, Standard 228 includes a simple calculation, supported by tables of global warming potential (GWP) for typical refrigerants and indicative typical annual refrigerant leakage rates for various applications (as shown in Table 1), which is then included in the overall carbon balance assessment for the building. The original source data that was used to create the table of refrigerant leakage as published in the standard has subsequently been updated by the authors

EQUIPMENT TYPE	Typical annual leakage rate of refrigerant mass charge per year
Supermarket refrigeration	30%
Commercial condensing units	15%
Water chillers	5%
Hermetic units with no field installed refrigerant piping	1%
Rooftop unit air conditioner	6%
Residential heat pump and air conditioner	2%
Variable refrigerant flow air conditioner	10%
Other refrigeration	2%
Other air conditioning	2%

Table 1: Typical annual refrigerant leakage rates by building type as tabulated in ASHRAE Standard 228

(Barrault, S and Clodic, D¹⁹). In the absence of other data, this could make an impact to the calculations, particularly significantly for variable refrigerant flow (VRF) systems. However, these tabulated values might legitimately be substituted by data that more properly represented the actual installation – the tabulated values may be considered as a ‘back-stop’ that are particularly useful at early stages of assessing the building’s carbon performance. In the foreword to Standard 228 it hints that embodied carbon will be fully included in a future edition.

The standard focuses on measuring and balancing energy and carbon flows across the site boundary. Any modelling for high-rise and non-residential existing and new buildings is required to conform with ASHRAE Standard 90.1, with no alternative methods offered. Energy assessments are defined in terms of the energy source, involving a range of multipliers being applied to the actual energy crossing the site boundary, to account for energy used or lost in the process of bringing the energy to site. The standard includes tables of regional and energy source specific factors that are limited to US and Canada applications, but it would not seem unlikely that this could be expanded in due course to make the standard useable in other global regions. While the primary calculation is based on annual average factors, the standard includes the flexibility to employ hourly emission factors if such data is available. This provides a further opportunity to apply building (or location) data rather than the more general regional data as tabulated in the standard. The standard also details how to verify performance for parts of buildings, as well as portfolios and entire communities, where a collection of building sites are owned or leased by a single entity.

Despite the urgency of the shift to net zero built environments, it appears that globally applicable methods and technical standards from respected sources to assess a building’s holistic carbon credentials may still be in the pipeline. The simplicity of ASHRAE Standard 228 is somewhat overshadowed by being intrinsically linked to mandatory use of ASHRAE modelling methods, which is likely to limit its global application – the North American carbon factor data can, nevertheless, be readily internationalised. However, until it fully embraces embodied carbon, it will remain a tool that provides only partial intelligence on a building’s net zero performance that is based principally on site energy balance.

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Turn to page 74 for references.



Module 221

September 2023

» 1. **What approximate increase in average global temperature was observed in 2022 compared with the 1850-1900 average?**

- A 0.5K or lower
- B From 0.5K to 0.75K
- C From 0.75K to 1K
- D From 1K to 1.25K
- E From 1.25K to 1.5K

2. **To limit global warming to well below 2K, by what year should greenhouse gas emissions peak according to the UNFCCC?**

- A 2025
- B 2030
- C 2035
- D 2040
- E 2050

3. **Which of these was not noted as necessarily being a potential benefit of net zero standards?**

- A Adoption of innovative technologies and practices
- B Delivery of buildings at reduced construction cost
- C Improvement of occupant comfort
- D Minimisation of environmental footprints and operational energy costs
- E Provide sound financial investment

4. **In the diagram of ASHRAE Standard 228 energy flows across the site boundary, which of these was not explicitly shown as an element of imported energy?**

- A Imported landscaping energy
- B Imported non-renewable energy
- C Imported nuclear sourced energy
- D Imported specific off-site energy
- E Imported transportation vehicle energy

5. **What is the typical annual leakage rate of refrigerant mass charge per year suggested by ASHRAE Standard 228:2023 for a rooftop air conditioner?**

- A 1%
- B 5%
- C 6%
- D 10%
- E 30%

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Products of the month

Lochinvar launches latest high-temperature heat pump

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Lochinvar has unveiled the latest addition to its product line-up, the Amicus Altus high-temperature air to water heat pump. Designed to produce hot water at temperatures of up to 70°C, the heat pump maintains high energy efficiencies while minimising environmental impact.

Available in three configurations - two-pipe heating only, two-pipe heating or cooling, and four-pipe simultaneous cooling with heating and heat recovery - the Amicus Altus is versatile and suitable for various commercial projects. Its ability to achieve high temperatures makes it an ideal low carbon replacement for gas boilers in buildings with high hot water demands, without requiring extensive remodelling of heating or hot water systems. This flexibility provides a valuable solution for achieving net zero carbon goals and reducing energy costs without significant upfront capital investments.

One of the standout features of the model is its use of the low global warming potential (GWP) refrigerant R290 (propane). Unlike traditional alternatives such as R410A, with a GWP of 2,088, R290 boasts an incredibly low GWP of just three.

R290 is also environmentally friendly, with zero ozone depletion factor, according to the Intergovernmental Panel on Climate Change and a GWP over a 20-year period that remains below one. Additionally, R290 does not contain polyfluorinated chemicals, which are subject to stricter regulations in the UK and Europe.

By incorporating this non-hydrofluorocarbon R290 refrigerant, Lochinvar has embraced a forward-thinking approach that aligns with the UK's phasedown timetable for eliminating higher GWP substances from heat pump applications. This move follows the European F-gas Regulation and demonstrates Lochinvar's commitment to environmentally responsible solutions.

Under the current phasedown timetable, the UK is looking to eliminate fluorinated gases (F-gases) from most heat pump applications by the end of the decade. This is in line with the European F-gas Regulation that the UK continues to mirror despite its departure from the European Union.

The Amicus Altus units offer cascading



Lochinvar's new Amicus Altus heat pump

capabilities, with outputs ranging from 88kW to 880kW and an impressive coefficient of performance (CoP) of up to 5.5, with a seasonal CoP of approximately 3.95. These units can operate in heating mode even at external air temperatures as low as -20°C.

With built-in controls and a BMS fault and remote on/off signal that prioritises hot water production, the Amicus Altus is user-friendly, easy to install, and supported by Lochinvar's offer of free site visits for every installation.

'We are delighted to be bringing such an impressive step forward for heat pump technology to the market,' said product engineer Steven Hunt. 'Air to water heat pumps are generally highly energy efficient, but the Altus also delivers hot water temperatures comparable with those that end users are used to with conventional gas boilers.'

The new product follows Lochinvar's launch of the UK's most powerful heat pump water heater, the Amicus AquaStore, last year. It has an output of 8kW and 455 litres of hot water storage capacity in a compact, monobloc package combining heat pump and storage vessel.

It can deliver up to 65°C hot water in both efficiency and hybrid modes, and up to 490 litres in a peak hour with a 50°C temperature rise.

Air to water heat pumps offer flexibility for integration into various heating systems, making them a viable option for different building types and installations. Despite higher initial installation costs compared with gas boilers, the long-term savings and reduced carbon footprint make heat pumps an attractive solution for sustainability-focused projects.

The Amicus Altus joins Lochinvar's extensive Amicus range of air source heat pumps, ideal for diverse project sizes and applications, from residential to commercial and industrial. Lochinvar's commitment to providing comprehensive solutions with heat pump technology at the core simplifies the design, specification, and installation processes for customers, ensuring a seamless transition to low carbon heating.

'Heat pumps are playing an increasingly important role in helping the UK transition to low carbon heating. The Amicus Altus is just the latest in a line of innovations designed to make the technology available to the widest possible range of users with minimal disruption to the existing building services,' said Hunt.

■ For more information visit www.lochinvar.ltd.uk

Products of the month

Rinnai's biomass strategy: paving the way for decarbonisation of off-grid sites

New policy paper aligns with UK's targets of cutting carbon emissions and achieving net zero

Rinnai welcomes the UK government's recently unveiled Biomass Strategy 2023. The policy paper has outlined the growing significance of biomass fuels, offering a glimpse into an expanding future for this vital sector.

Biomass energy, harnessed from biological sources such as plants, wood and waste (manure), is proving to be an instrumental player in the nation's ambitious drive towards achieving net zero greenhouse gas emissions by 2050.

Professor Paul Monks, chief scientific adviser to the Department for Energy Security and Net Zero, lauds the potential of biomass to decarbonise an array of sectors. 'The United Kingdom has set an ambitious target to achieve net zero greenhouse gas emissions by 2050. Meeting this target will require a significant shift in our approach to energy and low carbon technologies. There has never been a more crucial time to take action.'

He continues: 'Biomass can play a significant role in decarbonising nearly all sectors of the economy. The UK is already a global leader in biomass policy and technologies, with biomass accounting for 8.6% of our energy supply in 2022.'

Biomass materials, particularly those of national origin, boast remarkable sustainability, with an impressive 66% of domestic biological ingredients deriving from within the UK.

The UK government's forward-looking approach to embracing alternative, low carbon energy sources aligns with Rinnai's commitment to innovation and sustainability. Dimethyl ether (DME) is also emerging as a notable contender within the realm of alternative bioenergy.

DME, produced from renewable and recycled carbon feedstock, offers a clean-burning fuel that shares chemical similarities with propane and butane. This resemblance to liquefied petroleum gas (LPG) renders DME transportable as a liquid in pressurised cylinders and tanks, making it a key solution for off-grid sites across the UK.

Beyond its transportation convenience, DME presents a simple, yet potent, solution for commercial and residential users to reduce their greenhouse gas emissions significantly. As Chris Goggin, Rinnai's operations director, says: 'We are in advanced developments of DME heating and hot water units that deliver identical operational performance results to that of a traditional water heater.'

Rinnai is already ahead of the curve, having designed water heaters that accept LPG and

BioLPG in anticipation of the widespread introduction of carbon-clean fuels into the UK energy market.

Goggin continues: 'Rinnai fully endorses the UK's Biomass Strategy and constantly strives for technological solutions that encourage carbon neutrality and economic use for customers. Rinnai continues to design and manufacture pragmatic, economic, and technically feasible products aimed at low and no carbon solutions.'

Furthermore, Goggin emphasises Rinnai's proactive response to evolving policy landscapes, acknowledging their impact on the choices and options available to UK customers seeking to decarbonise their operations.

Rinnai is proactively navigating potential shifts in future UK power policy by offering a versatile range of products that operate on electrical power, including heat pumps and direct electrical ranges, as well as gaseous fuels such as hydrogen and DME. DME presents immense potential for supporting off-grid sites that demand practical, technologically advanced, and economically viable solutions.

The unveiling of Rinnai's 'biomass strategy' aligns harmoniously with the broader context of its comprehensive decarbonisation efforts. Its H3 range encompasses a wide spectrum of decarbonising products, from hydrogen/BioLPG-ready technology and hybrid systems, to an array of low-global warming potential (GWP) heat pumps and solar thermal options.

The H1 range, a cornerstone of Rinnai's decarbonisation approach, centres on hydrogen technology. As global energy markets gear up for the advent of clean hydrogen fuels, Rinnai water heaters are already hydrogen 20% blend-ready and include a pioneering 100% hydrogen-ready hot water heating technology. The H2 range further simplifies decarbonisation through renewable gas-ready units, solar thermal, and heat pump hybrids.

Rinnai's H3 range takes the forefront in promoting low-GWP heat pump technology. Available for domestic and commercial use, these heat pumps use R32 refrigerant, boasting a commendable coefficient of performance (COP) and seasonal COP. In essence, the range equips businesses and homeowners with the tools to reduce their carbon footprint significantly while ensuring optimal comfort and energy efficiency.

■ For more information visit rinnai-uk.co.uk



Products of the month

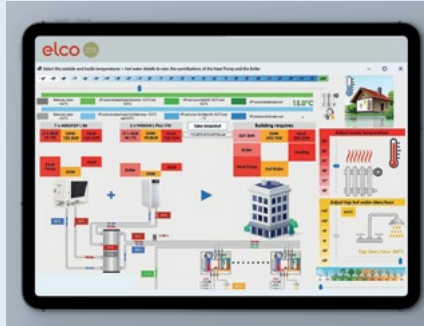
ASHRAE recognises Elco's Hybrid System Wizard at technology awards

Decarbonisation software wins acclaim for sustainable technology design

Elco has achieved a notable milestone with its newly launched Hybrid System Wizard (HSW), receiving acclaim at the ASHRAE UK Chapter's Technology Awards. The HSW triumphed in the Sustainable Digital Technology category. Geared towards consultants, building services engineers, and design and build (D&B) contractors, the user-friendly cloud-based software is designed to facilitate efficient decarbonisation of projects.

A key highlight of the HSW is its ability to swiftly calculate a project's annual carbon emissions and operational costs. Valuable in planning stages 1 and 2, the software provides accurate comparisons of yearly CO₂ emissions and running costs across diverse setups, including boiler-only, heat pump-only, heat interface unit (HIU)-based, and hybrid systems. These calculations significantly streamline consultants' workflows.

Andreea Manoiu, senior manager at Elco,



expressed her delight at the recognition from ASHRAE UK: 'It's a testament to the benefits the Hybrid System Wizard offers consultant engineers and specifiers who work on the decarbonisation of heating systems.'

She highlighted the software's capacity to evaluate annual CO₂ emissions, running costs, and various options, thereby helping customers to meet net zero targets.

The HSW allows customisation, offering three distinct weather data options, adjustable to match a system's energy needs. Additionally, it computes system parameters, seasonal

performance factor, and crucial domestic hot water (DHW) data. The software facilitates monthly energy generation analysis for heating and DHW. Moreover, it incorporates a module for district heating projects, empowering users to design tailored systems for different apartment types.

The HSW encompasses products from Elco's sister companies in the Ariston Group, further expanding its scope. It illustrates how hybrid system performance shifts with external and internal temperature changes, empowering users with data-driven insights. The software calculates 288 scenarios for each selected heat pump or boiler, factoring hourly temperature variations over five years for precise outputs.

Elco offers the HSW at no cost to consultants and D&B contractors keen on accelerating the UK's decarbonisation efforts. The software promises to catalyse the transition to sustainable heating solutions, aligning with the industry's evolution towards a greener future.

■ Visit www.elco.co.uk/selector-tool-demo

Thermally insulated piping promises greater efficiency for district energy sector

Aquatherm unveils piping system tailored for underground installation

Expanding into the district energy sector, Aquatherm has unveiled its thermally insulated (TI) range of pre-insulated piping systems. Tailored specifically for underground installation within district energy schemes, the new product promises efficiency, cost savings, and operational ease.

One of the standout features of the TI range is its suitability for longer-distance water transportation. By combining advanced thermal insulation technology with robust engineering, Aquatherm has created a solution that can transport heating and cooling water safely and efficiently over extended distances. This not only guarantees improved performance, but also leads to significant cost and time savings.

There are numerous benefits offered by Aquatherm's TI range. Traditional underground installations demand substantial trench depths and accompanying civil work. However, Aquatherm's TI pipes can be



installed at shallower depths of 500mm. This not only simplifies installation, but also reduces civil work, materials and labour.

The unique properties of Aquatherm's Fusiolen material eliminate the need for costly expansion designs, loops and foam pads. This provides immediate and long-term cost savings, streamlining the initial costing and installation phases.

The lightweight and flexible nature of Aquatherm's polypropylene pipes facilitates

easy installation, manoeuvring, and deflection around obstacles. The system's reduced weight in comparison with steel equivalents significantly cuts down on labour, machinery, and tooling requirements. Notably, jointing times are substantially reduced, with a 10in butt fusion joint taking around 30 minutes, including cool-down time.

Aquatherm offers an extensive selection of fittings among PP-R manufacturers. Moreover, the company provides a bespoke prefabrication service, catering to specific project requirements, including degree bends, pre-insulated air vent assemblies, and entire prefabricated systems.

The Aquatherm TI range has already garnered praise for its transformative potential. During the installation of the Gateshead district heating system, Balfour Beatty praised the system's ease of use and deflection capabilities, underscoring its potential to revolutionise the industry.

■ Call 01444 250500 or email enquiries@aquatherm-uk.com

Armstrong launches range of pressurisation units >

Armstrong Fluid Technology has unveiled the 3760 pressurisation unit series for HVAC applications. These offer contractors and consultants maximum flexibility and space-saving options for optimal pressure for sealed systems up to 300,000 litres, some with vacuum degassing and chemical dosing.



The Pro Floor Standing Pressurisation Units feature digital technology with BMS connectivity, enhancing accuracy and reducing downtime through real-time adjustments. With safeguards such as dry-run protection and flood alerts, the units are designed to optimise efficiency.

The ProVDG Pressurisation Units integrate pressurisation and vacuum degassing, preserving system components and enhancing pump efficiency. This range offers flexibility in top-up delivery pressure.

At the pinnacle is the 3760 ProDoseVDG Pressurisation Unit, a 3-in-1 solution merging pressurisation, vacuum degassing, and automatic dosing.

■ Call +44 (0)161 223 2223 or email ukhvacsales@armstrongfluidtechnology

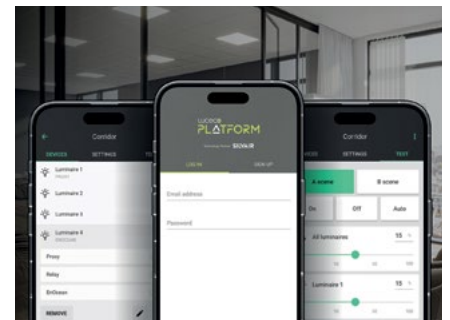
Luceco collaborates with Silvair to launch wireless lighting control solution >

Luceco has announced a partnership with Silvair to introduce the new Luceco Platform. This wireless lighting-control system, powered by Silvair's advanced technology, offers features such as dimming, scene-setting, presence detection, and daylight control. Collectively, these functions lower energy consumption and operational expenses.

The newly available Luceco Platform App, a product of this collaboration, streamlines lighting system commissioning through enhanced tools, seamlessly integrating with Luceco's lighting portfolio. The platform prioritises energy efficiency with an innovative energy-monitoring feature, enabling users to monitor consumption and manage resources responsibly.

Russell Joseph, of Luceco, said that this partnership not only simplifies lighting commissioning, but also aids customers in reducing their carbon footprint through meticulous energy monitoring and reductions.

■ Visit www.luceco.com/uk



< New service engineer appointed at Condair

Condair welcomes Liam Deegan as its newest service engineer for the South East and Midlands. With a decade of HVAC experience and gas qualifications, Deegan expands Condair's service team, which now boasts 19 technicians.

Condair provides onsite engineering expertise, prioritising customer humidity control needs. Offering planned maintenance agreements, it enhances unit performance, reduces labour costs, and provides spare parts and extended warranties.

Tony Tullett, service director at Condair, said: 'We are delighted to have Liam join the Condair Service Team.'

■ Visit www.condair.co.uk



Warsaw's Zamoyski Palace illuminated by Trilux >

Trilux has been working with Warsaw's Zamoyski Palace, infusing modern lighting technology into this architectural treasure.

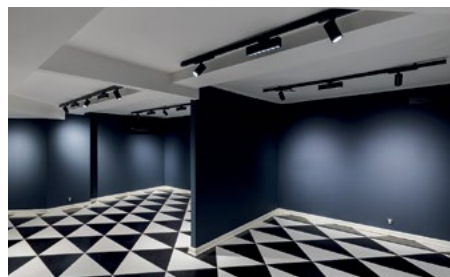
The collaboration has not only rejuvenated the palace's underground areas, but also transformed its basement into a versatile exhibition space.

An historic, neo-Renaissance palace, it now houses the Association of Polish Architects, SARP.

Trilux's Lenty track-mounted spotlights and luminaires, designed to blend energy efficiency and aesthetics, beautifully accentuate the exhibits.

Trilux also illuminated the palace gardens with its outdoor lighting during the SARP 2023 Awards.

■ Visit www.trilux.com/en

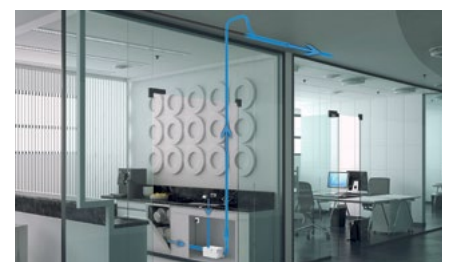


Jung Pumpen announces compact pump for efficient wastewater solutions >

Designed for versatility, Jung Pumpen's Hebefix Plus boasts a compact 183mm tank depth that will fit neatly in tiny, confined spaces for wastewater applications.

Accompanied by the U3 pump with a 6m head capacity, the system incorporates a run-time monitor, high-level acoustic alarm, and BMS-compatible volt-free contact. Pump Technology, the largest UK supplier authorised by Jung Pumpen, offers these solutions.

■ Call 0118 9821 555 or visit www.jung-pumps.co.uk



> Innovation hub opened by Woodford Renewables and SmartTECH



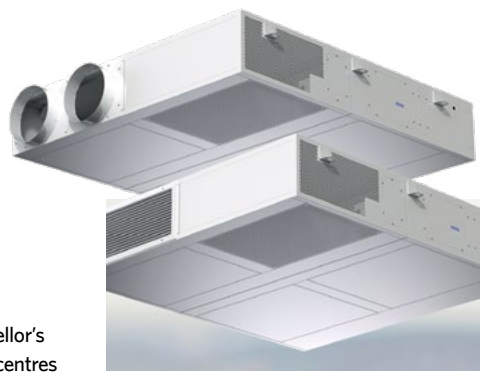
Woodford Renewables and SmartTECH has successfully launched the new innovation energy hub at its Essex headquarters.

Designed to promote energy-saving strategies and technologies, the hub will drive Woodford's new division, benefiting consultants, engineers and facilities managers in the commercial and domestic sectors. The facility demonstrates sustainable products, provides staff training, and offers a platform

for local businesses to explore sustainable building options.

The Innovation Hub aligns with Woodford's commitment to sustainability and renewable energy, contributing to the UK's net zero goals.

■ Visit www.woodford.ltd/renewables



New funding boost for leisure centres spurs energy-efficient ventilation upgrades >

Breathing Buildings has welcomed the UK Chancellor's announcement of a £60m fund for public leisure centres with pools, to emphasise energy efficiency.

Its NVHR 1700 offers an ideal ventilation solution for leisure centres, optimising thermal comfort, indoor air quality and efficiency. With the fund's support, leisure facilities can enhance ventilation, capitalise on heat gains, and contribute to the nation's sustainability goals.

NVHR 1700 is highly efficient, with specific fan power levels as low as 0.08W/l/s and, in larger applications, provides airflow rates as high as 540l/s.

■ Visit www.breathingbuildings.com

> Ideal Heating upgrades training programme



Ideal Heating – Commercial Products has expanded its installer training courses, backed by a substantial investment through its Expert Academy team. Covering Ideal Heating's complete commercial product line-up, the training encompasses established courses on boilers such as Evomax 2 and Imax Xtra 2, plus new offerings on heat pumps and heat interface units.

Expert Academy's experienced trainers ensure hands-on learning, covering installation, servicing, commissioning, and fault finding. The state-of-the-art training facilities include mobile boiler rigs, while a detailed brochure outlines course specifics.

■ Email enquiries@expert-academy.co.uk or visit bit.ly/IHTraining23

Enhanced fire priority demand valve optimises system performance >

Aquatech Pressmain has introduced the fire priority demand valve, engineered to close upon fire sprinkler activation. It isolates the flow of water to the domestic riser, enabling the booster set to pump all the available water to the sprinkler riser, ensuring optimal flow.

Equipped with status alerts, alarm messages and an auto-shutdown feature at low tank water levels, the valve boasts a failsafe actuator and pipework water cooling. Connect with the company's area sales managers to explore this advanced solution.

■ Visit aquatechpressmain.co.uk

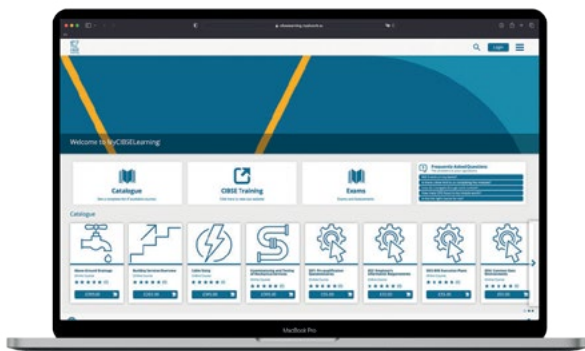
AQUATECH PRESSMAIN
FIRE PRIORITY DEMAND VALVES

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Pitching for equality

Cundall's new global head of diversity, equity, inclusion and culture, Lucy May, answers questions about her journey from football to the construction industry

Lucy May brings a wealth of experience to Cundall from her previous roles as head of inclusion at Newcastle United Football Club and as a Women's Select Group referee for Professional Game Match Officials Limited. She has officiated for the Football Association across four continents, and continues to referee in the Women's Super League. With a history of driving diversity, equity and inclusion (DEI) in traditionally male-dominated sectors, May has transitioned from football to the construction industry and shares her vision for promoting DEI within Cundall's global workforce.

Tell us about your previous role and how it prepared you for this new position?

At Newcastle, I led strategy implementation. I worked with the club to help it achieve the Premier League equality standards that weren't being met. Being able to make such an impact was a really positive experience.

I created the 'United as One' brand for Newcastle, to emphasise unity among supporters, employees and players. It's about feeling that, although we're all different, we're all here because we love the same thing. It's amazing to see its ongoing use at events such as Northern Pride.

There are several comparables with the building services industry, because the challenges around DEI aren't necessarily linked to a sector – there are outstanding issues that are very similar.

Are there any specific DEI initiatives that you want to introduce at Cundall?

It's a work in progress. I want to take the time to understand the company. Cundall has grown vastly over the past few years, with offices in 25 countries, so it's about making sure we have one overarching global vision, while creating a delivery model that enhances and encourages a plan to address the cultural differences in each of our regions.

Ultimately, the focus should be on sustainable, meaningful change. People often ask for a five-year strategy, but I find that difficult when you're looking at diversity and inclusion. If we reflect on what it looked like five years ago, to where we are

now, could we really have planned for that? Did we know some of the societal issues we were going to face? It's about setting principles that still allow us to flex as things change and issues are highlighted.

What changes have you observed within women's football throughout your career?

It's totally changed. There's more excitement around it – it's grown crazily. At my first Women's Super League game, there were maybe 100 people there. When you look at where we are now, I sometimes have to pinch myself. I first picked up the whistle 20 years ago, and was the only girl in the room. As women, we often degenderise ourselves to fit in, because we don't want the repercussions of breaking a mould. When you look now, it's a very different environment and I'm so grateful to have been part of that journey.

What lessons can we learn off the back of the change in women's football?

What it's really demonstrated is the power of activism for driving change. Allyship is great, but we need to translate this into action. The united front of key messages around zero tolerance and support is crucial.

Increased coverage of Lionesses' [England women's] games boosted engagement and showcased their professionalism and quality. It's a valuable lesson for organisations. The visibility of role models plays a pivotal role in educating people. It's not just about leadership role models – we need relatable figures at all levels. When you can see someone that you relate to, it's a lot easier to stand up and say 'that's what I want to do'.

I use football analogies all the time at work. If you had 11 defenders on a pitch, you might not concede goals, but you're not going to win games. The diversity of position is just as important as the diversity of person – and it's the same in business.

What has been your best experience in refereeing?

It's got to be walking out Arsenal vs Chelsea at the 2016 Women's FA Cup Final at Wembley and the stadium was full. That feeling of looking up and realising where I was, and that, as a little girl, I didn't have any relatable role models. Women's football wasn't even really a thing. I didn't have a school team because I was the only girl. I remember just sitting there, looking at what can be achieved in such little time.

EVENTS AND TRAINING



NATIONAL EVENTS AND CONFERENCES

Building safety: meeting the Building Regulations and delivering the golden thread

28 September, The Royal Society, London

This event will set out the breadth of the regulatory changes, the new requirements of Building Regulations, and details of the new regime for the golden thread and key building information that will apply to all accountable persons for a higher-risk building.

[go.cibse.org/golden-thread-2023-events](https://www.cibse.org/golden-thread-2023-events)

CIBSE Guide M Launch

28 September, London

Launch event for CIBSE *Guide M: Maintenance engineering and management*, including introductions and discussion from the lead authors and contributors.

[bit.ly/GuideMlaunch](https://www.cibse.org/Bit.ly/GuideMlaunch)

CIBSE YEN Careers Fair

12 October, International Students House, London

The Careers Fair brings together students looking for their first opportunity and employers that can nurture their talents. Students, apprentices and graduates will be invited to meet with organisations and prospective employers, and there will be CV workshops, plus informative sessions delivered by CIBSE and YEN members.

[bit.ly/CareersFair23](https://www.cibse.org/Bit.ly/CareersFair23)

CIBSE Young Engineers Awards

12 October, Royal College of Physicians, London

The awards recognise the innovative thinking, hard work and skills of those entering and new to the industry, and showcase those employers who are committed to developing and encouraging young talent.

www.cibse.org/yea

Façade 2023 Design and Engineering Awards

8 November, London Hilton, Park Lane

The awards recognise and reward excellence and achievements in façade engineering, raising the profile of, and drawing attention to, the importance of this discipline.

[bit.ly/FEA23](https://www.cibse.org/Bit.ly/FEA23)

CIBSE Build2Perform Live

5-6 December, London ExCel

Build2Perform Live is the meeting place for forward-thinking industry professionals, visionary speakers, leading industry exhibitors and young talent. It is the must-attend event in the building services sector.

www.build2perform.co.uk

CIBSE REGIONS AND GROUP EVENTS

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

West Midlands: Carbon steel tubes – intermediate knowledge

26 September, online

Tube specifications and tube manufacturing methods, with an introduction to galvanic corrosion and installation and commissioning issues. With speaker, Dr Chris Owen, Tata Steel UK.

West Midlands: Carbon steel tubes – Advanced

24 October, online

With speaker Dr Chris Owen, Tata Steel UK.

ANZ: CIBSE ANZ Young Engineers Awards

26 October, Melbourne

The winners of the three ANZ Young Engineers Awards – Student, Graduate and Young Engineer of the Year – will be announced.

MEMBERSHIP WEBINARS

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

Check the website for upcoming dates and to register: [bit.ly/CJMemWeb](https://www.cibse.org/Bit.ly/CJMemWeb)



TRAINING COURSES

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

Mechanical services explained

12-14 September, London
10-12 October, remote

Building services explained

12-14 September, London

Energy efficiency-related Building Regulations: Part L

14 September, remote
2 October, London

Low carbon consultant building design

14-15 September, London
27-28 September, remote

Power system harmonics

15 September, remote

Energy strategy reports

18 September, remote

Low carbon consultant building operations

18-19 September, London

Electrical services explained

19-21 September, remote
17-19 October, remote

Fire safety building regulations: Part B

20 September, remote

Heat Networks Code of Practice (CPI)

20-21 September, remote
4-5 October, London

Advanced simulation modelling for Design for Performance

20 September, London

Introduction to the Building Safety Act

26 September, remote

Design of ductwork systems

27 September, remote

Design of heating and chilled water pipe systems

3 October, remote

ISO 50001:2018 Energy management system

10-11 October, London

On demand training

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- Courses and modules available offline when using the app
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- Interactive content
- Corporate training exclusive tools (dashboards, reports)



CIBSE JOURNAL WEBINAR

The latest *CIBSE Journal* webinar, sponsored by Airflow, is now available on demand. This webinar, titled 'Understanding MVHR for commercial buildings', discusses the importance of ventilation and why ventilation with heat recovery is an ideal solution for commercial buildings.

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





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- Implementing the Building Safety Reform Programme
- Health and Wellbeing
- Light2Perform

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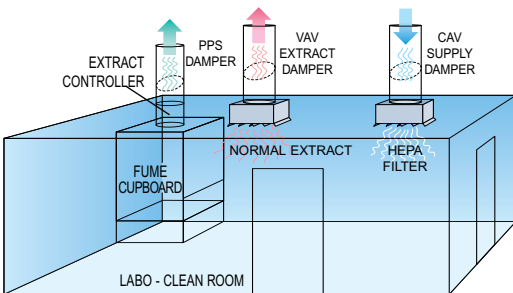


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