

# CIBSE JOURNAL

#Build2Perform

March 2023

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**BUILDING PERFORMANCE  
AWARD WINNERS REVEALED**

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CARBON IN LIGHTING**

**HAYS SALARY SURVEY  
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# Rooting for retrofits



The CIBSE Building Performance Awards took place on 1 March and showcased a brilliant array of projects, products and processes that will inspire more engineers to design net zero buildings.

The choice of a retrofit project as Building Performance Champion was a reminder that the biggest challenge in meeting net zero targets lies in our existing buildings. (A theme elaborated on by Hywel Davies on page 15.)

The Welsh School of Architecture at Cardiff University worked with Swansea Council to identify six homes that would typify the type of buildings that would need to be improved to eliminate carbon

emissions from the housing stock.

The measures taken include external wall insulation, double-glazing, ground source heat pumps, PVs and batteries. The judges called it an exemplar project, 'demonstrating true collaboration'. They were impressed by the focus on post-occupancy, praising the comprehensive handover pack and the post-occupancy evaluation and monitoring, which identify more opportunities for improvements.

The *Journal* went to press before the awards ceremony, so if you want to see the winners actually receiving their awards, visit [www.cibsejournal.com](http://www.cibsejournal.com). We will feature the winners over the next 12 months.

Google's much-anticipated new office development in London's King's Cross is nearing completion. Platform G, as it will be known, reflects Google's position as one of the five Big Tech giants. Not only is the building huge – at 350m more than matching the platform length of the train station next door – but it also features an array of innovative building services design befitting a pioneering technology company (page 44). A vast BIM model was created to coordinate the services within the floor voids created by the giant steel roof trusses that span above the office floor. As well as enabling the coordination of 10,000 openings, it allowed the early involvement of specialists and a high level of prefabrication.

Occupant health was a key requirement of Google, and Atelier Ten has maximised indoor quality with carbon filtration and F9 filters on the air handling units, and is providing a generous fresh-air supply rate of 16L/s-1 per person.

This year's International Women's Day is on 8 March. Gender inequality is still prevalent in construction, unfortunately. Surveys bear this out, as does personal testimony, as our interview with one CIBSE Member reveals. In our feature (page 16), we find out what companies are doing to address every kind of inequality in our industry.

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

## CONTRIBUTORS



### Hywel Davies

Retrofitting existing buildings is one of the smartest growth strategies, creating jobs and stimulating innovation



### Gaele Blake

Hays director on why a shortage of engineers means pay rises in building services are outdoing other sectors



### Harriet McKerrow

WIBSE vice-chair on why companies must have channels for reporting misogyny at work

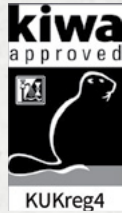


### Tim Dwyer

CPD module 212 looks at solar photovoltaic options and up-and-coming PV technologies

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## Hundreds of sewage leaks at hospitals

England's hospitals suffered 456 sewage leaks over the past year, according to figures obtained through a Freedom of Information (Fol) request by the Liberal Democrats.

Of England's 206 non-ambulance NHS trusts, 55 responded to the political party's Fol request, which uncovered the 456 leaks.

The worst trusts for leaks were Leeds Teaching Hospitals, which reported 105, followed by North Tees and Hartlepool Hospitals, with 80.

Cambridgeshire's Hinchingbrooke Hospital, the concrete roof of which has structural problems, also registered sewage leaks.

Liberal Democrats leader Sir Ed Davey said: 'This is a national scandal. Our country's hospitals are falling apart after years of underinvestment and neglect. Patients should not be treated in these conditions and heroic nurses should not have the indignity of mopping up foul sewage.'

NHS estates figures show the health service's repairs backlog grew by 11% in the past year, to £10.2bn.

## Heat pump grant scheme at risk of 'serious failure'

**Take up of grants 'disappointingly low', says House of Lords report**

The government's programme to kickstart the heat pump rollout is at risk of 'serious failure' because of 'disappointingly low' take-up of grants, warns a House of Lords committee.

In a letter to junior energy minister Lord Callanan, the House of Lords environment and climate change committee outlined the conclusions of its recently published inquiry into the Boiler Upgrade Scheme (BUS).

Under the scheme, the government has earmarked £150m per year from 2022 to 2025 for grants of up to £6,000 to households that replace fossil-fuel boilers with low carbon alternatives, such as heat pumps. However, according to figures from its administrator, Ofgem, the total value of BUS vouchers issued since the scheme was launched in May, to the end of January, was just £49.7m.

If the current take-up rate of grants continues, only half of the scheme's allocated £450m budget will be used, says the committee. It adds that take-up of grants has been bedevilled by wider government policies, which have failed to provide certainty to installers and consumers about the future shape of domestic low carbon heat.

The Lords committee writes that government 'mixed messaging' and 'misinformation' about hydrogen's future role in home heating is 'unhelpful', because it is 'not a 'serious option in the short to medium term, and any use for this purpose in the long term is likely to be limited'.

Keeping hydrogen open as an option is 'negatively affecting' take-up of already established low carbon heating technologies, they continue, adding that it is also unhelpful that the government's ambition to phase out gas boilers by 2035 has not been put forward more strongly.

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Alison, Technical Co-ordinator

# New net zero department targets energy efficiency

## Grant Shapps leads Department for Energy Security and Net Zero

Improved energy efficiency will be one of the six priorities for the Department for Energy Security and Net Zero (DESNZ), which has been set up as part of a wider Whitehall revamp.

The government announced the establishment of the new ministry, which has been split out from the Department for Business, Energy and Industrial Strategy (BEIS), on 7 February. It will be headed by Grant Shapps, who has been Secretary of State for BEIS since October last year.

The creation of the new department fulfils a commitment by Prime Minister Rishi Sunak, when he was running for the Conservative Party



leadership last summer, to set up a dedicated ministry for energy matters.

According to the new department's mission statement, the DESNZ will initially focus on cutting energy bills before moving onto longer-term goals, including pan-government coordination of net zero objectives.

A policy paper, published on the same day as the department was announced, identifies its six priority outcomes. They include: improving the energy efficiency of UK homes, businesses and public sector buildings to meet the 15% demand-reduction ambition set out in Chancellor Jeremy Hunt's autumn statement; and ensuring security of energy supply and that the UK is 'on track' to meet its legally binding net zero commitments.

In addition, it wants to 'significantly' speed up delivery of network infrastructure and domestic energy production, developing options for reform of the electricity market, and passing the Energy Bill to support the emerging carbon capture use and storage and hydrogen sectors.

Shapps will be joined at the new department by Graham Stuart MP and Lord Callanan. Two new junior ministerial roles have also been created for MPs Andrew Bowie and Amanda Solloway, who will double up as a government whip.

The department's permanent secretary is Jeremy Pocklington, who was director general, energy and security, at BEIS for two years until 2018, before which he was director general of the markets and infrastructure group at the Department of Energy and Climate Change.

BEIS's energy and net zero directors will transfer to the new department, including Ben Rimmington, who oversees net zero buildings and industry.

## IN BRIEF



### Exhibition opens in honour of Max

An exhibition opens this month to celebrate the life and career of Max Fordham, who died last year. 'Max Fordham: Engineering ideas, engineering change' will take place at the Building Centre, 26 Store Street, London WC1E 7BT from 8-24 March, and is free. A curated collection of drawings, models, original letters and videos will explore many of Fordham's key ideas and their impact on the design of the built environment through seminal projects that he worked on over the past 50 years.

### Construction output's biggest fall since 2020

UK construction suffered its largest monthly fall in output in two and half years, according to new figures. The UK Construction Purchasing Managers Index, which is compiled by S&P Global and the Chartered Institute of Procurement and Supply, was 48.4 in January – the second month in a row that this has been below 50, which signals a contraction. The rate of decline was the fastest since May 2020. Housebuilding, at 44.8, was the weakest-performing category of construction output in January, with its steepest rate of contraction since May 2020.

### Data analytics saves £200,000 on energy

Demand Logic has helped to achieve energy bill savings of £200,000 across four prime commercial properties in Birmingham in less than two years. Hines, Avison Young, Oval Real Estate, and Ashdown Phillips and Partners used the proptech company's building analytics technology to save energy and improve the performance of equipment in their buildings in Brindleyplace and Colmore Square, which cover 775,000ft<sup>2</sup> of floor space. Oval has also used the technology at 6 Brindleyplace and Arca, previously St Philips Point.

## Consumer levy for gas firms criticised

Gas companies reaping record profits from the energy crisis could receive subsidies from cash-strapped consumers to support hydrogen production, under government plans for a levy to support the fledgling industry, a think-tank has warned.

In a briefing published last month, E3G criticises a proposal in the government's Energy Bill to introduce a levy on consumer bills to fund hydrogen development. This would increase household bills, which are already under pressure because of the cost-of-living crisis, the think-tank warns.

The briefing adds that the levy will not deliver any benefits to these customers because hydrogen is 'highly unlikely' to be used to decarbonise home heating because it is 'inefficient, expensive and brings safety risks'.

Use of the proposed revenue-support mechanism will fund blue hydrogen, derived from gas, so producers that have made record profits from the energy crisis could receive support levied from consumer bills. Centrica, owner of British Gas, reported profits of £3.3bn for 2022 on 16 February.

The authors of the briefing are urging parliament to amend the Energy Bill to remove clauses 65-67, which provide for the introduction of the hydrogen levy.

## IN BRIEF

### Net zero offers great economic potential

Expansion of the net zero economy offers 'great potential' for regions across the UK to boost growth and reduce regional inequality, according to a new report. The study, carried out by CBI Economics for the Energy and Climate Intelligence Unit, says almost 20,000 net zero businesses are contributing £71bn to the UK economy. It finds that the North East, Scotland, Northern Ireland and the South West are among the areas with the highest concentrations of net zero economy firms as a proportion of total businesses. It also found that the net zero economy was 1.7 times more productive, in terms of GVA per employee, than the national average for the UK economy.

### Electrification accelerates in light of war in Ukraine

Electrification of the transport and heating sectors continued to accelerate globally in 2022, with record numbers of electric vehicles and heat pumps sold contributing to growth, according to a new report by the International Energy Agency. The Paris-based organisation's annual global electricity market report says demand rose by almost 2%, which it described as 'resilient' amid the global energy crisis triggered by Russia's invasion of Ukraine. It also says that renewables and nuclear energy will meet more than 90% of the additional electricity demand until 2025.

# Building services pay rises outstrip other sectors

## Skills shortages are putting employees in strong position, finds Hays' salary survey

Pay increases in building services firms have outstripped those for construction and property as a whole, according to the latest Hays Recruitment salary survey for *CIBSE Journal*.

The annual survey, carried out in autumn 2022, shows an average salary increase of 5% over the previous year for building services companies, compared with 4.4% for the wider construction and property industry. However,



the survey also shows that building services employees are putting a strong emphasis on work-life balance, even at the expense of pay.

A third (33%) of building services engineers said they would consider a lower-paid job for a better work-life balance alone, while 17% said they would sacrifice salary for a role with more purpose and a better work-life balance.

Four out of five (80%) told Hays that an organisation's purpose is crucial when considering a new role, and even more (83%) put a high value on sustainability.

When quizzed on the top benefits they seek, additional time off for wellbeing was cited by 24%, the same proportion as availability of statutory paid maternity/paternity leave and a company car or vehicle allowance.

Only 24% of building services engineers are currently offered hybrid working, while 51% are based fully in the workplace, according to Hays. A more flexible, hybrid approach would tempt 40% of employees in the sector to move organisation, while 21% would be tempted by the chance to work remotely one day a week.

## Redrow to fit ASHPs in new homes

Volume housebuilder Redrow has said all new homes on its future developments will be fitted with air source heat pumps (ASHPs). The move pre-empts the government's proposal to ban gas boilers from new-build properties from 2025. It also follows new research, carried out for Redrow by Opinionium, that shows living in an energy-efficient home is more important for 74% of UK adults than it was a year ago.

Heat pumps will be fitted in combination with electric, ground-level underfloor heating in Redrow's new schemes. The company is working in partnership with heat pump manufacturers Mitsubishi, Vaillant and Daikin, with each offering its own training centre and facilities for installers.

Matthew Pratt, CEO of Redrow, said: 'We are committed to further improving the energy efficiency of our homes while maintaining our reputation for best-in-class build quality and design. We will shortly go above and beyond regulatory requirements, future-proofing our homes and helping our customers lower their energy use.'

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# One in 20 social homes affected by damp and mould

**Around 230,000 properties affected, according to survey by regulator**

Around one in 20 social homes has damp and mould problems, according to figures in a new report by the Regulator of Social Housing.

The report is based on an analysis of evidence submitted by larger social landlords about the extent of damp and mould problems in their properties. It was carried out after the coroner's report, last November, into the death of two-year-old Awaab Ishak, which stated that it was the result of a severe respiratory condition caused by prolonged exposure to mould in Awaab's Rochdale housing association home.

The regulator's report says fewer than 0.2% of social homes fell into category 1 of the Housing Health and Safety Rating System because they have the most 'serious' damp and mould problems. Such properties would fail the Decent Homes Standard. Another 1-2% have category 2 'serious' damp and mould problems, which are



The death of Awaab Ishak has highlighted the dangers of damp and mould in housing

'notable' in a further 3-4% of homes, according to the regulator, which has said it will take action against providers that do not meet its standards.

However, the *Financial Times* has reported that the Treasury has imposed limits on spending by the Department for Levelling Up, Housing and Communities after its Secretary of State, Michael Gove, announced an additional £30m of funding in January for works to improve substandard housing.

## IN BRIEF

### Concern that UK won't retain 'EU' asbestos rules

It is not necessary to amend the provisions of the Control of Asbestos Regulations (CAR) 2012, a review by the Health and Safety Executive (HSE) has found. The regulations are effective and should be retained, but there is further scope to regulate work around asbestos surveying and removal, according to the review.

Asbestos is the single greatest cause of work-related deaths in the UK, with around 5,000 people a year killed by asbestos-related diseases.

The British Occupational Hygiene Society has welcomed the HSE review's findings, but has expressed alarm that the CAR 2012 are, potentially, due to be abolished – along with all other major regulations protecting health in the workplace – at the end of this year, under the Retained European Law Bill, because they are rooted in EU law.

## Proposed light curfews for City of London

Parts of the City of London could be turned into 'brightness zones', where lighting is switched off or dimmed during curfew periods.

A draft Lighting Supplementary Planning Document (SPD), published by the City of London Corporation earlier this month for consultation, lays down requirements for future planning applications in the Square Mile, and provides guidance on lighting existing buildings.

Developers will be required to submit a detailed strategy for how their buildings will be lit, and developments could be allocated into 'brightness zones' with curfew times. During these periods, all external lighting – other than that required for safety or to prevent crime – would have to be switched off or dimmed.

The SPD is designed to cut light pollution and help the City of London Corporation reach its target for the Square Mile of net zero by 2040. The corporation will also encourage businesses and building owners to sign up to a new voluntary Considerate Lighting Charter, to show their commitment to improving lighting in the City.



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## Method proposed for converting operational energy to carbon

LETI has proposed a methodology for the conversion of operational energy into operational carbon, for the purpose of making design decisions.

It suggests that a decarbonised carbon factor is applied to electricity consumption below a LETI energy use intensity (EUI) target, and a non-decarbonised carbon factor is applied to electricity above the EUI target.

LETI said this methodology accounts for buildings not benefiting from a decarbonised grid beyond their fair share.

The methodology has been developed by a workstream of around 50 built environment professionals, and aims to provide a basis for further analysis and discussion.

LETI has also launched a whole life carbon webinar series for this year.

For details of the methodology and webinar series, visit [www.leti.uk](http://www.leti.uk)

# Welsh retrofit wins three CIBSE Performance Awards

## Cardiff University project targets net zero improvements for existing homes

A housing retrofit project in Wales has been named overall Building Performance Champion at CIBSE's annual awards, held at the Park Plaza Westminster Bridge on 1 March.

The Low Carbon Built Environment Team, at the Welsh School of Architecture (WSA), Cardiff University, also won Collaboration of the Year and Project of the Year for *Towards Net Zero: Evidence from six whole-house energy retrofits*.

Six homes off mains gas were selected for the retrofit, and WSA worked with Swansea Council to install efficient, replicable, solutions while the occupants were living there.

Measures taken included installing external wall insulation, ground source heat pumps, and PV panels and batteries, and reducing glazing. The award judges called it an exemplar

scheme that demonstrated 'true collaboration'.

Fifteen awards were given out on the night. Arup associate director Stephen Hill was named Engineer of the year. He leads on carbon strategy and operational performance for major Arup projects and has contributed to publications on net zero. Arup also won the CIBSE Embodied Carbon Award for Consultants.

Cundall won the award for Building Performance Consultancy of the Year (over 300 employees), while XCO2 and Carbon Intelligence won the awards for consultancies with up to 50 employees and 51-300 employees respectively.

For details of all the winners from this year's awards, see page 22.

The Building Performance Awards took place as *CIBSE Journal* went to press. Pictures from the ceremony are available at [www.cibse.org/bpa](http://www.cibse.org/bpa)

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## IN BRIEF

### Views wanted for CIBSE response to ecodesign proposal

CIBSE is seeking views for its response to the Department for Business, Energy & Industrial Strategy's (BEIS's) proposal to update the ecodesign requirements of lighting products from 2023 and 2027.

BEIS is proposing that lamps offered for sale in Britain have a minimum energy performance of 120lm/W by 2023 and 140lm/W by 2027, with some exemptions.

CIBSE will be responding through the Society of Light and Lighting and contributing to a wider industry response. For details, and to contribute, visit [bit.ly/3KpEDG8](https://bit.ly/3KpEDG8) by 27 March. The consultation document, impact assessment and draft regulations are all available for review.

### Ken Dale Travel Bursary

Entries are now open for the 2023 Ken Dale Travel Bursary.

The bursary offers building services engineers in the developmental stage of their careers the chance to win up to £4,000 to travel the world, researching how different conditions impact the built environment. The deadline for entries is 1 May 2023.

Aluwaine Manyonga won the 2022 bursary, and travelled to Southern Africa to research the impact of off-grid solar-powered lighting.

For more information on how to apply, go to: [bit.ly/CJMar23CN3](https://bit.ly/CJMar23CN3)



The 2022 bursary winner focused on off-grid solar

# Leading experts host electric building webinar

## Latest in #GrowYourKnowledge series looks at challenges of electrification

The CIBSE #GrowYourKnowledge webinar series continues in 2023, with an event on the All-Electric Building on 15 March.

The webinar is based on a session held at Build2Perform Live, and looks at the challenges of electrification, including grid capacity, design strategies, and accommodating electric vehicle charging (Part 5).

The panel considers approaches to electrification, including strategies for existing building stock. To illustrate these challenges, and potential solutions, they present a recent case study of Convent Way, a new all-electric residential development in Hounslow (see 'Current challenge', *CIBSE Journal*, January 2023).

The webinar is chaired by Katie Clemence-Jackson, sustainability associate at QODA, and the speakers are: Chris Twinn, principal

at Twinn Sustainability Innovation; Tony Day, energy research consultant; and Henry Metcalfe, senior electrical engineer at QODA Consulting.

Previous webinars include: Dynamic thermal modelling of basic blinds, TM69; Urban albedo: developing a canyon albedo calculator (R106); Commissioning Code M: Commissioning management launch; Heat pump installations for large non-domestic buildings; and What does net zero mean? CIBSE-LETI FAQs. All are available to watch on demand.

Since its launch in April 2020, the #GrowYourKnowledge series has held 71 webinars, and attracted more than 27,000 attendees. The most popular webinar in 2022 was Heat pump installations for large non-domestic buildings (AM17 launch), with more than 1,000 attendees.

● For more information and to register for any of the webinars visit: [www.cibse.org/growyourknowledge](https://www.cibse.org/growyourknowledge)



Chris Twinn



Katie Clemence-Jackson

# Certification webinar looks at opportunities around net zero

CIBSE Certification is hosting a free webinar on 9 March, focusing on the challenges and opportunities around net zero carbon, with guest speaker Simon Wyatt, partner at Cundall.

Wyatt leads Cundall's net zero carbon and sustainable governance teams, and is an environmental specialist focusing on carbon-reduction policy and strategy. He is widely recognised as a leading authority on net zero and whole life carbon in the built environment, and has authored official policy on embodied and whole life carbon in the UK and internationally.

Over the past few years, Wyatt has delivered the first WELL-certified projects in both Europe and the Middle East and North Africa. He has also been instrumental in helping to develop net zero carbon and whole life carbon definitions and methodologies for the Greater London Authority and the Construction Industry Council Hong Kong.

● Register to attend at [bit.ly/CJMar23CN1](https://bit.ly/CJMar23CN1)



The two-day conference takes place in Glasgow

## Scottish event to tackle key regional issues

Conference takes place at Glasgow's University of Strathclyde on 7-8 June

CIBSE and CIBSE Scotland are to host a two-day conference at the University of Strathclyde, focusing on issues related to building services in the region.

Day one of the conference, on 7 June, will look at CO<sub>2</sub> emission reduction and operational efficiencies, while day two – on 8 June – will examine the Building Safety Act as it applies to Scotland.

Confirmed speakers for day one include: NHS Scotland Assure's Michael Cassells, who will be talking about net zero healthcare; Star Refrigeration's Dave Pearson, discussing heat pumps; Arup's Karen Warner, presenting on smart buildings; and Scottish Renewables' Helen

Melone, who will talk about heat networks.

There will also be a presentation on a Passivhaus case study from Max Fordham's Gwylm Still and Heather Fox, while Alan Crichton, from Sprinktec, will discuss fire protection. NHS Scotland Assure's Thomas Rodger will discuss infection control, and Richard Atkins will look at impact of regulations on design.

The second day of the conference will focus on the Building Safety Act, and highlight differences between England and Scotland. It will consider the response to Grenfell and will feature the requirements for those working in Scotland and how the Act relates to them, and their obligations when working on projects in England.

● A full programme, with booking details, will be available on [www.cibse.org](http://www.cibse.org) soon

## Book now for Glasgow CIBSE Technical Symposium

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

The symposium, supported by ASHRAE, seeks to bring together practitioners and researchers to consider the latest thinking in the sector. It will feature a range of peer-reviewed papers, presentations and posters outlining the latest developments in practice, technology and policy, and showcase the latest guidance for building services engineers.

It will focus on the challenge of decarbonising our buildings and infrastructure, and provide practitioners with up-to-date information about the latest developments in meeting the net zero carbon imperatives. The symposium will also cover the latest building safety-related reforms in the UK industry. It will look particularly at the challenge of retrofitting the existing building stock in a cost effective way at scale, good quality and pace.

● The full CIBSE Technical Symposium programme will be released this month. Book your place at [www.cibse.org/symposium](http://www.cibse.org/symposium)

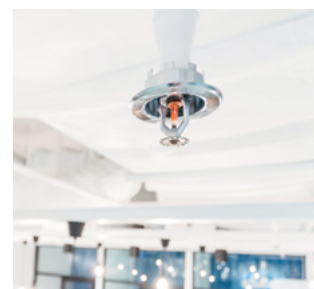
### IN BRIEF

#### Fire safety is focus of SoPHE conference

The Society of Public Health Engineers' (SoPHE's) 2023 Technical Conference will take place at the Institute of Physics on 23 March.

It will focus on fire safety, with a range of presentations outlining the latest developments in fire strategy and fire suppression for domestic and commercial premises. The latest policy and guidance for building services engineers will also be covered.

There will be expert speakers on regulatory and planning guidance, with presentations on how fire regulations influence water regulations, and vice versa, and the impact on the built environment. Register at [bit.ly/CJMar23CN2](http://bit.ly/CJMar23CN2)



#### Irish and Welsh regs consultations seek member responses

The Irish Department for Housing, Local Government and Heritage is seeking comments on a proposed amendment to Part B of the Building Regulations for Ireland. The consultation runs until mid-April and CIBSE Ireland is preparing a response.

There are also two consultations by the Welsh government, the first of which relates to carbon monoxide alarms. It is seeking views on proposals to amend the statutory guidance supporting Part J of the Building Regulations to require carbon monoxide alarms to be fitted alongside the installation of flued fixed combustion appliances in residential dwellings.

The second Welsh consultation wants input on proposals to amend Building Regulations to require all new-build houses to be equipped with gigabit broadband capability.

CIBSE Members are encouraged to submit comments to [technical@cibse.org](mailto:technical@cibse.org) by 24 April.

Further details can be found at [bit.ly/CJMar23CN4](http://bit.ly/CJMar23CN4)

# New members, fellows and associates

## FELLOWS

<b>Carey, Patrick</b> Lija, Malta
<b>Dent, Matthew</b> Hessle, United Kingdom
<b>Healey, Philip Raymond</b> To Kwa Wan, Hong Kong
<b>Keeling, Gregory Charles</b> Bishop's Stortford, United Kingdom
<b>Warne, James</b> London, United Kingdom
<b>Zhong, Hua</b> Nottingham, United Kingdom

## MEMBER

<b>Al Battal, Nader</b> London, United Kingdom
<b>Al-Rahman, Abdulrahman Akenzua</b> Potters Bar, United Kingdom
<b>Ala, Likhita</b> Cardiff, United Kingdom
<b>Alpaz, Zeki</b> Leeds, United Kingdom
<b>Ayres, Simon</b> Wickford, United Kingdom
<b>Bajenaru, Nicolae</b> London, United Kingdom
<b>Balina, Lauma</b> Bristol, United Kingdom
<b>Barker, Benjamin</b> Bristol, United Kingdom
<b>Basharat, Nadeem</b> Paisley, United Kingdom
<b>Bates, Andrew</b> Redhill, United Kingdom
<b>Blake, Christopher</b> Swinton, United Kingdom
<b>Bloomfield, Steven Edward</b> Christchurch, United Kingdom
<b>Broome, Mark</b> Exeter, United Kingdom
<b>Butt, Robin</b> Oxford, United Kingdom
<b>Carter, Kevin</b> Gomersal, United Kingdom
<b>Chan, Yuk Fai</b> Tuen Mun, Hong Kong
<b>Chiu, Chin Yan Karis</b> Bristol, United Kingdom
<b>Clements, Paul</b> Pimlico, United Kingdom
<b>Clements, James Alan</b> Bexley, United Kingdom
<b>Cragg, Stephen</b> Nottingham, United Kingdom
<b>Dagres, Petros</b> London, United Kingdom
<b>Defalco, Adrian Mark</b> Warlingham, United Kingdom
<b>Dulake, Phil</b> Leeds, United Kingdom
<b>Elmasry, Ayman</b> London, United Kingdom
<b>Gallacher, Craig</b> Glasgow, United Kingdom
<b>Gkikas, Alexandros</b> London, United Kingdom

<b>Grant, Gemma Ann</b> Menston, United Kingdom
<b>Gudgeon, Edward</b> Bromsgrove, United Kingdom
<b>Hadi, Tony</b> Manchester, United Kingdom
<b>Hillyard, Danny</b> Birmingham, United Kingdom
<b>Howes, Marek</b> Portsmouth, United Kingdom
<b>Hughes, Christopher</b> London, United Kingdom
<b>Hughes, Caroline</b> Castleblayney, Ireland
<b>Kaminiaz, Agnieszka</b> Cheshunt, United Kingdom
<b>Kent, Darren</b> Coulston, United Kingdom
<b>Kerr, Stuart</b> Glasgow, United Kingdom
<b>King, Colum</b> Belfast, United Kingdom
<b>Knight, Marcus</b> Reading, United Kingdom
<b>Kourtelis, Georgios</b> Leyland, United Kingdom
<b>Kulkarni, Mayuresh</b> London, United Kingdom
<b>Lam, Ming Tsang</b> NT, Hong Kong
<b>Lau, Chi Wai</b> Yuen Long, Hong Kong
<b>Lazarev, Gleb</b> Diggers Rest, Australia
<b>Lee, Chee Ngai</b> Hong Kong, Hong Kong
<b>Lester, James</b> Glastonbury, United Kingdom
<b>Li, Man wai</b> London, United Kingdom
<b>Loizou, Dean</b> Borough Green, United Kingdom
<b>Mak, Tsz Ho</b> Hong Kong, Hong Kong
<b>McHale, Brad Richard</b> Eldwick, United Kingdom
<b>McQuatt, Andrew</b> South Queensferry, United Kingdom
<b>Milton, Thomas</b> Glasgow, United Kingdom
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<b>Nath, Suman</b> Edinburgh, United Kingdom
<b>Nelson, Tom</b> London, United Kingdom
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<b>Parry, Robert</b> Lingfield, United Kingdom
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<b>Scullion, Craig</b> Glasgow, United Kingdom
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<b>Timmons, Paul</b> Cheadle, United Kingdom
<b>Tse, Man Kwan</b> Hong Kong, Hong Kong
<b>Vlachos, Georgios</b> New Malden, United Kingdom
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<b>Weller, Emma</b> London, United Kingdom
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<b>Wong, Ho Ming</b> Bristol, United Kingdom
<b>Yau, Wan Kan</b> Hong Kong, Hong Kong
<b>Zeng, Cheng</b> Coventry, United Kingdom

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<b>Aslam, Naeem</b> Slough, United Kingdom
<b>Carney, Adam</b> Liverpool, United Kingdom
<b>Clarehugh, Graham Luke</b> Leeds, United Kingdom
<b>Clark, Reece</b> Rotherham, United Kingdom
<b>Clarkson, Daniel</b> Oswaldtwistle, United Kingdom
<b>Cook, Joshua John</b> ShIPLEY, United Kingdom
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<b>Murray, Liam</b> Solihull, United Kingdom
<b>O'Shea, Gregory</b> Southampton, United Kingdom
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<b>Bennett, Levi</b> Nottingham, United Kingdom
<b>Bool, David John</b> Ingatstone, United Kingdom
<b>Carlile, Jack</b> Liverpool, United Kingdom
<b>Collins, Luke</b> Weston-super-mare, United Kingdom
<b>Dobson, Mitchell Paul</b> Sheffield, United Kingdom
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<b>Hines, Mark</b> Derbyshire, United Kingdom
<b>Kelly, Jack</b> Dartford, United Kingdom
<b>Kumar, Vignesh</b> Tamilnadu, India
<b>Manoharan, Jawaharlal</b> Bahrain, Bahrain
<b>Mason, Silke</b> London, United Kingdom
<b>Matthews, Billy</b> Bexhill-on-Sea, United Kingdom
<b>O'Brien, Dane</b> Clevedon, United Kingdom
<b>Palmer, Daniel</b> Southampton, United Kingdom
<b>Pritchard, Kyle</b> Walsall, United Kingdom
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<b>Taha, Mohamad</b> Abu Dhabi, United Arab Emirates
<b>Watson, Daniel</b> Hull, United Kingdom
<b>Wilson, Damien</b> Swinton, United Kingdom
<b>Winton, Ian</b> Belfast, United Kingdom
<b>Xynogala, Aikaterini</b> Birmingham, United Kingdom

# Elephant in the room

The UK has ambitious net zero carbon targets. That means tackling some 27 million existing homes and two million commercial buildings. Hywel Davies considers the importance of refurbishment

For decades, the UK has added about 1% to its existing building stock and refurbished about twice that each year. US figures are similar. Now we have some 27 million existing homes and a target for them to be net zero carbon by 2050. That requires a million domestic retrofits a year.

There is plenty of focus on the sustainability and carbon impact of the new houses. But what about existing stock? American architect and former President of the American Institute of Architects, Carl Elefante, once self-deprecatingly described the existing stock as the 'elephant in the room'.

He argues passionately that the greenest buildings are those that already exist. Buildings account for about 40% of global carbon emissions. At present, about a quarter of that is due to materials and construction activity and three-quarters to operational energy.

Replacing a building carries a considerable carbon cost compared with retaining and refurbishing it. And, as operational energy is reduced by more efficient systems, improved building controls and perhaps greater management focus on controlling energy bills, the balance will swing further towards embodied carbon.

The more we can re-use, repurpose and refurbish our existing buildings, the better for our carbon ambitions. But there is much more to this than carbon. One of the greatest concerns about the net zero agenda is that it is perceived as a cost, a burden on the economy. 'Without this obsession with being green, just think what our economy could do!'

But regenerating and updating our existing buildings is not a burden. It is a huge growth opportunity. Every town or city has abandoned or unoccupied buildings that could be better used. There is ample scope to stimulate years of growth. Older buildings that are energy hogs need refurbishing to reduce their demand for energy by fabric improvements and new heating systems.

If we are concerned about the appeal of those projects and our profession to younger engineers – and architects and other professionals – there is plenty of engineering and architecture in refurbishing existing buildings. These need to be maintained, preserved and adapted



**“The more we can re-use, repurpose and refurbish our existing buildings, the better for our carbon ambitions”**

for the present, which is often more challenging than clearing the site and starting again. And yet, as Elefante has argued, existing buildings are a resource to be used purposefully and managed.

The launch at the beginning of March of the National Retrofit Hub, which aims to enable the delivery of housing retrofit at significant scale across our housing stock, marks a significant and long overdue step forward in addressing the elephant of existing housing.

The benefits of retrofitting buildings are many. They include lower energy bills, peak load on the grid and CO<sub>2</sub> emissions and therefore reduce total investment needed to decarbonise the grid. Reducing aggregate and peak grid demand enhances our energy security.

A major retrofit programme offers nationwide job creation and growth and a stimulus to innovation in the technologies that are needed to improve the energy performance of our housing stock, especially in the hard-to-heat sector.

The benefits go beyond the building and energy sectors. Retrofit should make homes cheaper to run, improve comfort and reduce burdens on the NHS. Retrofitting existing buildings is probably

one of the smartest smart-growth strategies available, with the potential to deliver energy efficiency, carbon reductions and health benefits.

But if it were that easy we would be doing it now and not need a national initiative like the hub. While we have the knowledge and expertise to deliver effective retrofits, they are not widely available and the principles of safe, healthy, well-ventilated and condensation-free energy efficient homes are nowhere near as extensively distributed as they need to be.

Delivering that knowledge, providing training and building confidence through appropriate competence and certification arrangements is complex and needs coordination to avoid duplication. It is also vital to avoid condensation and poorly ventilated homes, with the dangers they pose.

But a common understanding across the industry will enable accelerated progress, improved outcomes and foster effective innovation. Retrofitting our existing buildings is critical to a healthy net zero future.

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

As International Women's Day again raises awareness of discrimination, **Molly Tooher-Rudd** looks at what companies and CIBSE Inclusivity Panels are doing to promote equality, diversity and inclusion in the workplace



# WHO'S STANDING UP TO INEQUALITY?

**A**s the annual International Women's Day (8 March) seeks to raise awareness of gender discrimination, there is evidence to suggest that sexism and inequality is still widespread in the UK construction industry.

While it may not always be visible in the office or on site, surveys and anecdotal evidence show that unacceptable behaviour towards women is an ongoing issue in the sector.

In its 2022 gender equality in construction report, recruitment consultant Randstad found that a quarter of the women surveyed had experienced inappropriate comments or behaviour from male colleagues, while 41% said the fear of sexual harassment had had an impact on their career.

This has been the experience of one CIBSE Member currently working in the industry. Speaking to *CIBSE Journal* anonymously, she said she had been verbally and physically assaulted while working in the industry.

'I've been in tears multiple times in the past two years, worrying about what's going to come at me next,' she says. 'There's a limit to how much I can handle.'

She says she's not alone: 'I can introduce you to a fair few women who are at the end of their tether regarding how they are treated by male peers, and by the fact they are expected to "just suck it up" as a price of working in the industry. We have all had enough.'

Misogyny in mainstream culture remains ever present, and has been amplified in recent years by high-profile online influencers such as Andrew Tate, whose sexist views have gained traction among many young men around the world. One woman who spoke to *CIBSE*

*Journal* said she broke off her relationship with an engineer after he expressed sympathy with Tate's views.

So, how can the building services industry protect women from bigotry and indeed stop prejudice and discrimination towards people from all backgrounds?

Kieran Thompson, head of talent, diversity and inclusion at Cundall, believes the sexism found in mainstream culture will seep into the sector, as 'we don't operate in a bubble'. However, the extent to which it does can be limited by how 'committed we are to building an inclusive culture', he says.

'You come across misogyny in all walks of life, including engineering,' agrees Harriet McKerrow MCIBSE, senior digital buildings and IoT consultant engineer at Facility Performance Consulting, and vice-chair at WIBSE, which supports women in CIBSE. 'Companies need to recognise that women may be vulnerable to this in the workplace and there must be channels for reporting incidences safely if they occur,' she says.

## Effective representation

WIBSE is a newly resurrected panel that forms one of the four pillars of the CIBSE inclusivity committee (see panel, 'Work of the inclusivity panel').

'There are women in lots of companies who find themselves in teams where they are the only woman, which can be quite isolating,' says McKerrow. 'We want WIBSE to be a community where people feel comfortable and included, and a space where they will be listened to.'

The representation of female engineers at junior level is improving as more female graduates come through. However, David Stevens, chair of CIBSE's LGBTQI+ panel, believes it's likely that women are still discouraged from coming into engineering because of the gender bias at higher levels. 'Making sure that women are effectively represented at all levels within your organisation is vital,' he says.

'We need to have more role models from different backgrounds,'



David Stevens, LGBTQI+ panel chair





hold themselves accountable. McKerrow believes the future will see lots of collaboration with other institutions, working together to find the best ways to inspire and support women.

Of course, there needs to be a focus on improving equality, diversity and inclusion (EDI) across all groups, not only for women. Other groups also have dates to celebrate inclusivity such as LGBT+ History Month, which took place in February. The industry remains extremely homogenous. Built In's 2022 *State of DEI in Tech* report found one in four companies is more than 70% white, and almost 40% of women and Black, Indigenous and people of colour employees felt excluded.

'This needs a behaviour change,' says Thompson. 'You need to be willing to challenge your ideas and outlooks, understand your privilege. It's difficult, but that's how we can grow and do better.'

### Open communication

In 2020, Cundall launched a five-year Valuing Diversity strategy. Since the initiative began, the company has implemented a dedicated EDI policy, a neurodiversity policy, and a trans-inclusion policy, and have enhanced policies around parental leave provision.

Senior leaders are now required to participate in a 12-month inclusive leadership programme. Participants attend a mixture of events and webinars, and are then brought together for a discussion. 'It's a way to get guards down and open communication around issues that, in the past, may have made some people squirm,' says Thompson.

'It's about examining your own culture and setting up inclusive policies you can measure yourself against,' adds Stevens.

Aecom has pledged to develop EDI within the company, with a campaign tagline: 'A world where infrastructure creates opportunity for everyone.'

'We are actively encouraging our employees to join an employee resource group,' says Clarke. 'Aecom has set up many groups, for example – women's leadership alliance, Pride and Be Bold, which is for Black communities. It's an opportunity for everyone to get together and understand each other better.'

To overcome the unconscious bias in recruitment practices, Cundall has adopted a version of the Rooney Rule, a policy that originates from the US National Football League, which requires teams to interview at least one ethnic minority candidate for any senior leadership position. 'This ensures we shortlist diverse candidates for our leadership positions,' says Thompson.

'Unfortunately, the assumption has been for so long that the best person for the role, when it comes to leadership, has

## "Cundall has adopted a version of the Rooney Rule, a policy that originates from the US National Football League, which requires teams to interview at least one ethnic minority candidate for any senior leadership position"

agrees Mary-Ann Clarke, of Aecom. 'As a woman in the industry, I've strived to be that role model and showcase the opportunities that are there for others.'

'It's important to recognise that everyone has some biases around gender – even women,' adds McKerrow, who believes one of the major challenges is unconscious bias, with the example being internal vacancies and promotions. 'Before anything has even begun, people start referring to the new team member as 'he'; it's just assumed,' she says.

Although something so small may not appear to be a problem, McKerrow says evidence shows that these learned associations are really hard to change: 'When the female candidate turns up, it feels wrong, because it wasn't what was expected. The assumptions are amplified throughout the process until it becomes the reality.'

Surveys bear out the lack of women in senior positions. In the Randstad poll, 48% of respondents said they had no female role models.

Since WIBSE reformed in July 2022, McKerrow has written a revision of the CIBSE code of conduct, identifying areas that were missing that were specifically relevant to gender inclusion. WIBSE identified a need for an industry standard for best practice in gender inclusion, to which companies can



Hakeem Makanju, chair, ethnic minorities groups panel



WIBSE vice-chair Harriet McKerrow



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» always been a white male, which we are working to challenge at Cundall.

Similarly, at Aecom, anybody who is leading an interview must undergo training to make sure unconscious bias is understood and avoided.

### Think globally

Regardless of the size of your organisation, you can be undertaking training and development,' says Stevens. 'It's key to understanding how each other is perceived – have your senior board director sitting down with that Black, ethnic minority, female, trans member of staff and learn about how they perceive the organisation, and what their lived experience has been like.'

Hakeem Makanju, chair of the CIBSE minority ethnic groups panel, says: 'Certain countries are more sensitive, and are more driven by culture and religion; it may, therefore, be difficult to implement the same EDI processes.'

Cundall has offices globally, so this is an issue it has had to consider. 'We have to make sure that our employees feel that they can be open about who they are as much as possible, and feel safe within their territories,' says Thompson.

'The most important thing is that everyone feels safe, and that we are spending time talking to these individuals in their environment.'

'We need to challenge poor behaviours,' Stevens says. 'It's about perception and changing what's appropriate and acceptable.'

'Embed EDI practices into your company culture, talk about it. By putting ourselves out there and saying "these are things that we're doing", people see Aecom as a business they want to work for,' Clarke says. 'Take the blinkers off – because, with diversity, we get innovation and creativity.' 

■ International Women's Day is on 8 March. Visit [www.internationalwomensday.com](http://www.internationalwomensday.com) to find out more and order IWD resources

■ For more information on WIBSE, visit the LinkedIn group [bit.ly/WIBSELinkedIn](https://bit.ly/WIBSELinkedIn) or email [wibse@cibse.org](mailto:wibse@cibse.org)

## CIBSE INCLUSIVITY PANELS

The CIBSE Inclusivity committee was reformed in 2022, and is made up of four panels: WISBE (women's committee), LGBTQI+, minority ethnic groups; and neurodiversity.

Over the past year, the panels have created action logs and are working on several agendas and strategies.

Hakeem Makanju, chair of the minority ethnic groups panel, said: 'We are currently ensuring that we have a good data-collection process, because, without data, we're not able to measure our progress. We need data benchmarks to help monitor CIBSE's drive towards a diverse, inclusive institution.'

'The CIBSE Inclusivity Guidelines that were generated a few years ago have been reviewed to align them with best practice and government guidelines, to ensure that the language we use is not misconstrued and doesn't cause offence.'

The committee has also proposed that a CIBSE award be created that recognises diversity and inclusion.

David Stevens, the LGBTQI+ panel chair, said he became a member of the inclusivity committee because 'it's important that people like me, who are open and are out, are seen within the industry, to show that we are represented, we are visible; that CIBSE is a safe space to be shared and enjoyed by all.'

# Better by design

Key guidance on evacuation lifts and stairwells are included in an BS991:2015 update, says Smoke Control Association member Ben Meek

The British Standard code of practice *BS 9991:2015 – Fire Safety in the design, management, and use of residential buildings* is being updated. The new version will be published once all outstanding comments from the consultation period have been addressed.



Up until now, it has been common to build residential buildings above 18m with a single communal escape stairwell. The buildings adopt a 'defend in place' evacuation strategy (also known as 'stay put'), meaning that each dwelling is constructed as a fireproof box.

This 'defend in place' procedure fails if the apartment fire compartmentation is breached, allowing fire to spread between dwellings. Fires that affect multiple floor levels overwhelm active fire-protection systems, such as corridor smoke ventilation systems, because the system is designed to handle a single fire on one floor.

If a stairwell becomes smoke-logged and it is the only escape route, occupants of the higher floor levels find themselves trapped inside the building.

In light of this, BS 9991:2022 provides stricter guidance for the use of single-stair residential buildings above 18m.

At present, a typical block of flats has a naturally or mechanically ventilated corridor that directly accesses the communal escape stairwell. This means the fire zone (the dwelling) is separated from the stairwell by no more than two fire doors.

The inclusion of a pressurised stairwell lobby between the apartment and stairwell adds an additional degree of fire separation between the fire zone and the escape route.

Furthermore, by pressurising the stairwell and stair lobby, the fire service should be afforded tenable conditions within the stair lobby to use it as staging point/fall-back position. 'Pressurisation' works by using supply fans to pump fresh air into the protected areas to direct airflow away from them when doors are opened and thereby repel any smoke and hot gas.

BS 9991:2022 provides clearer and further-reaching guidance on the provision of evacuation lifts. It also states that evacuation lifts should be located within protected lobbies, which should have direct access to a stairwell and be served by a smoke-control system.

The SCA website provides a list of suitable smoke-control contractors with mechanical smoke ventilation and pressurisation design capabilities. See [www.smokecontrol.org.uk](http://www.smokecontrol.org.uk)

● Ben Meek is a design engineering manager at SCS Group

# CIBSE BUILDING PERFORMANCE AWARDS 2023

The CIBSE Building Performance 2023 Awards Celebration was held on Wednesday 1 March 2023 at Park Plaza Westminster Bridge, London

## 1 BUILDING PERFORMANCE ENGINEER OF THE YEAR

**Stephen Hill** - Associate Director in the Buildings Sustainability Team, Arup

*Sponsored by Ideal Heating Commercial*

## 2 BEST DIGITAL INNOVATION

Cloud-Based Smart Energy Management Platform (CBSEMP) - **Swire Properties**

*Sponsored by CIBSE Patrons*

## 3 COLLABORATION

Working together to deliver whole house energy system retrofits at scale - **Low Carbon Built Environment Team, Welsh School of Architecture, Cardiff University**

*Sponsored by Lochinvar*

## 4 BUILDING PERFORMANCE CONSULTANCY (UP TO 50 EMPLOYEES) XCO2

*Sponsored by Mitsubishi Electric*

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

**Carbon Intelligence, part of Accenture**

*Sponsored by Airflow*

## 6 BUILDING PERFORMANCE CONSULTANCY (OVER 300 EMPLOYEES)

**Cundall**

*Sponsored by ABB*

## 7 FACILITIES MANAGEMENT

Savills Portfolio - **Smart Managed Solutions**

*Sponsored by Gratte Brothers Group*

## 8 CIBSE EMBODIED CARBON AWARD - MANUFACTURERS AND SUPPLIERS

**NorDan UK**

*Sponsored by Buro Happold*

## 9 CIBSE EMBODIED CARBON AWARD - CONSULTANTS

**Arup**

*Sponsored by CMR*

## 10 PROJECT OF THE YEAR (DOMESTIC)

Towards Net Zero - Evidence from six whole house energy retrofits - **Low Carbon Built Environment Team, Welsh School of Architecture, Cardiff University**

*Sponsored by Crane Fluid Systems*

Headline sponsor



Sponsors



## Congratulations to our

# WINNERS

### HIGHLY COMMENDED SHEPHERDS BARN

- LEAP

### 11 PROJECT OF THE YEAR (NON-DOMESTIC)

Cranmer Road, Kings College Cambridge  
- **Max Fordham**

*Sponsored by Crane Fluid Systems*

### 12 LEARNING AND DEVELOPMENT

Airborne Infection Reduction through Building  
Operation and Design (AIRBODS)  
- **Loughborough University**

*Sponsored by SfS - Smoke & Fire Safety*

### HIGHLY COMMENDED LEARNING AND DEVELOPMENT

'Build Better Now' COP26 Virtual Pavilion  
- **AECOM**

### 13 PRODUCT OR INNOVATION OF THE YEAR - WELLBEING

MODULHAUS™ - **VOLUMETRIC™**

*Sponsored by TamLite Lighting*

### 14 PRODUCT OR INNOVATION OF THE YEAR - AIR QUALITY

HVR Zero - Hybrid Ventilation with Heat Recovery  
- **Monodraught**

### 15 PRODUCT OR INNOVATION OF THE YEAR - THERMAL COMFORT

iAirDoor - **Wirth Research**

### 16 BUILDING PERFORMANCE CHAMPION

Working together to deliver whole house  
energy system retrofits at scale - **Low Carbon  
Built Environment Team, Welsh School of  
Architecture, Cardiff University**

*Sponsored by TamLite Lighting*

### HIGHLY COMMENDED BUILDING PERFORMANCE CHAMPION

Airborne Infection Reduction through Building  
Operation and Design (AIRBODS)  
- **Loughborough University**



# REPEAT PERFORMANCE

An exemplary housing retrofit in Wales is the 2023 CIBSE Building Performance Champion. Judges thought the collaborative approach by the Welsh School of Architecture at Cardiff University could provide a template for decarbonising other existing homes

## Building Performance Champion, Project of the Year – Domestic and Collaboration of the Year

**Winner, Towards Net Zero: Evidence from six whole-house energy retrofits – Low Carbon Built Environment Team, Welsh School of Architecture, Cardiff University**

This pioneering retrofit project, which improved energy performance and comfort for residents, was a clear favourite with the judges.

They called it ‘an exemplar project, demonstrating true collaboration with multiple stakeholders on a challenging retrofit’.

The project was a collaboration between Swansea Council and the Welsh School of Architecture (WSA) at Cardiff University. Six homes off mains gas were selected for the retrofit, as they were energy inefficient and expensive to heat, with damp and mould problems.

Swansea Council and the WSA worked with residents and the supply chain to plan, design and install efficient, replicable solutions to drive towards zero carbon targets – all while the occupants were living there.

The building performance objective was to reduce energy demand and maximise renewable supply, while ensuring a comfortable and affordable home was

provided for the residents. The judges particularly liked the fact that the houses were representative of a typical Welsh typology, so the outcomes and lessons learned would be replicable for future projects.

They also praised the way the team developed and delivered a comprehensive handover pack, and the post-occupancy evaluation and monitoring, in which the

outcomes were used to identify more opportunities for improvements.

The energy efficiency measures installed included external wall insulation, reduced glazing area, double-glazed windows, loft insulation, ground source heat pumps, and solar photovoltaic panels and batteries.

A significant challenge was to complete the retrofit works while the occupants remained living there. The work was carefully managed to minimise disturbance and residents were kept informed about the schedule of works throughout.

**Collaboration of the Year, sponsored by Lochinvar  
Project of the Year – Domestic, sponsored by Crane Fluid Systems**



This pioneering retrofit project in Wales was a clear winner



## Engineer of the Year

**Winner: Stephen Hill,**  
**associate director at Arup**

Judges praised Stephen Hill's 'infectious enthusiasm and encyclopaedic knowledge'. During his 25-year career with Arup, Stephen has been a mechanical services designer, building performance consultant and associate carbon and net zero consultant. His current role is focused on driving the transformational change required to achieve net zero carbon. He is leading on carbon strategy and operational performance for major Arup projects, and is developing carbon and sustainability frameworks for large property firms. Stephen has also contributed to net zero publications from Arup and UK-GBC.

Sponsored by [Ideal Heating Commercial](#)



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

**Winner: XCO2**

XCO2 stood head and shoulders above the other finalists in this keenly fought category, and retained its 2022 title. Its 'insightful and thorough' entry convinced the judges that it was best in class.

The firm offers net zero services on all projects and is willing to share its knowledge by delivering multiple CPDs to the industry.

It recently worked on five net zero retrofit projects that will result in 500 social homes in London becoming zero carbon. Working together and building relationships are two of its values, demonstrating the importance of collaboration.

Sponsored by Mitsubishi Electric



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

**Winner: Carbon Intelligence**

Judges were unanimous in their decision to make Carbon Intelligence the winner of this award. They said the company's programme of client engagement - using its data platform as a collaboration tool - came across strongly. Its commitment to gathering in-depth data on existing buildings was commended by the judges. The platform helps clients monitor and manage energy usage, air quality and a range of performance indicators, while its machine-learning capabilities help build performance benchmarks and highlight anomalies.

Sponsored by Airflow



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

**Winner: Cundall**

Cundall's tangible commitment to zero carbon - coupled with its strong ethics and equity - gave it the edge in this competitive category. Judges were impressed by its global Zero Carbon Design pathway, which commits Cundall to achieving zero carbon design on every project by 2030. Cundall's award entry also showed strong preparation for the Building Safety Act 2022, with its legal and construction, design and management teams working closely to ensure engineers understand and implement the changes.

Sponsored by ABB





## Facilities management

### Winner: Savills Portfolio - Smart Managed Solutions

Reinvigorating its FM approach to decarbonisation for Savills Portfolio, using data and technology to drive improvement, has helped make Smart Managed Solutions a BPA winner. The judges said its entry demonstrated strong collaboration with a software provider to maintain better environments, reduce carbon and provide improved outcomes. The company's knowledge sharing across all levels of the organisation - through a Smart Academy - was a particular highlight. Smart Managed Solutions and Savills have worked in partnership for five years, maintaining a property footprint of three million ft<sup>2</sup>.

Sponsored by Gratte Brothers Group



## Learning and Development

### Winner: Airborne infection reduction through building operation and design (Airbods) - Loughborough University

Loughborough University's research into airborne infection reduction through building operation and design (Airbods) contributed to the resumption of large-scale events after Covid. The analytical risk models it developed can identify scenarios and space types that should be targeted for remediation by improving ventilation or using air cleaning systems. It has enabled policy-makers to evaluate the changes in risk that modifications have at a population scale, enabling them to focus interventions.

Sponsored by SFS - Smoke & Fire Safety



## Innovation of the Year – Thermal Comfort

### Winner: iAirDoor - Wirth Research

Judges praised iAirDoor for reinventing the over-door air curtain, and addressing challenges in a sector where innovation to reduce energy consumption and heat loss is 'long overdue'. They praised iAirDoor's cost-effectiveness, the ease of installation and maintenance, and the remote-monitoring and management features that allow the manufacturer to respond to operational issues. The iAirDoor significantly reduces wind infiltration through open doorways. Stopping infiltration when outside air differs from desired indoor air temperature results in significant energy savings and a noticeable improvement in thermal comfort indoors - particularly close to the open door.



## Product or Innovation of the Year – Wellbeing

### Winner: Volumetric Modulhaus

Judges described Volumetric Modulhaus as a ‘stand out’ winner of the Wellbeing award. They said the company’s modular homes, aimed at rehousing rough sleepers, made a significant contribution to wellbeing. Volumetric worked in close partnership with Hill Group to design and manufacture the bespoke single-person homes, with 200 being gifted to homeless charities and councils across the country. Sustainable technologies allow exceptionally low running costs (around £5 per week). Nearly 200 former rough sleepers are now living in Modulhaus developments.

Sponsored by TamLite Lighting



## Product or Innovation of the Year – Air quality

### Winner: HVR Zero – Hybrid Ventilation with Heat Recovery – Monodraught

Monodraught has combined strong engineering qualities and premium material use with cost-effectiveness to achieve a decentralised energy-ventilation unit with zero embodied and operational carbon. Judges praised the level of detail that went into the product engineering and said the consideration of embodied carbon demonstrated ‘how new products need to address this challenge and target net zero over the product’s life-cycle’. They added that it provides an interesting challenge to traditional centralised air systems in relation to controllability and efficiency.



## Project of the Year – Non-Domestic

### Winner: Cranmer Road, King’s College, Cambridge – Max Fordham

Judges loved the continuity of design, delivery and operation of King’s College, Cambridge’s new Passivhaus student housing. Judges were impressed by Max Fordham’s focus on optimising building performance. They highlighted the survey feedback that was used to improve energy performance, the comprehensive commissioning, and how analysis of future climate scenarios influenced design and construction. A user guide was written for students, so they could understand how to achieve comfort in a low-energy way.

Sponsored by Crane Fluid Systems



## CIBSE Embodied Carbon Award – Manufacturers and Suppliers

**Winner: NorDan UK**

Judges said the window manufacturer had clearly considered the whole life impact of its product – from manufacturing, operation and maintenance, to end of life – and praised its award entry for including ‘good-quality data’. NorDan’s products have some of the lowest embodied carbon in the industry because its frames are around 95% timber, and the company uses renewable energy sources and minimises waste. Sustainability values have been implemented throughout its supply chain.

Sponsored by Buro Happold



## CIBSE Embodied Carbon Award – Consultants

**Winner: Arup**

Arup has won this award for significant investment in understanding the embodied carbon of building services and assessing design options with the lowest impact. The judges were impressed by how Arup shared knowledge to drive best practice inside the firm and how it developed an internal Arup methodology to assess embodied carbon for building services. This goes beyond the TM65 mid-level calculation by including an estimate for stages A5, B4 and B5. Arup also carried out groundbreaking work on embodied carbon benchmarks for MEP.

Sponsored by CMR



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



**VELOGRID**  
Velocity Averaging Sensor



**P-Sensor**

CMR are the inventors and manufacturers of both the P-Sensor and the Velogrid. The Velogrids are made to measure to fit any ductsize up to 3m x 3m and the P-Sensor has a keyboard to easily enter : duct height - width - density - magnification factor and the scaling in m/s - m3/s - m3/h - l/s. It can even work out the Air Change rate. And the BMS gets three linear volume signal outputs of 0..10V 4..20mA and an addressable Modbus rtu bus.

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# IT'S NOT JUST ABOUT THE MONEY

The skills shortage in building services persists, and if companies want to attract talent they will need to offer more than financial incentives, finds the 2023 Hays Salary Survey. **David Blackman** looks at the must-have perks for engineers

**T**he UK has avoided a recession – just – according to the GDP figures for the last quarter of 2022.

Construction and property reflect this guarded picture, judging by the latest sector jobs and salary survey, which was carried out last autumn by recruitment consultancy

Hays for *CIBSE Journal*.

Just over half (57%) of construction and property employers expected their organisation's performance to improve in 2023. This is down on the previous year's figure of 71%, but is more positive than may have been expected given the bearish economic backdrop.

Just over a third (37%) of employers predicted their organisation's performance will stay the same over the next 12 months.

Despite the headwinds affecting the economy, Aecom's work is holding up 'pretty well', says John Lewis, head of building engineering for UK & Ireland.

'While there is caution, certainly for the next two quarters at least, everybody's still very, very busy,' he says.

Wayne Eustace, director at engineers CPW, agrees: 'We have a very positive order book in the coming months.'

Long-held concerns around skills shortages have become more acute though over the past year. Almost all (95%) construction and property employers reported skills shortages, compared with 92% in the previous year, according to the report. The skills crisis is hitting firms' ability to deliver projects (40%) and productivity (54%).

FairHeat has almost doubled in size since this time last year after recruiting around a dozen new staff, including 10 graduate engineers

over six months. However Tom Naughton, the specialist heat networks engineer's managing director, admits that the company still has a 'huge issue' with skill shortages.

Even after winning small company Employer of the Year in last year's CIBSE awards, FairHeat still struggles to recruit experienced engineers. 'There are so few people spread among so many organisations that demand is massively outweighing supply,' he says.

Recruiting young engineers leaves the company at risk of becoming bottom heavy, says Naughton. 'The biggest skill gap is in people with five years' experience in the sector who can manage projects and teams.

'It's a huge commitment financially, spending all that time and resources investing in people and getting them skilled up, and then another organisation could come along and just offer them a bit more money,' he says.

However, FairHeat's investment in training is paying off, with some reaching the point where they can take on the kind of managerial roles for which there is a shortage of candidates, says Naughton. The level of

skills shortages in building services makes holding on to staff particularly important, says Eustace. 'There's such a skill shortage that you cannot afford to lose people even in a downturn. When things pick back up again, it's so much harder to recruit new staff into the business,' he says.

The company has never made engineers redundant, even during downturns, according to Eustace. 'We'd rather turn off the profits and look at other things because we know that, without the staff, there is no business,' he says.

As a global company, Aecom is able to draw on skills from its overseas operations and by supplementing inhouse staff from SMEs and, to a lesser extent, contract workers, says Lewis.

But the company is also 'recruiting heavily', including taking on a record number of graduates and apprentices, he says.

Faced with these kinds of skills shortages it is unsurprising that salaries have increased over the past year. The Hays survey shows that the proportion of construction and property employers that increased salaries in 2022 (81%) was a notable rise on the 60% that did so in 2021.

Three-quarters (76%) also said they intend to increase pay over the next 12 months. And the average salary increase over the past year was 5% for building services, compared with 4.4% for the construction and property sector as a whole.

Gaëlle Blake, director for construction and property at Hays, isn't surprised that pay increases in building services engineering firms are outstripping those for the wider sector.

In a market where candidates for engineering roles are in 'very short supply', smart employers are being 'proactive' and not waiting until somebody announces they have a new job to make a counter offer.

'That's the right response, especially given the cost of living. They don't want to be losing staff who don't want to leave, simply because they can't afford to stay,' she says.

'It's the right thing to do, given the circumstances. I also think it's pretty smart commercially, because they know quite how hard it would be to find somebody else to replace them.

'Those engineers are so in demand they would find jobs easily.'

Naughton says FairHeat has carried out an inflation adjustment exercise.

'We're in London and employ lots of young engineers, so the increase in rents and general cost of living has hit our team quite hard,' he says.

In addition to increasing salaries,

**"There's such a skill shortage that you cannot afford to lose people even in a downturn. When things pick up again, it's so much harder to recruit new staff"**

**Consultants: Associate**

Region	Typical salary 2023	Min salary 2023	Max salary 2023
East Midlands	£70,000	£60,000	£75,000
East of England	£62,000	£56,000	£69,000
London	£78,000	£65,000	£80,000
North East England	£49,000	£43,000	£50,000
North West England	£63,000	£55,000	£68,000
Northern Ireland	£58,000	£55,000	£60,000
Scotland	£60,000	£55,000	£65,000
South East England	£69,000	£62,000	£72,000
South West England	£70,000	£68,000	£73,000
Wales	£68,000	£68,000	£73,000
West Midlands	£70,000	£60,000	£75,000
Yorkshire and the Humber	£54,000	£46,000	£55,000
<b>National Average</b>	<b>£64,250</b>	<b>£57,750</b>	<b>£67,917</b>
<b>% increase year on year: 7.5%</b>			

**Consultants: Director**

Region	Typical salary 2023	Min salary 2023	Max salary 2023
East Midlands	£80,000	£70,000	£85,000
East of England	£78,000	£72,000	£82,000
London	£105,000	£90,000	£140,000
North East England	£55,500	£46,000	£59,000
North West England	£72,000	£65,000	£80,000
Northern Ireland	£70,000	£70,000	£75,000
Scotland	£70,000	£60,000	£85,000
South East England	£80,000	£72,000	£87,000
South West England	£75,000	£70,000	£79,000
Wales	£73,000	£70,000	£79,000
West Midlands	£80,000	£65,000	£85,000
Yorkshire and the Humber	£56,000	£46,000	£60,000
<b>National average</b>	<b>£74,542</b>	<b>£66,333</b>	<b>£83,000</b>
<b>% increase year on year: 6.3%</b>			

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

Region	Typical salary 2023	Min salary 2023	Max salary 2023
East Midlands	£30,000	£26,000	£32,000
East of England	£28,000	£23,000	£31,000
London	£35,000	£30,000	£38,000
North East England	£23,250	£19,000	£24,000
North West England	£27,000	£18,000	£28,000
Northern Ireland	£27,000	£24,000	£30,000
Scotland	£30,000	£24,000	£32,000
South East England	£32,500	£23,000	£33,000
South West England	£35,000	£31,000	£38,000
Wales	£34,000	£31,000	£38,000
West Midlands	£30,000	£26,000	£32,000
Yorkshire and the Humber	£23,250	£19,000	£25,000
<b>National average</b>	<b>£29,583</b>	<b>£24,500</b>	<b>£31,750</b>
<b>% increase year on year: 4.4%</b>			

**Consultants: CAD technician**

Region	Typical salary 2023	Min salary 2023	Max salary 2023
East Midlands	£30,000	£26,000	£35,000
East of England	£33,000	£29,000	£39,000
London	£38,000	£32,000	£45,000
North East England	£27,500	£22,000	£28,000
North West England	£30,000	£25,000	£38,000
Northern Ireland	£27,000	£22,000	£30,000
Scotland	£28,000	£23,000	£31,000
South East England	£34,000	£31,000	£36,000
South West England	£33,000	£30,000	£38,000
Wales	£31,000	£30,000	£38,000
West Midlands	£31,000	£26,000	£35,000
Yorkshire and the Humber	£29,500	£24,000	£30,000
<b>National Average</b>	<b>£31,000</b>	<b>£26,667</b>	<b>£35,250</b>
<b>% increase year on year: 2.6%</b>			

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

Region	Typical salary 2023	Min salary 2023	Max salary 2023
East Midlands	£40,000	£32,000	£40,000
East of England	£44,000	£38,000	£51,000
London	£45,000	£38,000	£50,000
North East England	£33,000	£28,000	£38,000
North West England	£38,000	£30,000	£40,000
Northern Ireland	£35,000	£32,000	£38,000
Scotland	£38,000	£30,000	£43,000
South East England	£39,000	£35,000	£40,000
South West England	£50,000	£47,000	£55,000
Wales	£47,000	£47,000	£55,000
West Midlands	£39,000	£32,000	£41,000
Yorkshire and the Humber	£28,500	£23,500	£29,000
<b>National average</b>	<b>£39,708</b>	<b>£34,375</b>	<b>£43,333</b>
<b>% increase year on year: 3.7%</b>			

**Consultants: Professional quantity surveyor**

Region	Typical salary 2023	Min salary 2023	Max salary 2023
East Midlands	£55,000	£50,000	£60,000
East of England	£59,000	£52,000	£62,000
London	£75,000	£55,000	£85,000
North East England	£45,000	£38,000	£48,000
North West England	£50,000	£40,000	£58,000
Northern Ireland	£45,000	£40,000	£50,000
Scotland	£41,000	£35,000	£50,000
South East England	£75,000	£59,000	£78,000
South West England	£60,000	£57,000	£65,000
Wales	£57,000	£57,000	£65,000
West Midlands	£53,000	£45,000	£60,000
Yorkshire and the Humber	£48,000	£38,000	£50,000
<b>National average</b>	<b>£55,250</b>	<b>£47,167</b>	<b>£60,917</b>
<b>% increase year on year: 7.5%</b>			



» FairHeat has set up an employee share ownership scheme with increased access for staff who have been with the firm for more than five years. ‘We’ve been looking at slightly more creative ways of examining why people would want to stay part of the team and not be swayed by a competitor offering a little bit more money.’

CPW has decided to allow staff to retain an offset, which the company had put in place for the National Insurance increase that had been due to come into force this April, says Eustace.

But businesses must be mindful of the impact of salary increases, says Lewis. ‘The market is very hot for talent and everybody’s got huge cost-of-living pressures, so we’re continuing to give salary increases. We need to make sure that in doing so we remain competitive and our business is growing sustainably,’ he says.

And while 76% of building services engineers told Hays they are currently satisfied with their jobs and 94% agreed there is scope for career progression, 52% said they are considering changing jobs in the next 12 months.

Just over a fifth (22%) would be tempted to change employers at the prospect of a better salary and/or benefits package.

While FairHeat has managed to retain nearly all its engineers over the past couple of years, losing staff is ‘always’ a concern because it will be difficult to find a ‘like-for-like’ replacement for an individual with three or four years’ worth of training. ‘We need to stay on top of that,’ says Naughton.

When considering a new role, building services engineers say the most important factor after salary is job security.

But when quizzed on the top benefits they seek, additional time off for wellbeing was cited by 24%, the same proportion as availability of statutory paid maternity/paternity leave and a company car or vehicle allowance.

A third (33%) of building services engineers would consider accepting a lower-paid job for a better work-life balance alone.

And 17% said they would sacrifice salary for a role with more purpose and a better work-life balance. Four out of five (80%) told Hays that an organisation’s purpose is crucial when considering a new role. Slightly more (83%) valued sustainability highly.

These findings reflect an important generational shift, says Lewis. ‘When I was a young man, the most important thing was to get your first company car and it really isn’t for many of our youngsters.’

Prospective recruits are ‘acutely aware’ »

**Consultants: Revit/BIM technician**

Region	Typical salary 2023	Min salary 2023	Max salary 2023
East Midlands	£40,000	£35,000	£45,000
East of England	£40,000	£31,000	£46,000
London	£55,000	£40,000	£65,000
North East England	£38,500	£31,000	£40,000
North West England	£44,000	£35,000	£45,000
Northern Ireland	£36,000	£32,000	£40,000
Scotland	£36,000	£25,000	£40,000
South East England	£50,000	£44,000	£56,000
South West England	£44,000	£41,000	£49,000
Wales	£42,000	£41,000	£49,000
West Midlands	£40,000	£35,000	£45,000
Yorkshire and the Humber	£39,500	£31,000	£41,000
<b>National average</b>	<b>£42,083</b>	<b>£35,083</b>	<b>£46,750</b>
<b>% increase year on year: 5.4%</b>			

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

Region	Typical salary 2023	Min salary 2023	Max salary 2023
East Midlands	£55,000	£45,000	£58,000
East of England	£53,000	£46,000	£61,000
London	£60,000	£50,000	£68,000
North East England	£48,500	£41,000	£50,000
North West England	£55,000	£45,000	£58,000
Northern Ireland	£49,000	£45,000	£55,000
Scotland	£50,000	£40,000	£55,000
South East England	£58,000	£53,000	£58,000
South West England	£55,000	£51,000	£58,000
Wales	£53,000	£51,000	£58,000
West Midlands	£53,000	£45,000	£58,000
Yorkshire and the Humber	£47,500	£40,000	£49,000
<b>National average</b>	<b>£53,083</b>	<b>£46,000</b>	<b>£57,167</b>
<b>% increase year on year: 3.8%</b>			

**Consultants: Sustainability consultant**

Region	Typical salary 2023	Min salary 2023	Max salary 2023
East Midlands	£48,000	£42,000	£55,000
East of England	£53,000	£43,000	£61,000
London	£60,000	£45,000	£75,000
North East England	£45,000	£38,000	£47,000
North West England	£50,000	£45,000	£55,000
Northern Ireland	£43,000	£40,000	£50,000
Scotland	£46,000	£35,000	£50,000
South East England	£46,500	£43,000	£48,000
South West England	£50,000	£46,000	£54,000
Wales	£48,000	£46,000	£54,000
West Midlands	£48,000	£42,000	£55,000
Yorkshire and the Humber	£48,000	£42,000	£50,000
<b>National average</b>	<b>£48,792</b>	<b>£42,250</b>	<b>£54,500</b>
<b>% increase year on year: 3.7%</b>			

**Contractors: Directors**

Region	Typical salary 2023	Min salary 2023	Max salary 2023
East Midlands	£75,000	£65,000	£85,000
East of England	£74,000	£72,000	£85,000
London	£105,000	£85,000	£130,000
North East England	£58,500	£52,000	£64,000
North West England	£75,000	£68,000	£85,000
Northern Ireland	£80,000	£75,000	£90,000
Scotland	£62,000	£52,000	£67,000
South East England	£80,000	£72,000	£82,000
South West England	£75,000	£70,000	£80,000
Wales	£73,000	£68,000	£77,000
West Midlands	£76,000	£65,000	£85,000
Yorkshire and the Humber	£63,000	£62,000	£68,000
<b>National average</b>	<b>£74,708</b>	<b>£67,167</b>	<b>£83,167</b>
<b>% increase year on year: 4.2%</b>			

**Contractors: CAD technician**

Region	Typical salary 2023	Min salary 2023	Max salary 2023
East Midlands	£33,000	£27,000	£35,000
East of England	£30,000	£27,000	£33,000
London	£48,000	£36,000	£55,000
North East England	£29,000	£23,500	£29,500
North West England	£31,000	£25,000	£35,000
Northern Ireland	£40,000	£35,000	£45,000
Scotland	£26,000	£23,000	£27,000
South East England	£43,000	£37,000	£44,000
South West England	£34,000	£33,000	£37,000
Wales	£32,000	£30,000	£36,000
West Midlands	£31,000	£26,000	£34,000
Yorkshire and the Humber	£28,500	£24,000	£29,500
<b>National average</b>	<b>£33,792</b>	<b>£28,875</b>	<b>£36,667</b>
<b>% increase year on year: 5.2%</b>			

**Contractors: Contract quantity surveyor**

Region	Typical salary 2023	Min salary 2023	Max salary 2023
East Midlands	£60,000	£50,000	£65,000
East of England	£55,000	£48,000	£62,000
London	£70,000	£60,000	£85,000
North East England	£48,500	£43,000	£53,000
North West England	£47,000	£40,000	£55,000
Northern Ireland	£52,000	£50,000	£60,000
Scotland	£47,000	£39,000	£49,000
South East England	£67,500	£62,000	£72,000
South West England	£58,000	£56,000	£64,000
Wales	£53,000	£50,000	£62,000
West Midlands	£54,000	£45,000	£62,000
Yorkshire and the Humber	£46,000	£42,000	£52,000
<b>National average</b>	<b>£54,833</b>	<b>£48,750</b>	<b>£61,750</b>
<b>% increase year on year: 5.4%</b>			

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» of issues such as corporate reputation and sustainability when considering an employer, according to Lewis. ‘They’re looking to be part of a business they feel has similar values to themselves: it has moved on an awful lot in the past five to six years,’ he says.

There is a shift in how younger workers approach work, Blake says: ‘It’s a generational thing. Millennials are very purpose-driven.’

FairHeat puts time aside every month for wellbeing sessions, including breathing coaches, says Naughton.

Every engineer in the firm is also assigned a peer, not a line or senior manager, who they’re encouraged to speak with regularly during work time.

An example of the flexible working arrangements that the company offers, he says, is that staff with families in different parts of the country are allowed to work there for as long as a week at a time.

Aecom, meanwhile, has just celebrated the fifth anniversary of its ‘freedom to grow’ approach to flexible working.

And flexible working is a key element of CPW’s ‘agile working’ approach. ‘It’s not about the number of hours you work per week, but you’ve got to be there for your clients and your team members. If you decide that you want to come in at 10am because you don’t want to go to the gym at 6am, you can do that,’ says Eustace.

But while building services engineers are ahead of the curve on work-life balance, the same is not true on hybrid working, according to the Hays survey. Only 24% of building services engineers currently

offer hybrid working, while 51% are based fully in the workplace. A hybrid approach would tempt 40% of employees to move to a different organisation, while 21% would like to be able to work remotely one day a week.

Naughton was surprised by this low penetration of hybrid working in building services. ‘I couldn’t imagine anyone currently going back to a five-day week again,’ he said.

The individual staff member’s appetite for hybrid working will depend on the different life pressures, says Lewis. ‘Some people want to be in the office so they’re among colleagues and enjoying the social and the development benefits of that. Others may have young families that are very demanding and really appreciate the ability to be able to flex their time,’ he says.

‘We want people to spend time with their colleagues and it’s important that more experienced people invest time in developing early careers people. But we’re not insisting on anybody being full-time in the office: there’s a balance.’ **CJ**

**Contractors: Estimator**

Region	Typical salary 2023	Min salary 2023	Max salary 2023
East Midlands	£50,000	£45,000	£55,000
East of England	£56,000	£52,000	£62,000
London	£62,500	£50,000	£70,000
North East England	£43,000	£36,000	£46,000
North West England	£44,000	£38,000	£45,000
Northern Ireland	£45,000	£40,000	£50,000
Scotland	£44,000	£36,000	£45,000
South East England	£67,000	£62,000	£72,000
South West England	£53,000	£50,000	£60,000
Wales	£48,000	£45,000	£60,000
West Midlands	£48,000	£40,000	£60,000
Yorkshire and the Humber	£41,000	£34,000	£44,000
<b>National average</b>	<b>£50,125</b>	<b>£44,000</b>	<b>£55,750</b>
% increase year on year: 3.5%			

**Contractors: Project engineer**

Region	Typical salary 2023	Min salary 2023	Max salary 2023
East Midlands	£42,000	£38,000	£45,000
East of England	£51,000	£46,000	£56,000
London	£60,000	£50,000	£65,000
North East England	£38,500	£33,000	£43,000
North West England	£43,000	£35,000	£45,000
Northern Ireland	£37,000	£35,000	£40,000
Scotland	£43,000	£32,000	£44,000
South East England	£54,000	£48,000	£56,000
South West England	£45,000	£43,000	£47,000
Wales	£42,000	£40,000	£44,000
West Midlands	£43,000	£33,000	£48,000
Yorkshire and the Humber	£39,500	£36,000	£46,000
<b>National average</b>	<b>£44,833</b>	<b>£39,083</b>	<b>£48,250</b>
% increase year on year: 5.9%			

**Contractors: Project manager**

Region	Typical salary 2023	Min salary 2023	Max salary 2023
East Midlands	£55,000	£50,000	£60,000
East of England	£56,000	£46,000	£62,000
London	£75,000	£65,000	£85,000
North East England	£49,000	£45,000	£55,000
North West England	£50,000	£40,000	£50,000
Northern Ireland	£44,000	£42,000	£50,000
Scotland	£48,000	£34,000	£49,000
South East England	£69,000	£62,000	£72,000
South West England	£54,000	£52,000	£57,000
Wales	£45,000	£45,000	£55,000
West Midlands	£55,000	£45,000	£60,000
Yorkshire and the Humber	£53,000	£45,000	£55,000
<b>National average</b>	<b>£54,417</b>	<b>£47,583</b>	<b>£59,167</b>
% increase year on year: 5.9%			

**Contractors: Senior contracts manager**

Region	Typical salary 2023	Min salary 2023	Max salary 2023
East Midlands	£60,000	£52,000	£65,000
East of England	£65,000	£56,000	£70,000
London	£78,000	£65,000	£90,000
North East England	£48,000	£39,000	£51,000
North West England	£58,000	£50,000	£68,000
Northern Ireland	£60,000	£55,000	£65,000
Scotland	£50,000	£42,000	£52,000
South East England	£73,000	£67,000	£74,000
South West England	£63,000	£58,000	£65,000
Wales	£60,000	£56,000	£63,000
West Midlands	£61,000	£52,000	£70,000
Yorkshire and the Humber	£45,000	£42,000	£52,000
<b>National average</b>	<b>£60,083</b>	<b>£52,833</b>	<b>£65,417</b>
% increase year on year: 5.7%			



Hays' Gaelle Blake: 'smart employers are proactive'

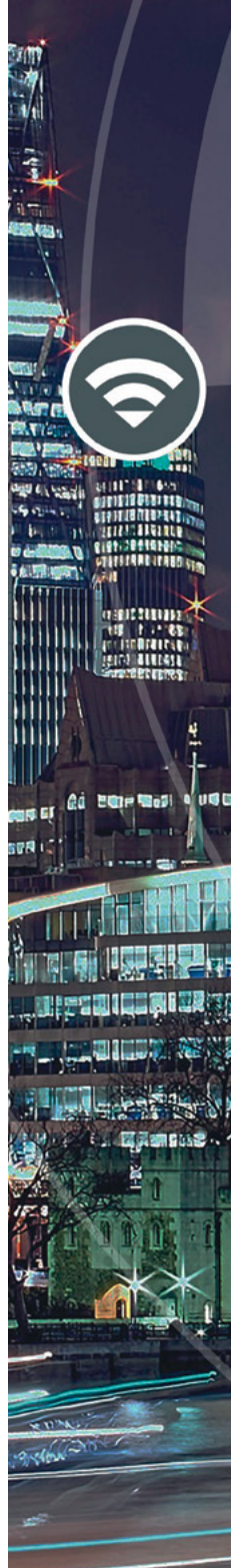


Aecom's John Lewis: 'Everyone is still very, very busy'



CPW's Wayne Eustace: 'Holding onto staff is important'





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# CIRCULAR ROUTE

To minimise embodied carbon in the retrofitting of nearly 900 luminaires at Birmingham's New Street station, Q Sustain used CIBSE TM65 to calculate the potential savings of reusing existing luminaires. The firm's **Lovely Chavan** and **Yara Bekdache** explain how it saved more than 163 tonnes of embodied carbon

**T**he construction industry has long focused on operational carbon, but has not often considered emissions related to the other life-cycle stages of building services products and equipment.

As much as half of the life-cycle carbon emissions from buildings comes from embodied sources, such as manufacturing of materials and construction processes.

In retrofits, building services accounts for 40-70% of embodied carbon emissions and 15-20% in new build. In the electrical category, LED lighting makes up the highest proportion of embodied emissions<sup>1</sup>. To make well-informed decisions, engineers and designers need to embrace whole life embodied carbon emissions and educate the client.

Whole life carbon assessment has five main components and is divided into A, B, C and D sections, as explained in Figure 2. It is the carbon emitted in the whole life-cycle of a component. Embodied carbon does not incorporate the carbon in the operations and beyond life-cycle categories.

In a recent refurbishment scheme at New Street station in Birmingham, Network Rail – along with its sustainability consultant Q Sustain – aimed to minimise the embodied carbon emissions resulting from the replacement of fluorescent lighting with LEDs on 12 platforms. This was the first time that the minimisation of embodied carbon was made a key requirement by Network Rail in an enhancement and renewal scheme.

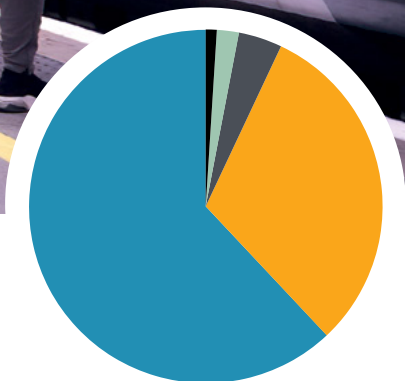
Q Sustain calculated the embodied energy savings of reusing luminaires and replacing the gear trays – the container that holds the electrical components protecting them from dust and moisture. The project team calculated that 163 tonnes of embodied CO<sub>2</sub>e would be saved.

The reduction in operational carbon as a result of using LEDs was also significant, with an estimated 67 tonnes of CO<sub>2</sub>e saved every year.

Calculations for embodied energy were based on the calculation methodology in *TM65 Embodied carbon in building services*<sup>2</sup>. It assesses the embodied carbon across the whole life-cycle of the product, which includes raw materials extraction, manufacturing, repair and disposal.

This method focuses on the embodied carbon of a product rather than a system or a building. This is based on information provided within an Environmental Product Declaration (EPD); however, such documents and information are not always available from suppliers.

At New Street, data supplied by Designplan Lighting, the manufacturers of the upgradeable flair luminaire, enabled the project team to calculate the savings in embodied carbon (kgCO<sub>2</sub>e). It provided information relating to the product's weight per material type and service life, as well as a breakdown of all the components, with their production location and energy use.



■ Lighting 62% ■ Panel 1% ■ Sockets, isolators, junction, floorbox 2% ■ Sensors, detectors, camera 4% ■ Power 31%

Figure 1: Study carried out showing embodied carbon breakdown for electrical services in an office refurbishment in San Francisco, California

### All change at New Street

A major redevelopment of Birmingham's New Street station took place between 2009 and 2015. The platform works were an early part of the redevelopment, when LED lighting was in its infancy and not installed. Therefore, this project has redesigned the platform lighting from T5 and T8 Fluorescent (at the time) to LED without having to replace the whole fitting (see Figure 3).

The original luminaire was designed and installed to a high quality to allow future upgradability, so it can sustain a long life and save on long-term costs and embodied carbon, avoiding replacement of complete new luminaires.

We identified that we would be able to save considerable embodied carbon, as well as operational carbon, by replacing the gear trays instead of all 891 complete luminaires across 12 sub-surface platforms, while



### Whole life carbon

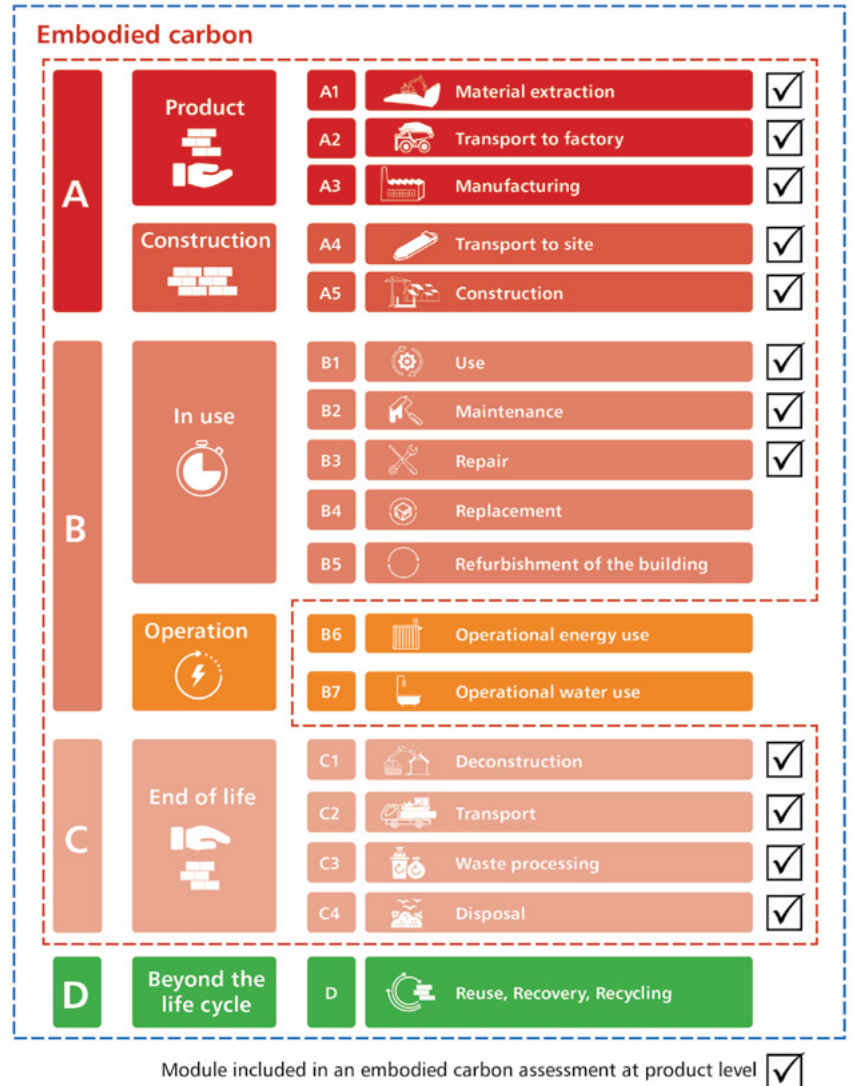


Figure 2: Stages and sections of whole life carbon (BS EN 15978:20115)<sup>3</sup>

### TM65 CALCULATION METHODOLOGY

The TM65 document for each luminaire provides the proportionate material distribution in percentage (at least 95% is needed to be known). This is used in calculating the weight of each material in the product. See Figure 4 for components of a luminaire.

Using the following embodied carbon coefficients, the embodied carbon (EC) of each material is found in kgCO<sub>2</sub>e by simple multiplication of material weights and their carbon coefficients. The sum of the above EC values gives the value of A1\* (EC for the material of the product).

The CIBSE TM65 guide says if there is no specific information from the manufacturer on repair or replacement of components within the product lifetime, a standard assumption of a 10% increase in weight should be used. So, this is (0.1x A1\*). The total A1, therefore, is, (A1 = A1\* + 0.1A1\*). Luminaires come under the category 2 of 'Medium' complexity and hence have the scale-up factor of 1.4. This scale-up factor is to account for A2 (transport to factory), A3 (manufacturing), A4 (transport to site), C2 (transport to waste processing), C3 (waste processing) and C4 (disposal). So, the total A1 is now multiplied by 1.4.

Any EC related to refrigerant is added at this step. However, there is no refrigerant involved with the luminaire. Buffer Factor is used to account for the simplicity of this method of calculation. This is 1.3 and is multiplied to the above calculated total (A1x1.4). As a result, we get our value of total embodied carbon associated with the product.

● TM65 is available at [www.cibse.org/knowledge](http://www.cibse.org/knowledge)



Figure 3: Before and after images of retrofitted platform light at New Street station

» retaining the original equipment manufacturer-supported luminaire United Kingdom Conformity Assessment (UKCA) status. The approach would also be much cheaper.

Following detailed discussions with Q Sustain, Designplan Lighting developed a retrofit option that replicated, but improved upon, the original lighting scheme. This included a special diffuser, which controlled glare, improved visual comfort, and minimised potential carbon emissions and time spent on a longer installation of a complete luminaire replacement.

To measure the embodied carbon saved, Q Sustain calculated the embodied carbon associated with a new fitting similar to the originals.

A retrofit of the following three luminaire types was undertaken at Birmingham's New Street station platforms (see panel, 'Luminaires at New Street').

For the methodology of calculating 'basic' embodied carbon, as stated within CIBSE TM65, see the panel 'Calculation methodology'.

Using the methodology, the total embodied carbon (kgCO<sub>2</sub>e) for the three luminaire types is: Fitting 1 – 18,342; Fitting 2 – 25,866; Fitting 3 – 118,584.

So, the total embodied carbon associated with the light fittings is 18,342 + 25,866 + 118,584 = 162,792 kgCO<sub>2</sub>e = 163 tonnes of CO<sub>2</sub>e.

Each time we retrofit a luminaire body with the gear tray, therefore, we are saving 163 tonnes CO<sub>2</sub>e of embodied carbon that would have been emitted if we had used a new luminaire (minus the gear tray). This works out at 39% of whole life carbon emissions – a significant saving.

Along with the carbon savings, the decision to retrofit gear trays of the luminaires has other benefits, including operational and energy savings. These are significant when you consider that 61% of the carbon emissions of a luminaire are operational (Figure 5).

### Operational and energy savings

The older light fittings had an average energy point of 70W/fitting, whereas, with the new LED retrofit, the power wattage at each point is reduced to 30W. So, a power saving of 40W is achieved on each light fitting. As the luminaires are operational for 24 hours per day throughout the year, operational energy now consumed is

## LUMINAIRES AT NEW STREET

1. Fitting 1 - 2x28W T5 narrow body  
- 91 no.
2. Fitting 2 - 2x36W T8 narrow body  
- 130 no.
3. Fitting 3 - 2x36W T8 wide body  
- 670 no.

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Peterborough	0173 331 1711
Rainham	0170 868 9900
Sheffield	0114 553 6500
Southampton	0238 062 3070

**Existing luminaires**

800 x 2x36W T8 Fluorescent @ 72W per point = 57.6kW
91 x 2x28W T5 Fluorescent @ 56W per point = 5.096kW
Average energy per point = 70W
Total energy / year = 549MWh/year for 891 luminaires
Total carbon / year = 117 tonnes CO <sub>2</sub> e per year per luminaire

**LED retrofit gear trays**

800 x LED RFGT @ 30.8W per point = 24.64kW
91 x LED RFGT @ 24W per point = 2.184kW
Average energy per point = 30W
Total energy / year = 235MWh/year for 891 luminaires
Total carbon / year = 50 tonnes CO <sub>2</sub> e per year per luminaire

**Table 1: Energy per point at the existing and retrofitted luminaires**

(30x24x365 = 264kWh per luminaire). Using the Carbon factor for electricity in the UK (revised in January 2022), we can calculate the carbon associated with the energy use, which gives the carbon emissions to be 56kgCO<sub>2</sub>e every year per luminaire.

So, the total operational carbon emission for 891 luminaires is 50 tonnes CO<sub>2</sub>e every year compared with 117 tonnes with the existing luminaires. The total operational carbon saved by the LED retrofit luminaires, therefore, is 67 tonnes CO<sub>2</sub>e every year (see Table 1).

This means that, typically, the return on investment will be two to four years when upgrading. This can be reduced further when using a retrofit gear tray, as less of the original installation needs to be replaced.

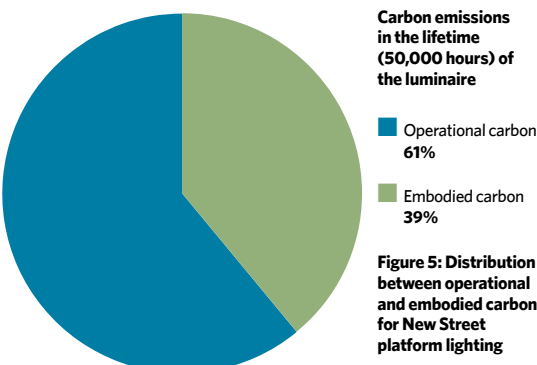
**Other benefits**

The adoption of LED lighting from fluorescent lamps benefits from the high light output per watt of electrical power consumption, known as the ‘luminous efficacy’. For example, the fluorescent luminaire, SPEC – 264551 at the platforms, improved on its efficacy from 44 lumens per watt to 112.28 lumens per watt with this retrofit.

So, the luminaires had a 150% increased light output for every unit of energy: greater output at higher efficiency.

Designplan made sure that the retrofit gear tray was fully tested and met all the requirements of UKCA, to ensure the full luminaire is fit for purpose.

The retrofit means that maintenance costs will be lower in future, as the LED gear trays have up to five times the operational life of fluorescent, reducing maintenance



1 Body 2 Gear tray 3 Weather-resistance casting 4 Diffuser 5 External frame fixture

**Figure 4: Components of a luminaire**

times. The disruption was also minimal, as the new LED gear tray could be fitted via a simple screw-type fused connection.

Replaceable gear trays offer one more valuable benefit – they provide access to new technologies as they are developed, meaning lighting will have a 30-year-plus design life<sup>4</sup>. **CJ**

■ **LOVELY CHAVAN** is a graduate consultant and **YARA BEKDACHE** is a sustainability specialist, both at Q Sustain. The paper was checked and approved by Azhar Quaiyoom, director and CEO at Q Sustain

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**ASSUMPTIONS**

This paper has made the following assumptions and has the following limitations:

- It is assumed that a new fitting would be of the same type as the old fitting
- The gear tray has not been included in the embodied carbon calculations
- A standard assumption of a 10% increase in weight was used for the luminaire replacement over the product life-cycle, in accordance with CIBSE TM65, where data is not available
- The granular components that form part of the luminaire have not been considered, but the fitting as a whole is used in the calculations provided by the manufacturer
- The basic method of calculation has been used with the buffer factors of 1.3, in accordance with CIBSE TM65
- Supply chain information is inconsistent and, therefore, product passports (EPDs) should be compared with checks and balances in TM65
- Retrofitting gear trays and perishable elements within a luminaire are reliant on the luminaire design being suitable
- Any luminaire that is specified with the intention of a future gear-tray retrofit should be robust enough in body to last 30 years+ in order to be sustainable and maintain its quality and integrity.

# Are you paying for your neighbour's energy waste?

## The rise of motivational tariffs in heat networks



The key to making UK heat networks cheaper and more efficient is creating smarter incentives, writes **Dan Cookson**, senior applications engineer – heat networks, at SAV Systems

In times of skyrocketing fossil fuel costs, energy shortages and looming climate targets, it's no surprise that UK households are crying out for cheaper (and, ideally, greener) forms of space and water heating.

This demand is accelerating a national shift from individual gas boilers to district heating networks using sources such as heat pumps, combined heat and power (CHP), waste heat, and renewable energies. Today, heat networks serve around half a million UK customers, forming the foundations of a more affordable and democratic energy landscape.

Despite these benefits, the communal

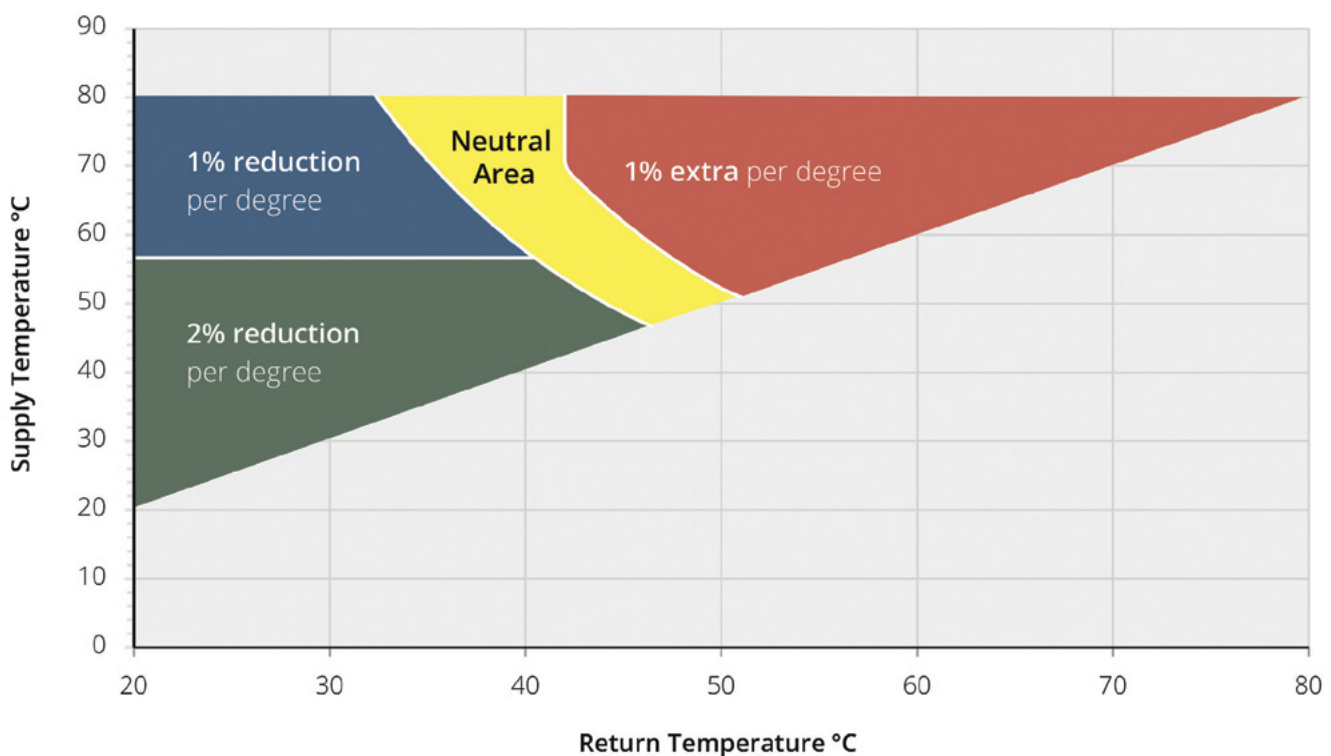
nature of heat networks can be something of a double-edged sword. When they are performing well, all users benefit from lower costs and a smaller carbon footprint. But when there are weak links in the chain – such as homes with unbalanced heating circuits, poor insulation or badly commissioned systems – everyone pays the price. To complicate things further, engaging with individual customers and accessing their properties to perform upgrades can be difficult, if not impossible.

One of the key performance indicators of a heat network is the temperature of the water returning to the energy centre – and every

degree counts. Higher return temperatures increase heat losses, reduce plant efficiency, shorten pipe lifespans, and raise overall running costs. Conversely, lower return temperatures improve the economy and longevity of the entire system, allowing operators to invest in upgrades and pass savings on to customers.

However, while operators dictate their supply temperatures and can reduce them during lower demand, the return temperatures are determined by the individual users. In an ideal scenario, dwellings receive hot water at around 60-70°C, extract as much heat as possible, and return it at a modest 30-40°C. The difference

Motivational Tariff Example



between the supply and return temperature, Delta T, is a critical number that operators continuously seek to increase by driving return temperatures down.

In response to this challenge, some heat networks have introduced motivational tariffs – a relatively new concept in the UK, but one with tremendous upsides. These tariffs minimise costs and emissions via a two-pronged approach: penalising customers for higher return temperatures while offering discounts for lower return temperatures. Operators may also include separate charges for water volumes drawn from the network and peak demand charges based on maximum flowrate. The result of these combined elements is a more transparent and equitable network for all users.

Under a motivational tariff model, a network operator may set an average annual return temperature of 35°C. Then, a customer averaging 30°C would receive a discount (based on total megawatt-hours consumed), while another, averaging 40°C, would receive a penalty charge – and a clear incentive to improve their efficiency. Through digital metering, customers and operators can access real-time

temperature data and cooperate to make upgrades that benefit the entire network.

In addition to enhancing performance, motivational tariffs are cost-effective for operators, who can use penalty income to fund discounts for more efficient customers. In the spirit of fairness, the operator may also choose to cap pricing variations, so that bills cannot rise or fall by more than a set percentage.

Motivational tariffs may be new to the UK, but they have already proven highly successful abroad. For example, in Denmark – often the poster child for social innovation – motivational

**“Motivational tariffs don't just reduce heat network costs and emissions; they fundamentally change the way users think about their energy”**

tariffs have been used for more than 20 years, during which time average return temperatures have dropped by an incredible 10°C. In one case, an operator paid out £270,000 in annual tariff payments, but realised more than £679,000 worth of efficiency gains, illustrating the incredible value of uniting customers in a common goal.

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## Key cooling presentations set for Technical Symposium

Papers have been submitted for the event taking place next month

The annual CIBSE ASHRAE Technical Symposium takes place at the University of Strathclyde on 20-21 April, and the theme this year is 'Delivering sustainable, safe and healthy buildings for a net zero future'.

The decarbonisation of cooling in an increasingly warming world will play a key role in achieving net zero targets, and a number of papers that have been submitted look at the potential of low carbon cooling.

### Rooftop cooling

A paper on using rooftops for low carbon cooling has been submitted by Dr Renaldi Renaldi, lecturer in thermal engineering at Cranfield University. This looks at the roof's potential for measures that reduce demand, as well as low carbon supply technologies.

Dr Renaldi's paper considers the application of green roofs and cool roofs, and looks at options including solar cooling, radiative cooling, and PV-based air conditioners.

He assesses various rooftop-based cooling measures and technologies using simulation models to determine their energy-saving performance in different climates. Cooling measures studies include vapour-compression chillers (baseline), solar absorption chillers, PV-driven chillers, radiative cooling panels, green roofs, and cool roofs.

### DX vs VRF on whole life carbon

A paper comparing the embodied and operational carbon of DX and VRF systems has been submitted by Anzala Asher.

She points out that VRF technology has gained traction in recent years for its energy efficiency and performance. However, building owners are conflicted about whether to opt for DX systems over VRF because of the low upfront cost.

The study encompasses the whole life-cycle, from manufacturing, installation and operation to end-of-life stages

### Minewater and smart cooling

Eshagh Goudarzi, of London South Bank University, has submitted a paper on the integration of minewater into smart cooling and heating network systems.



The University of Strathclyde will host the 2023 CIBSE Technical Symposium

The paper builds on a feasibility study in Barnsley, Yorkshire, which explored the design of a heat network that uses waste heat from a glass factory and integrates heat, power and mobility.

Goudarzi's work focuses on analysing the subsurface factors, including flowrate, yield, mine void volume, and interconnectivity, which affect the flow – and, consequently, the thermal behaviour of – the available minewater.

A 3D model using Petrel has been created, combining available data from boreholes and Coal Authority maps to characterise subsurface conditions. From this, a numerical model has been generated to explore various scenarios and test the impacts of different engineering configurations.

### Fresh air in air conditioning

The purpose of the paper submitted by Bara Sabri is to highlight and address the effects of introducing fresh air with air conditioning units, and to evaluate its impact on the cooling/heating performance, indoor air quality and condensation.

He says that a misconception in the HVAC market is that the heat load with the introduction of outside air can be covered by the equipment. The paper will explore the effects beyond the theoretical mixed air calculations on the psychrometric chart and extends to include the practical effects, including coil type and modulating valve, indoor fan operation, and filtration concerns.

● For more information and to book [www.cibse.org/technicalsymposium](http://www.cibse.org/technicalsymposium)

## Airedale launches low-GWP heat pumps and chillers

A new range of lower-GWP chillers and heat pumps has been launched by critical cooling specialists Airedale by Modine.

It is introducing several new ranges of scroll and inverter screw compressor platforms, operational with low-GWP refrigerants R32, R1234ze and R513a.

Two new ranges have been announced: the SpiraChill and iChill. This first launch incorporates heat pump and cooling-only options, delivering anywhere from 200kW to more than 1,400kW of cooling and/or heating, with full heat-recovery options available.

With a cooling and heating capacity extending to more than 1,200kW, SpiraChill offers partial and full heat recovery on all models. Using the latest in scroll compressor technology means SpiraChill is optimised for lower-GWP refrigerant R32.

iChill is Airedale's first inverter-driven screw chiller, with capacities from 200-1,400kW, and with high full-load and seasonal efficiency, capable of efficient and precise load matching. iChill is optimised for low-GWP refrigerant R1234ze (GWP 7) and lower-GWP refrigerant R513a (GWP 613).

## Vent-Axia expands air purifier range

A new air purification range from Vent-Axia kills 99.99% of viruses, bacteria and fungi within seconds of contact.

The launch of the PureAir Room 500 X, aimed at commercial premises, is designed to create a healthier, safer indoor environment. More than 90% of our time is spent indoors, breathing in air that can contain more than 900 chemicals, particulates, viruses and bacteria, which all adversely affect our health.

Commercial and education settings are increasingly looking to air purification to help ensure good indoor air quality (IAQ).

Vent-Axia has partnered with CodiCoat, which has developed the fastest ISO-certified antimicrobial and antiviral coating technology in the world, to create the PureAir Room 500 X. The technology features an advanced, seven-stage air-cleaning system, with a groundbreaking medical-grade HEPA Plus filter.

The H13 HEPA filter, which contains an advanced coating and unique nano treatment, is certified to ISO 18184:2019 (determination of antiviral activity of textile products) by independent laboratories.

# EFFICIENT LIFTING

Reducing the 'lift' in a refrigeration cycle can cut a chiller's operational energy use significantly, according to Trent Hunt, in a presentation at last month's ASHRAE Conference in Atlanta. **Tim Dwyer** summarises the paper

The recent ASHRAE Conference in Atlanta, Georgia, maintained a firm focus on decarbonisation. There were several strategic-level presentations on moving towards a decarbonised future, as well as a diverse selection of seminars offering technical detail that, ultimately, will provide the practical path to net zero.

More than a fifth of the 68 seminars addressed decarbonisation explicitly, including the well-attended CIBSE ASHRAE-supported 'Accelerating change in building design and operation towards a decarbonised and net zero energy future', for which CIBSE vice-president Adrian Catchpole provided the introductory presentation on 'Integrating modern methods for sustainable built environments'.

A great example of how better basic understanding of important, but relatively simple, technical detail can significantly influence the real environmental impact of buildings was delivered by Trent Hunt, of Mechanical Products NSW, Utah.

A key part of his presentation, in seminar 63, illustrated practical considerations to reduce operational energy consumption for chillers. He focused on some key factors that can impact 'lift' in a refrigeration cycle significantly – as illustrated in Figure 1, where the condenser and/or evaporator could be shell and tube or direct air heat transfer.

Hunt explained that lift is the difference between liquid condensing pressure and

"Hunt was keen to highlight a common misunderstanding – that focusing on the condensing temperature alone will ensure efficient operation"

saturation suction pressure, typically converted to temperature – for example, 29.5°C (85°F) liquid condensing temperature (where the heat is rejected) and 4.5°C (40°F) saturated suction temperature (where the cooling is delivered).

By decreasing lift, the work of the compressor is reduced, so decreasing power consumption and emissions – 'it's that simple!' He gave some real-world examples where performance could be impacted significantly. Dirty coils on an air-cooled or scale-coated tubes in a water-cooled condenser, will increase the condensing pressure, so increasing lift.

Conversely, by decreasing the condensing pressure – for example, by lowering water temperature in a cooling tower – lift will be reduced. Other examples given to reduce condensing pressure included: increasing the condenser area; employing 'adiabatic'

dry coolers (where water is evaporated into the inlet air stream); and, for water-cooled condensers, increasing cooling water flowrate and designing more refrigerant passes through the condenser.

However, Hunt was keen to highlight a common misunderstanding – that focusing on the condensing temperature alone will ensure efficient operation. He cited an instance when an incorrect amount of glycol was added to the chilled water circuit; the specification was 30% glycol, but 'the contractor put in the entire 50-gallon drum of glycol and now, all of a sudden, you have 42% glycol'.

To compensate for the reduction in heat transfer to the now less-conductive chilled water, the saturated, suction temperature (and pressure) needs to be lower (the blue line in Figure 1), so increasing the lift and energy use. Hunt said that a way to reduce lift when cooling requirements are lower (for example, in winter) is to use 'cold water reset', allowing the setpoint on the chilled water to rise.

He noted that other options to raise suction pressure can be explored, including: increased evaporator area; more passes across the (liquid) evaporator; more evaporator tubes; and reduced chilled water flow when less cooling is needed. However, he cautioned that care is needed with reducing flow, particularly if there is glycol in the chilled water, as the glycol will increase the water viscosity and the chilled water will move more swiftly to laminar flow, which can lead to local freezing.

Hunt encouraged the audience to carefully consider the impact – and, potentially, unintended consequences – of the various design and operational decisions on the compressor's lift.

The drive to discuss and interpret the means and method of reducing the impact of buildings and decarbonising HVAC&R was evident across the whole conference. **CJ**

Future articles in *CIBSE Journal* will explore some more of the papers and presentations from the ASHRAE conference. In the meantime, most of them are available (with a paid registration) in the virtual ASHRAE 2023 winter conference at [bit.ly/CJMar23TD](https://bit.ly/CJMar23TD)

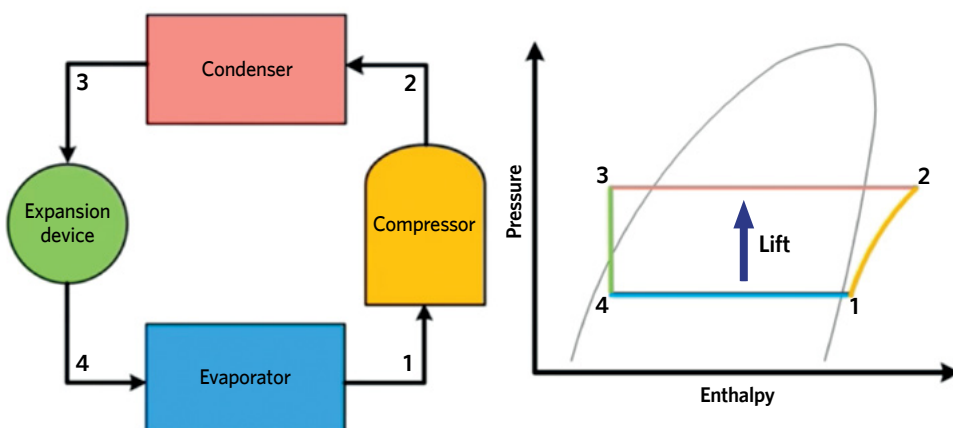


Figure 1: Simplified schematic and pressure-enthalpy diagram of a basic refrigeration cycle illustrating 'lift'



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Google's landmark 'Platform G' office development will be arriving in King's Cross, London in 2024. **Andy Pearson** talks to building services consultant Atelier Ten to find out how a BIM model was used to coordinate the highly innovative buildings services design along its 330-metre length



# ARRIVING ON PLATFORM G

**G**oogle's new London HQ – the multinational technology company's first purpose-built office in Europe – takes a new approach to the traditional office. Designed by Heatherwick Studio and Bjarke Ingels Group, and currently being delivered by BDP, the team has taken a subtle and considered approach, with a low-rise scheme that sits proudly within the urban context of London's King's Cross.

Currently being built, the huge 60,000m<sup>2</sup> wedge-shaped 'landscaper' known as 'Platform G' stretches 330m along the length of the pedestrianised boulevard connecting King's Cross station with Granary Square, to the north. Among its standout features are extensive landscaped roof terraces, a running track, and a swimming pool.

Building information modelling (BIM) was a client requirement and essential to coordinate the services within the floor voids. It also enabled early involvement of specialist contractors, which gave the project team more scope for prefabrication and meant

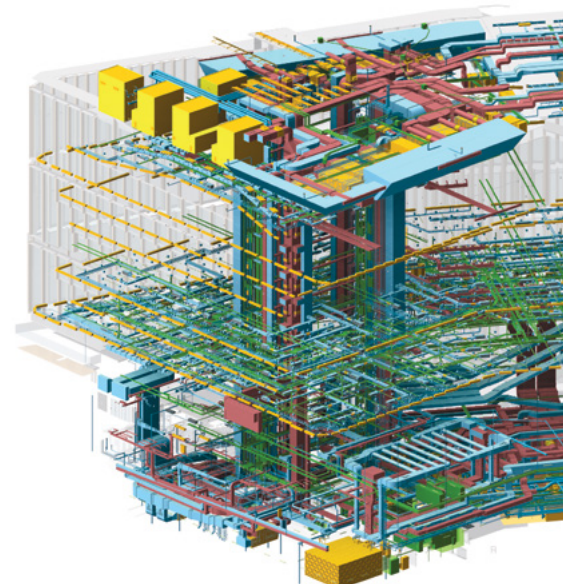
access for plant-maintenance needs could be baked into the model at an early stage.

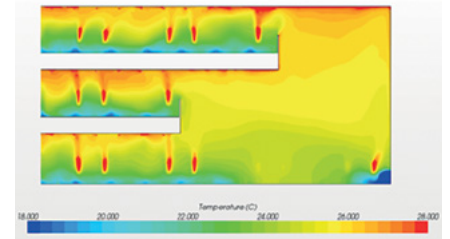
The workers are housed across eight office floors at its 60m-wide northern end, tapering down to five floors at its narrower, southern elevation, where it faces the station.

To further minimise the building's presence on the streetscape, the design lifts the mass of office floors two-storeys above the street, to enable the west façade

## PROJECT TEAM

**Client:** Google  
**Concept architects:** Heatherwick Studio and Bjarke Ingles  
**Design delivery architect:** BDP  
**Building services design, energy analysis and environmental design:** Atelier Ten  
**Main contractor:** Lendlease  
**Structural engineer:** AKT II  
**Cost management:** Gardiner & Theobald



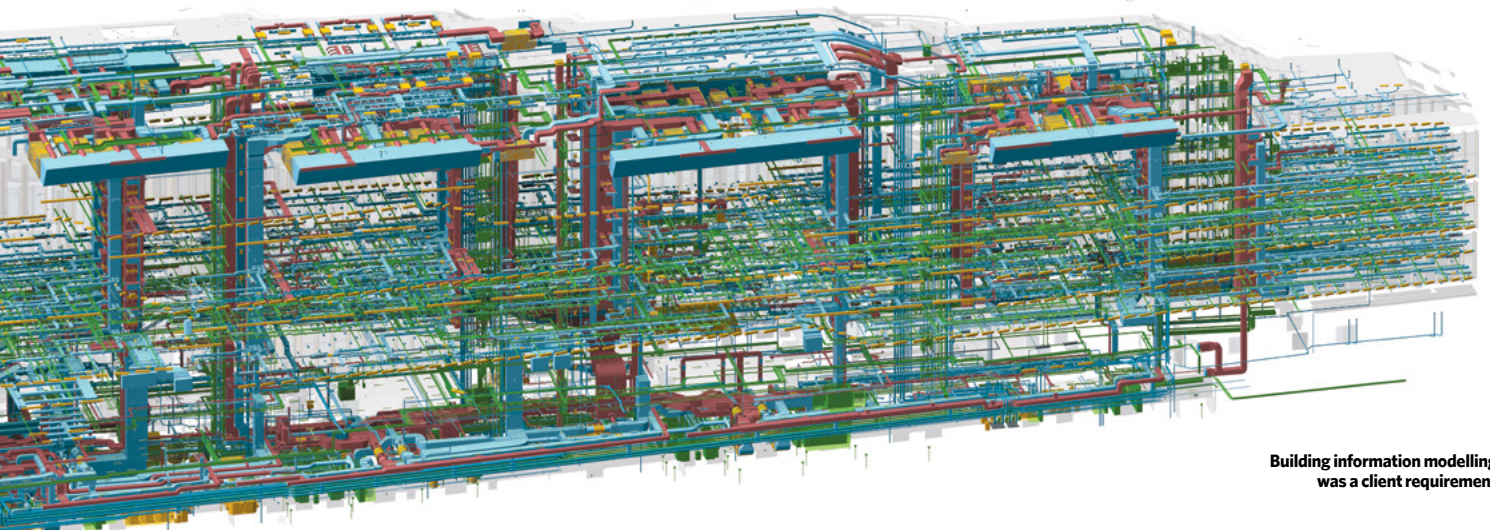


Office space designs were refined using CFD models along with multi-zone thermal dynamic simulations showing analysis of internal air distribution and stratification

**“The wedge-shaped ‘landscaper’ stretches the entire length of the pedestrianised boulevard connecting King’s Cross station with Granary Square”**

to accommodate retail buildings beneath. The approach is continued inside the building, where workspace flexibility and a loose-fit servicing strategy will enable the technology business to adapt and evolve the office spaces over time. The structure is unusual in that every third floorplate stretches the full width of the building. These are constructed using

reinforced concrete and are stepped along the length of the building, with the varying levels connected by a feature staircase. Between these wide concrete structures, additional floors of cross-laminated timber (CLT) have been inserted. These interstitial floors are set back from the glazed façades to create double- and triple-height workspaces, increasing flexibility while opening up the volume to allow daylight deep into the floor plates. Atelier Ten, the project’s base-build MEP engineers, worked with the concept architects and delivery architect, BDP, to develop the façade design to complement the triple-height concept. Daylight analysis and extensive parametric modelling were used to establish thermal gains and losses. Sunlight and glare were also modelled; these are mitigated using a top-down/bottom-up blind system controlled by the occupants. The offices also feature an energy efficient LED lighting scheme incorporating daylight dimming to prioritise natural daylight over artificial illumination. The façade incorporates a saw-tooth detail, where giant timber mullions shade the angled, glazed elements. Glazing is high-performance, low solar-transmission and high visible light-transmittance, to further reduce the need for artificial lighting >>



Building information modelling was a client requirement

» while minimising heating and cooling loads. 'We analysed several different iterations of the saw-tooth design to develop the orientation of the fins on the east- and west-facing façades, to ensure there is no direct solar gain on the office floors, while allowing daylight in,' says Gita Maruthayanar, associate director at Atelier Ten.

To deal with façade-generated heating and cooling loads at source, the floor plates incorporate perimeter four-pipe trench units to provide additional heating or cooling.

Atelier Ten refined the design of the internal office spaces using a mix of computational fluid dynamics (CFD) models to analyse internal air distribution and stratification, along with multi-zone thermal dynamic simulation to ensure occupant comfort. The engineer also undertook CIBSE TM54 modelling to assess the building's operational energy performance.



Interstitial floors are set back from the glazed façades to create double- and triple-height workspaces

**ELECTRIFYING EXPERIENCE**

The building's incoming, high-voltage 11kV power supply comes from a dual ring-circuit to provide 8.5MVA capacity in a resilient N+1 arrangement. Two standby 1MVA generator sets, located in the basement, provide a secondary supply to support life-safety and firefighting systems. Extensive sub-metering is provided to monitor energy use on a zone-by-zone basis.

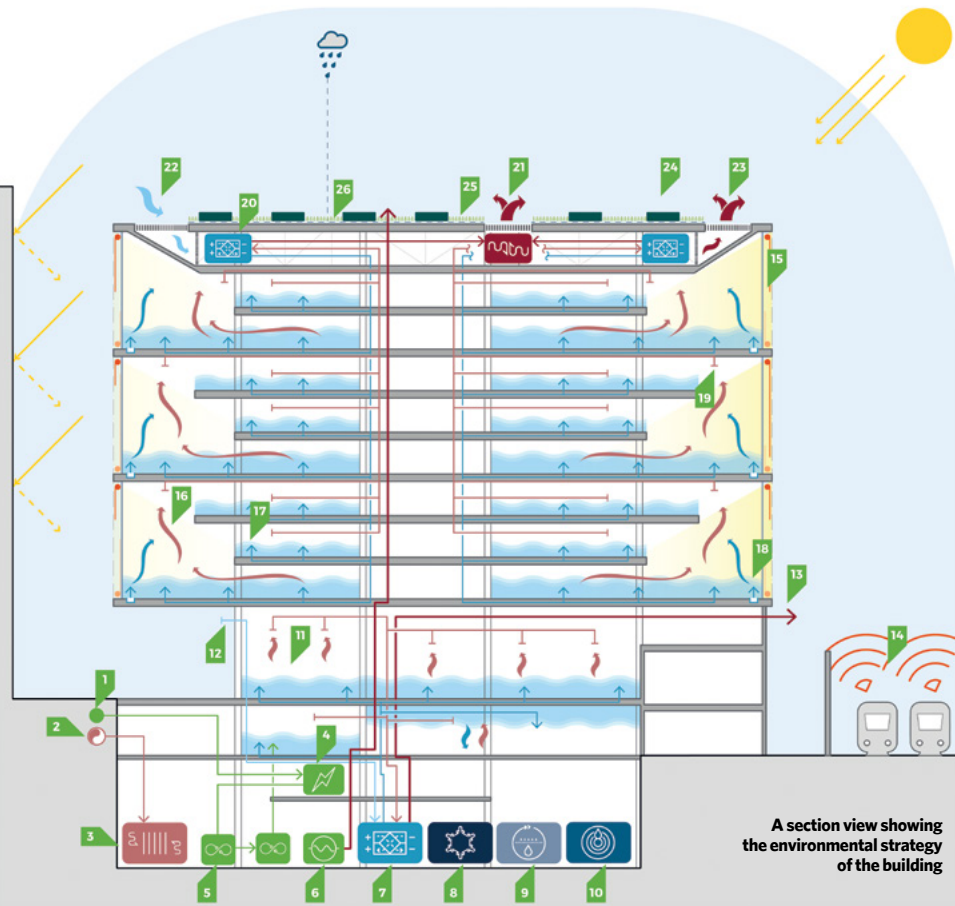
In addition, the building is fitted with a roof-level photovoltaic array with the potential to generate up to 19,800kWh of electrical power annually.

**Air displacement ventilation**

To keep workspaces comfortable, while ensuring future workspace change can be accommodated, Atelier Ten developed a full fresh-air displacement ventilation system concealed in the floor void. 'This solution provides additional benefits, including improved air quality and increased comfort levels within the occupied space, while also

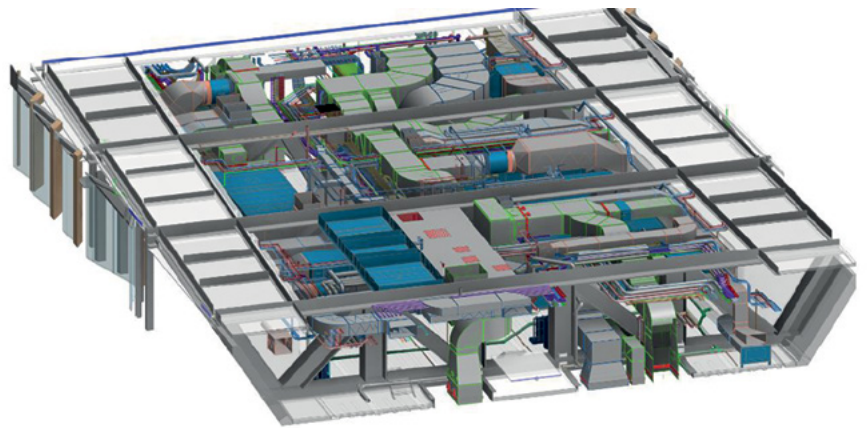
reducing energy use because of free cooling opportunities,' says Maruthayanar.

Airflow rates are modulated locally using variable air volume (VAV) boxes in response to carbon dioxide levels in the offices. Lengths of flexible ductwork connect each VAV to floor diffusers. 'The use of floor-based air supplies provides a denser distribution of outlets, which can go a long way to improving

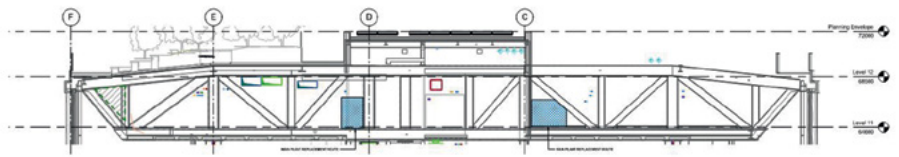


A section view showing the environmental strategy of the building

- 1 Incoming electrical and comms connections
- 2 District heating mains
- 3 District heating plate heat exchanger and pumps for building LTHW distribution
- 4 HV switchgear and comms intake at accessible level for utility providers
- 5 Switchgear for electrical systems distribution to building
- 6 Generator for life safety and comms room resilience
- 7 Heat recovery AHUs for basement and ground plane accommodation
- 8 Water-cooled chillers
- 9 Greywater tanks and treatment
- 10 Potable and Cat 5 watertanks and booster set
- 11 Lobbies, auditoria and town hall with displacement ventilation (auditoria and town hall on separate systems)
- 12 Air intake for basement AHUs at underside of level O3
- 13 Basement AHU discharge towards train tracks
- 14 Trains - source of noise and air particulates
- 15 Top down black-out blind and bottom up transparent blind for solar/glare control
- 16 Triple height spaces with displacement ventilation
- 17 Upper floors: underfloor air as displacement (open plan) or fresh air only with local terminal units for conditioning (cellularised eg meeting rooms)
- 18 Active heating and cooling trenches to perimeter spaces
- 19 High level extract from triple height spaces via ducts in upper floors
- 20 AHUs with filtration and heat recovery for office accommodation
- 21 Heat rejection at northeast of site
- 22 Air intake plenum to structure and plant zone of building
- 23 Air exhaust plenum to structure and plant zone of building
- 24 Photovoltaic panels on landscape roof
- 25 Green roof with biodiversity measures
- 26 Blue roof with rainwater attenuation - captured rainwater for irrigation



Above: A BIM model showing MEP services between trusses  
Below: A section view of the structural trusses



flexibility and simplifying workspace reconfiguration,' Maruthayanar says.

Indoor air quality was an essential element of Google's brief. It specified a fresh-air supply rate of  $16\text{L}\cdot\text{s}^{-1}$  per person, an impressively high volume given the brief was established pre-Covid. According to Maruthayanar, the air-supply rate is equivalent to providing  $4.6\text{L}\cdot\text{s}^{-1}$  of outside air per  $\text{m}^2$  of floor area, which, she adds, is well above the British Council for Offices standard. 'The brief challenges industry norms in terms of provision of fresh air in contributing to the health and wellness of staff, which should lead to better productivity,' she says.

In an attempt to minimise duct sizes within the floor void, Atelier Ten initially proposed combining the fresh-air ventilation system with either ceiling-mounted passive chilled beams or cooling pipework embedded within the soffits. However, the decision was made not to have water-based systems on office floors. 'That meant we had to push up the ventilation rate to deliver sufficient cooling through the underfloor ventilation system, which is why we have bigger ducts and a larger floor void,' Maruthayanar says.

To minimise the length of ductwork concealed beneath the floors, the engineer investigated pressurising the floor voids. However, Maruthayanar says, there were concerns about potentially high levels of air leakage on the interstitial CLT floors, which could have compromised the volume of conditioned air delivered to workspaces on these floors. 'If you pressurise the plenums, you would have had air leakage on the CLT floors because their design means they

## "A plantroom has been formed in the void created by the giant steel roof trusses that span east-west above the office floors"

are not fully sealed,' she explains.

55 air handling units (AHUs), located in what Maruthayanar calls the 'roof-truss plantroom', provide conditioned air to the office floors. This plantroom has been formed in the void created by the giant steel roof trusses that span east-west above the office floors. The trusses carry the weight of the landscaped roof garden above and the weight of the floor plates below on the western elevation, which are suspended from them.

'To incorporate the rooftop garden, it was necessary to concentrate the majority of engineering services equipment within basement plantrooms or in air handling rooms directly below the garden,' says Maruthayanar.

The AHUs are sized to slot between the trusses. They incorporate cooling and heating coils to temper the supply air and a

heat recovery unit to reclaim energy from the exhaust air.

### Chiller approach

Cooling is provided by high-efficiency Turbocor water-cooled chillers. These are located beneath the building in a two-level basement plantroom; this space also accommodates the ventilation plant for the basement and ground-floor operations. The chillers are served by cooling towers discreetly located at the perimeter or the wider, northern end of the roof.

Maruthayanar says that Atelier Ten did look at alternative cooling technologies, including air source heat pumps, but 'based on the loads, we calculated that the Turbocor chillers were the most cost- and energy-efficient option, particularly as their efficiency at part load is quite high.'

### MATERIAL EVIDENCE

While the architectural design pushes boundaries with the building's form, it is also striving to push boundaries with its approach to sustainability and occupant wellbeing. Construction materials for the project were chosen based on Google's healthy materials programme. This evaluates building products and materials based on established industry standards that value transparency and occupant health.

'We looked at moving away from steel ducts to using cardboard ducts, but - because of the challenge of dealing with the extensive amount of ductwork - we decided not to push forward with this option,' Maruthayanar says. 'We did look at other materials for ducts and pipework, but the building is quite large, so to move away from conventional materials would have been quite difficult.'

» The chilled water system is described by Maruthayanar as variable speed. 'From the chillers, we have a pump set circulating chilled water around the AHU circuit; a pump set that supplies the perimeter trench units on the office floors; and a pump set serving the ground-level spaces.' Dividing the system into three allows the pumps to turn off if there is no load on a particular circuit.

Heat for the AHU coils (and domestic hot water) is supplied from the combined heat and power (CHP) and boiler plant forming the King's Cross district energy centre. 'Although King's Cross Energy Centre generates heating and cooling, it could only supply heat to this building, which is why we have the chillers,' Maruthayanar says.

The AHUs are fitted with carbon filters and F9 filters to maximise indoor air quality. 'This is an enhancement on what is the norm for London office buildings,' Maruthayanar says. The filtered, tempered fresh air is ducted to the floor plates via risers formed in the building's five concrete cores.

### The benefits of BIM

BIM was a project requirement. Modelling was key to coordinating the mass of services within the floor voids, a task made more challenging because the voids incorporate a structural grid of castellated up-stand beams, on the concrete and CLT floors, through which many of the services had to pass.

'The best way we could see to coordinate everything was to use the BIM model to position the openings in every up-stand beam, to ensure the services could pass through the castellations,' Maruthayanar says. There are more than 10,000 such openings. 'It was quite an intense information process,' she recalls.

BIM also enabled early specialist contractor involvement, which was helpful



## “Early involvement of specialist contractors ensured access for plant maintenance was incorporated into the model at an early stage”

in finalising the MEP base-build design. 'The trade contractors took our RIBA 4A level design and evolved it to a RIBA 4B design with greater specificity over fabrication and installation, which we then adopted back into our BIM model,' Maruthayanar explains.


Early involvement of the specialist contractors ensured appropriate access for plant maintenance was incorporated into


the model at an early stage, along with MEP secondary steelwork and support systems. Maruthayanar says: 'Involvement of the trade contractors enabled us to provide detailed RIBA Stage 4B drawings, which were a step beyond the standard for MEP projects. This helped reduce the construction programme and smooth the installation process on site.'

BIM also enabled extensive use of MEP prefabrication in the basement plantrooms and risers. 'We had allowed zones for the installation of prefabricated service modules within the risers, but we had not developed the structural support system for the modules,' say Maruthayanar. 'When the 4B process occurred, the trade contractor responsible for the multi-service modules was able to add all the supporting steelwork, gantries and walkways to the model.'

As well as being able to spatially coordinate the secondary steelwork, its addition to the BIM model enabled the weight of the prefabricated modules to be established, which was useful in helping finalise the structural model. 'Prefabrication was beneficial, as it meant the modules were worked on off site by various trades simultaneously, which helped speed construction on site,' says Maruthayanar.

Needless to say, the building will be smart. Maruthayanar says Google 'will be developing its own network infrastructure to integrate the engineering systems and give users with tools to improve productivity and create a platform of accessible information, to make the building more flexible'.

The giant building is aiming for Breeam Outstanding and Leed Gold certification. According to Maruthayanar, the impact of Atelier Ten's passive, active and renewable measures is calculated to achieve an overall reduction in CO<sub>2</sub> emissions of 22% against Part L 2013 target emissions. 




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# Exploring and evaluating your assets

**G**ordian's mobile data capture solution, Kykloud, is already being used for the largest survey programme in Europe, for the UK Department for Education, to capture condition data for all government-funded schools and further education colleges throughout England, writes Joanne Elliott, Gordian senior account manager.

Anyone involved with building and infrastructure assets knows how challenging it can be to collect the right information, create valuable reports and do it quickly, now more than ever.

With Kykloud, Gordian replaces traditional handwritten notes and spreadsheets, improves

project delivery times by up to 60%, and enhances onsite communication capabilities for surveyors, inspectors and auditors by enabling them to collect real-time data using fully customisable survey templates on hand-held mobile devices.

As well as traditional data capture requirements, asset photographs can be automatically and accurately annotated with metadata, in-built optical character recognition (OCR) tools are available to read manufacturer plates and asset tags, and live onsite calculations will assist surveying teams in their decision-making. Verification rules will help QA the data at the point of entry, and then, post-survey, the data can be audited using Kykloud's portal-based tools. Once the user is happy with the collected data, bespoke reports can be generated at the touch of a button.

The insights delivered from these high-quality reports enable Gordian customers

to make better decisions and deliver more meaningful results for business, finance and facility executives – not to mention purchasing departments, cost estimators and building contractors.

The expertise applied to the development of Kykloud and all of Gordian's capital planning solutions – some already available in the UK and others that are on the way – is derived from extensive project deployment across a broad range of sectors, including education, but also extending to corporate, healthcare, retail, and non-profit organisations.

Across all of these markets, one challenge faces those who have yet to adopt contemporary surveying and inspection tools, and that is the urgent need to capture, analyse and process robust and consistent data as quickly, efficiently and accurately as possible.

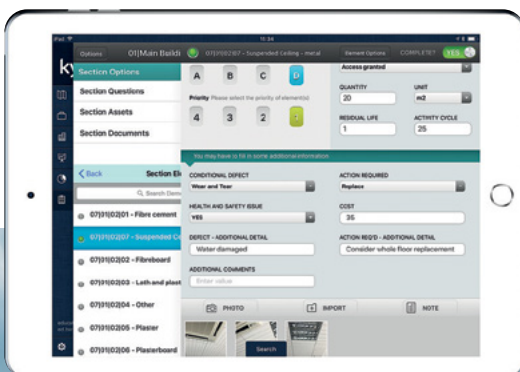
The issue becomes even more acute in the UK with many private finance initiative (PFI) funded projects reaching the end of their contractual obligations over the next 2-5 years. The need for accurate, contractually mandated condition assessments of PFI-related properties will vastly increase and, with it, the need for detail and speed.

That's why so many are turning to Gordian as their partner of choice to help determine where, when, how and with whom they complete projects across their portfolio of facilities.

Gordian, backed by the financial strength of its parent company, Fortive, delivers world-class expertise and solutions that scale and evolve with the industry. As global economies deal with cost and supply chain unpredictability, certainty becomes a premium item.

The certainty delivered by Gordian in the form of its Kykloud, VFA and other solutions are essential components to ensure the best value for money through accurate assessment and evaluation of assets, and determining what will be required to maintain and operate those assets well into the future.

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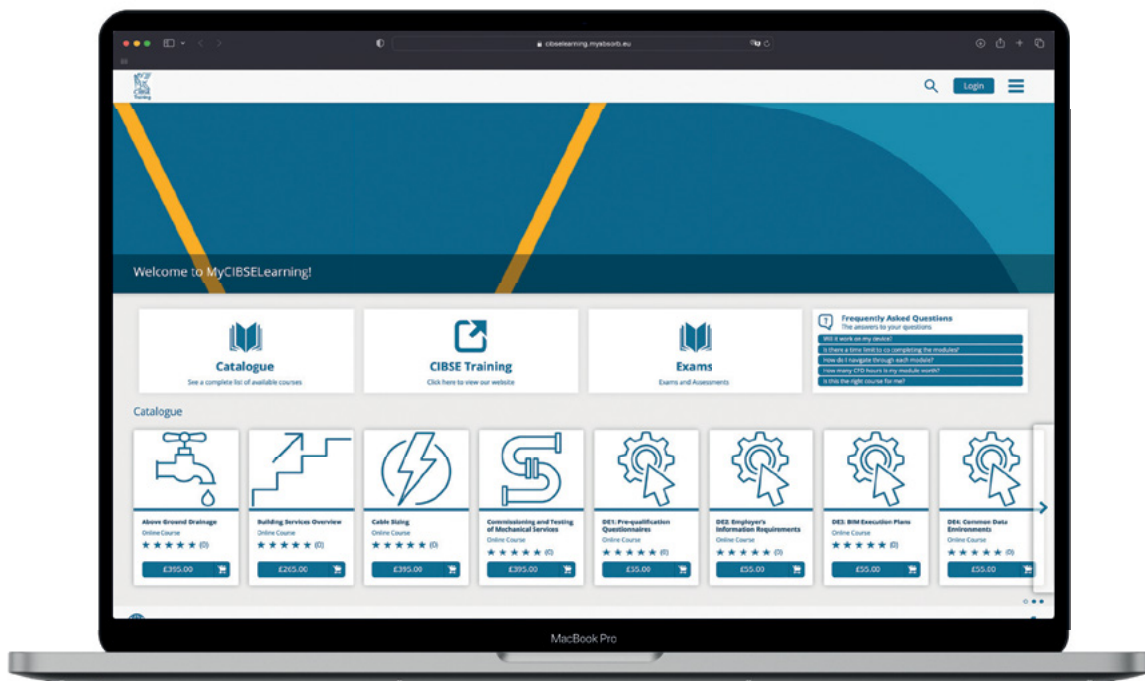


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## Solar PV for buildings

This module explores existing solar photovoltaic (PV) options and introduces up-and-coming PV technologies

The International Energy Agency (IEA) recently reported<sup>1</sup> that global solar photovoltaic (PV) electricity generation increased by a record 179TWh (up 22% in a year) in 2021 to exceed 1,000TWh – the second-largest absolute generation growth of all renewable technologies in 2021, after wind. The IEA contends that solar PV is becoming the lowest-cost option for new electricity generation in much of the world, and this is likely to drive investment in the coming years. This CPD will provide an overview of the core PV technology choices for today and in the near future.

To meet net zero emissions by 2050, the IEA predicts that in the period 2022-2030 global average annual generation growth of 25% is needed. The IEA report<sup>1</sup> highlights the impact of smaller PV installations, with residential, commercial, and industrial segments providing almost half of global PV generation, and installations on investors' own buildings and premises being responsible for almost 30% of total installed PV capacity as of 2021.

Solar PV is typically referred to in terms of cells, modules, panels, and arrays, as illustrated in Figure 4. PV panels and arrays are increasingly seen used as ground-mounted (as in the example of Figure 1), attached to building roofs (and walls) – typically referred to as building attached PV (BAPV) – as in the example of Figure 2, and as building integrated PV (BIPV), as in the example of Figure 3. At the end of September 2022, 55% of UK capacity (7,739MW) came from ground-mounted or standalone solar installations.<sup>2</sup>

Solar cells contain a material that conducts electricity only when energy is provided by photons from the sun, as direct, diffuse and reflected irradiance, and are specified using terminology as summarised in the panel on page 53.

Modern commercial solar cells used in building applications are typically made of crystalline silicon cells. Silicon makes up<sup>3</sup> 26% of the Earth's crust, and using a reduction process, in which the silica is heated with a carbon material, oxygen is removed from molten silicon-bearing quartz aggregates, leaving behind purer, metallurgical-grade silicon. Higher-purity electronic-grade silicon requires further

refining, and the resulting molten silicon is then cast or drawn into cylindrical ingots that are sliced into 0.2-0.5mm thick discs or wafers. Impurities are added during the silicon production process (known as 'doping') so that the otherwise non-conducting disc of silicon, which is now termed a 'crystalline polysilicon', acts as a semi-conductor (as well as a diode). Phosphorus or arsenic are typically used for n-type doping (introduced on one side of the wafer) and boron or gallium are mixed into the silicon (typically when molten) as p-type doping forming 'holes' that allow an electric current to flow through the silicon. Solar irradiance will ionise the atoms in the semiconductor so that electrons jump from their atomic bond and are then free to move through 'holes' in the material. If the top, solar facing, n-type layer is connected by electrical conductors (typically via external circuit) to the rear p-type layer the electrons will travel from the n-type to the p-type layers and then pass through their junction to create an electrical current.

The circular wafers are typically trimmed to a rectangle (with major dimensions approximately 155mm or larger), with the corners cropped off to create an irregular





Figure 1: Example of ground-mounted PV  
(Source: Sun Gift Solar, www.sungiftsolar.co.uk. All rights reserved)

» octagon shape. The resulting monocrystalline cells (as shown in Figure 5) are black (or very dark blue) and offer a higher efficiency (recently as high as 23%) compared with the cheaper irregular bluish polycrystalline cells (composed of multiple crystals – currently edging over 20% efficient) that are normally cast into a rectangular block and sliced into rectangular wafers (without further trimming). Wafers are fragile and if handled inappropriately can suffer from microcracks that are invisible to the eye, but which can significantly degrade a cell's performance.

The application of monocrystalline silicon accounts for the majority of installations, having overtaken the slightly cheaper polycrystalline silicon in recent years. The maximum theoretical efficiency for a silicon solar cell is around 32%.

Traditionally, multiple thin, metallic lines, known as 'fingers', are laid down on the front surface of the cell to transfer electrons from the solar cell to the busbars. Wider busbars, typically made of aluminium or silver-plated copper, run perpendicular to the fingers. The rear of a cell semi-conductor also has a printed grid of conductors. Low resistance wires connect multiple cells to the PV junction box. Optimisations to the collecting conductors – which in some cases remove the need for visible fingers and busbars – are employed to reduce electrical resistance and increase absorption. Anti-reflection coatings and textured cell surfaces are employed to reduce wasted reflection.

A single cell will have an open-circuit voltage – the maximum voltage available at zero current – in the order of 0.45-0.6V, and commonly 36, 60, 72 or 144 cells are connected together in a module to provide a nominal output voltage – for example 12, 24 or 40 volts. Single or multiple modules can then be arranged in parallel or series to form

PV panels that are designed to work at a specific range of voltage and current. The panel is sealed to protect the cells, with the front face covered with a non-reflective transparent material, the back of the panel being sealed to prevent damage and short circuiting, as shown in Figure 6, and the panel mounted into a rigid metallic frame. Panels are connected in arrays (in 'strings'), and can be series connected to provide higher voltages or parallel connected to increase current – higher currents require larger conductors to reduce losses. (The connections are often 'intelligently' controlled to optimise the system performance and reduce the impact of adverse conditions, such as shading of PV panels.)

Passivated emitter and rear contact (PERC) cells have become popular as a low-cost development to monocrystalline cells that increases efficiency by a few per cent, where a 'passivation' layer is added to the rear of the cell to reflect photons back into the cell. PERC cells currently have a basic wholesale cost of around £300 per kWp.

Trailing behind crystalline silicon panels in building applications are thin-film solar cells, which can be easier to fabricate but, until recently, are significantly less efficient – thin films make up<sup>4</sup> 3% to 5% of the global market. Thin-film solar cells are made by coating a thin layer of a highly-absorptive semiconductor material on a sheet of glass, plastic, or metal foil, rather than creating a crystalline wafer. Flexible materials can be used to apply PV on curved or irregularly shaped surfaces. Thin films are typically dark or partially transparent (at lower efficiencies, as in Figure 3), so the modules look uniform and can replace traditional glazing elements. Some thin-film technologies, such as cadmium telluride (CdTe) copper indium gallium selenide (CIGS) with a maximum theoretical efficiency of 33%, are already being manufactured at efficiencies comparable to traditional crystalline silicon cells.

Higher temperatures cause the semiconductor properties to shift, resulting in a slight increase in current, but a much larger decrease in voltage. BSRIA<sup>5</sup> notes that the temperature coefficient of a panel is a percentage of how much more or less energy is produced by the panel per degree above or below 25°C. For example, if the temperature coefficient of a panel is -0.5%, on a hot day when the panel's temperature may reach 35°C, the efficiency of the panel will reduce by up to 5%. Both monocrystalline and polycrystalline have temperature coefficients of -0.4% to -0.5%. Thin-film solar panels have temperature coefficients between -0.2% to -0.25%, so thin-film solar panels can be more suitable for locations that experience higher temperatures.

There are several emerging techniques in PV that have the potential to significantly improve the efficiency and performance of solar panels, as described by the US Department of Energy (DoE).<sup>4</sup> For example, **bifacial solar cells** are double-sided to capture light on *both* sides of a silicon solar module – they capture light reflected off the ground or roof where the panels are installed. **Perovskite solar cells** are a relatively new type of thin-film solar cell that have rapidly increasing conversion efficiencies, with some cells already achieving more than 25% conversion



Figure 2: Example of roof-mounted PV  
(Source: Sun Gift Solar, www.sungiftsolar.co.uk. All rights reserved)



Figure 3: Panels with CdTe thin film (88Wp-m<sup>2</sup>) with 20% transparency  
(Source: Polysolar, www.polysolar.co.uk. All rights reserved)

Solar PV cell → Solar PV module → Solar PV panel → Solar PV array

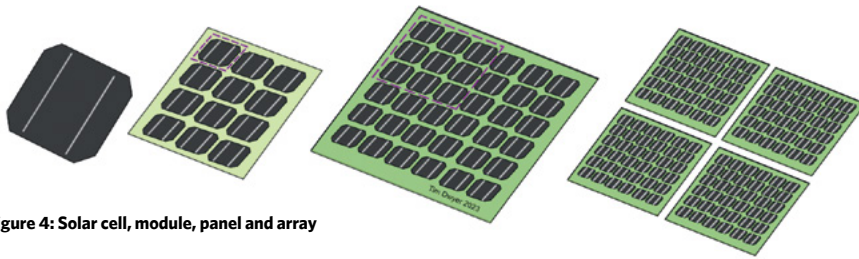


Figure 4: Solar cell, module, panel and array



Figure 5: A simple monocrystalline solar cell

PV PANEL PERFORMANCE SPECIFICATION

A crystalline panel standardised specification will be dependent on the cell type, cell size, number of cells, layout geometry and resistance of connections. The electrical performance is typically quoted in terms of the following:

- The peak power output rating,  $W_p$ , of a solar panel, is the output under standard test conditions (STC) – that is, cell temperature of 25°C, solar irradiance of 1,000W·m<sup>-2</sup>.
- Efficiency – the maximum percentage of sunlight energy that the panel converts into electricity
- Voltage ( $V_{mp}$ ) and current ( $I_{mp}$ ) at maximum power point
- Open circuit voltage – the maximum voltage that the panel can provide ( $V_{oc}$ )
- Short circuit current – the maximum current that can be delivered by a panel ( $I_{sc}$ )
- Maximum input voltage
- Temperature coefficient of power.

Solar panels are typically supplied with a product warranty for basic manufacturing defects of 10+ years, and a power output warranty of 25-30 years. A solar panel degrades over time, the potential electricity production decreasing slowly – typically 2%-3% degradation in year one, and then 0.50% or less per year.<sup>6</sup>

Output will be impacted by angle and orientation of the panel relative to the sun, shading from nearby objects, and soiling or dust accumulation on the panel surface.

electricity (at approximately £0.34 per kWh in the UK), this will provide a simple payback of between eight and 12 years. Since the panels are expected to last approximately 25 years (with one inverter replacement), the return over 20 years is usually 9%-18% (internal rate of return (IRR)%).

A recent report<sup>8</sup> by Elementa and Wilmott Dixon estimated the combined embodied carbon and operational carbon for two example UK commercial applications under various scenarios for a period of 25 years, considering complete installations employing monocrystalline or thin-film PV. In all scenarios, even with grid decarbonisation, the operational carbon saving was shown as outweighing the embodied carbon impact over the 25-year life span. In 2021, the US National Renewable Energy Laboratory (NREL)<sup>9</sup> collected together the output of numerous studies and estimated that the life-cycle carbon impact of PV is in the order of 43gCO<sub>2e</sub>·kWh<sup>-1</sup>. This compares with 13gCO<sub>2e</sub>·kWh<sup>-1</sup> for wind and nuclear, and 486gCO<sub>2e</sub>·kWh<sup>-1</sup> for gas-powered and 1,001gCO<sub>2e</sub>·kWh<sup>-1</sup> for coal-powered electricity generation.

As noted in the Elementa/Wilmott Dixon report, to head towards net zero embodied carbon, investment will, in any case, be required to achieve grid decarbonisation.

So, across the life of an installation, both the financial and the carbon accounting would appear to stack up (in these UK examples) in support of PV. However, these may not be the only, or even the most pressing, factors in many areas around the globe, particularly in developing countries with limited infrastructure, and in the ‘developed’ world where electricity distribution networks might strain to meet future loads,<sup>10</sup> and security and safety of supply is key to short- and medium-term life. Both BAPV and BIPV installations can play an important part in the diversification and decarbonisation of the world’s electrical supply as a local contribution to the renewable technologies that can contribute to the ambitions of a net zero future.

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■ Turn to page 54 for references

efficiency; however, to be commercially viable, perovskite cells have to become more stable and durable enough to survive 20 years outdoors. **Multijunction solar cells** have multiple layers, each absorbing a different part of the solar spectrum, making greater use of sunlight than single-junction cells. Light that is not absorbed by the first semiconductor layer is captured by a layer beneath it (and so on, through successive layers). Multijunction solar cells have demonstrated efficiencies higher than 45%, but they are costly and difficult to manufacture. **Organic PV** are lightweight solar cells made with carbon compounds that use organic polymers and molecules that conduct and generate electricity in a similar way to those in organic light-emitting diode display technologies. They can be different colours or transparent. Work is continuing to improve lifetime and efficiency and mitigate the visual effects of ageing.

Example costs of commercial systems provided by a UK-based installer<sup>7</sup> indicate that commercial installations of rooftop solar panels usually cost approximately £1,500 per kWp (including control equipment). With an approximate solar energy cost of £0.06 per kWh across the life of the installation, compared with grid-supplied

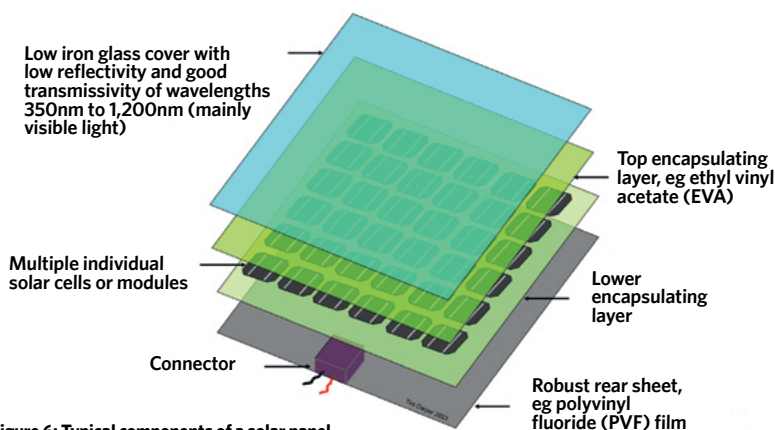


Figure 6: Typical components of a solar panel that would be enclosed in an aluminium frame



# Module 212

March 2023

» 1. What global annual generation growth is required in PVs according to the IEA??

- A 10%
- B 15%
- C 20%
- D 25%
- E 30%

2. Approximately what proportion of UK solar PV comes from ground-mounted or standalone solar installations?

- A Less than a quarter
- B A quarter to a third
- C A third to a half
- D A half to two-thirds
- E More than two-thirds

3. What is the open-circuit cell voltage for a single cell that is quoted in the article?

- A Less than 0.45V
- B 0.45V–0.6V
- C 0.6V–12V
- D 24V
- E 40V

4. How much would a panel output reduce if the temperature coefficient of a panel is -0.4% at 30°C compared with STC?

- A 0.4%
- B 1%
- C 2%
- D 4%
- E 20%

5. According to the NREL, what is the estimated approximate life-cycle carbon impact of PV?

- A Practically zero
- B 13gCO<sub>2e</sub>·kWh<sup>-1</sup>
- C 43gCO<sub>2e</sub>·kWh<sup>-1</sup>
- D 486gCO<sub>2e</sub>·kWh<sup>-1</sup>
- E 1,001gCO<sub>2e</sub>·kWh<sup>-1</sup>

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### Further reading:

CIBSE TM25 *Understanding building integrated photovoltaics* (2000) – a little old, but still useful.

BRE National Solar Centre *Solar PV on commercial buildings. A guide for owners and developers* (2016).

BSRIA BG 34/2021 *The illustrated guide to renewable technologies 2nd Ed.* (2021).

Smets, A et al, *Solar Energy: The physics and engineering of photovoltaic conversion, technologies and systems*, UIT Cambridge, 2016 – freely downloadable Kindle Edition from Amazon.

### References:

1 *Solar PV*, IEA, Paris 2022, [bit.ly/CJMar23CPD1](http://bit.ly/CJMar23CPD1) – accessed 9 February 2023.

2 Solar photovoltaics deployment in the UK – December 2022 – BEIS, [bit.ly/CJMar23CPD8](http://bit.ly/CJMar23CPD8) – accessed 9 February 2023.

3 [bit.ly/CJMar23CPD2](http://bit.ly/CJMar23CPD2) – accessed 9 February 2023.

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5 Agha-Hossein, M and Bleicher, D, BG 34/2021 *The illustrated guide to renewable technologies 2nd Ed.* BSRIA 2021.

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7 [bit.ly/CJMar23CPD5](http://bit.ly/CJMar23CPD5) – accessed 9 February 2023.

8 Hamot, L et al, *Whole life carbon of photovoltaic installations*, Elementa/Wilmott Dixon 2022.

9 *Life Cycle Greenhouse Gas Emissions from Electricity Generation: Update*, [bit.ly/CJMar23CPD6](http://bit.ly/CJMar23CPD6) – accessed 9 February 2023.

10 [bit.ly/CJMar23CPD7](http://bit.ly/CJMar23CPD7) – accessed 9 February 2023.

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## Products of the month

### Lochinvar goes for heat pump power

Low carbon heating and hot-water equipment manufacturer Lochinvar has launched the 'UK's most powerful heat pump water heater'

Lochinvar has launched the Amicus Aquastore, a new heat pump water heater, with an output of 8kW and 455 litres of hot-water storage capacity in a compact monobloc package, combining both a heat pump and storage vessel.

Up to 65°C hot water can be delivered when in efficiency and hybrid modes and, in peak hours, up to 490 litres can be provided with a 50°C temperature rise.

The new product is aimed at the burgeoning low carbon replacement market for gas-fired water heaters in commercial buildings. It has been designed to minimise disruption by avoiding the need for wholesale changes to existing heating and hot-water systems.

Its space-saving monobloc construction means that it is easy to manoeuvre into position and offers plenty of options for positioning, another very important consideration for replacement projects. It is also a straightforward 'plug and play' process to set up and commission.

'Water heater replacements are often distress purchases, which means the end user needs something relatively easy and quick to install,' said Lochinvar's heat pump technology manager, James Cooper.

'The beauty of the Amicus Aquastore is that we can offer that quick response, but also provide a solution that dramatically reduces the customer's energy usage and carbon footprint without the need for a more complex, disruptive and expensive installation.'

To support the rapidly growing demand for projects that require heat pumps, Lochinvar is holding generous stock of the units. It also offers comprehensive technical advice to ease the design and installation process.

The Aquastore is the latest addition to the extensive Amicus range of air source heat pumps (ASHPs), which has models delivering domestic hot-water capacities from 7.7kW up to 210kW for a wide range of projects, including large residential, medium and large commercial, and industrial applications.

To improve output and efficiency, the Amicus heat pump range employs the innovative principle of enhanced vapour injection (EVI). EVI is a two-stage compression process with inter-cooling that produces a superheated vapour that boosts capacity and efficiency.

As a result, Amicus units can achieve a



**"The company is seeing increased demand for hybrid systems where heat pumps are combined with high-efficiency 'conventional' technologies, such as gas-fired boilers and water heaters"**

coefficient of performance (COP) up to 4.4 and are 25% more efficient than standard scroll compressor-driven systems. They are also capable of operating in outside temperatures as low as -20°C.

Amicus heat pumps can be used as standalone replacements for conventional heating products or as part of an integrated system, providing pre-heated feed water to gas-fired condensing boilers, water heaters and thermal stores in buildings with large heating or hot-water demands.

'Heat pumps are playing an increasingly important role in helping the UK transition to low carbon heating and the Amicus Aquastore is just the latest in a line of innovations designed to make the technology available to the widest possible range of users,' said Cooper.

'As well as our onsite support and technical backup, Lochinvar can offer all the components needed to provide a complete low carbon system with heat pump technology at its heart. This considerably simplifies the specification, design, and installation process,' he added.

Lochinvar traces its history to 1919, and its products have been supplied in the UK since 1976, when the Knight and Charger water heater ranges were among the first products of their type.

Since then, it has expanded its offering to include a wide range of high-efficiency heating and hot-water solutions for commercial and industrial applications.

Today, the company is seeing increased demand for hybrid systems where heat pumps are combined with high-efficiency 'conventional' technologies, such as gas-fired boilers and water heaters, to improve operating performance where a fully renewable system may not be an option, either for financial or technical reasons.

This 'hybrid' or integrated approach is proving particularly effective in retrofit projects, because it avoids the potentially disruptive and costly process of replacing other system components.

Lochinvar has recently expanded its Oxfordshire office and warehousing space to keep in step with growing demand, and its sales and product management teams cover the whole of the UK and Ireland.

■ Visit [www.lochinvar.ltd.uk](http://www.lochinvar.ltd.uk)



## › Products of the month

### Rinnai focus groups voice net zero concerns

The three Hs – hydrogen, hybrid systems and heat pumps – are at the heart of the debate, says company

**R**innai has initiated a series of focus groups with the purpose of understanding the heating and hot-water delivery industry's concerns around implementing a clear, practical, technical and economic pathway to net zero.

The manufacturer is hosting a series of focus groups to discuss the legislative, technical and practical difficulties that current decarbonising aims are creating for contractors and installers. It will look at this in relation to hydrogen, hybrid and heat pump solutions.

Chris Goggin, Rinnai operations director, said: 'We are all aware of the current constraints we have in striving to net zero, such as the ongoing Ukraine war and global hikes in energy prices. So much confusion is arising from the fact that the UK government has not given any true leadership, other than to make a legal commitment to net zero.'

'We absolutely must achieve the goal of net zero, but it must be with practical, economic and technical solutions that can provide heating and hot water to a housing stock of 22 million homes, and the same number of commercial and industrial buildings.

'We have instigated our focus groups to give a voice to the professionals involved daily in the installation and specification of heating and hot-water technology and systems.'

The focus groups have shown that hybrid systems, including heat pumps, are a highly relevant value proposition regarding current installation projects, especially for retrofit arrangements.

The groups have revealed that contractors are looking at all aspects of heat pump technology. The options include coefficient of performance (COP), seasonal performance factor (SPF), or seasonal coefficient of performance.

COPs were seen as being of greatest importance when considering heat pump technology. The group also agreed that SPF should be the preferred method of calculating system performance as this was a truer reflection of reality.

Another discussion point focused on the key issues contractors and consultants encountered when designing and installing commercial heating and hot-water provision systems. A lack of time and design constraints were stated as being most important.

Groups agreed that manufacturers can

improve their support to consultants with: design support, carbon modelling, turnkey solutions, CPDs, capital expenditure modelling, and operational modelling. Technical support on and off site was another area of concern.

Major anticipated challenges facing the industry in 2023 were market uncertainty, an expected downturn in business, regulations and legislation, workforce skills shortages and a lack of products. All members of the focus group registered varying levels of concern. However, market uncertainty and expected downturn in business, alongside rules and regulations, were given greater emphasis.

Goggin said: 'Rinnai has started these groups so that we can share views and experience in gaining better outcomes for all of us working towards net zero – and we need to understand the current concerns within the market held by educated and seasoned professionals.'

Rinnai will use this information to refine and adapt products and services that offer a clearer path towards net zero.

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



**“We must achieve the goal of net zero, but it must be with practical, economic and technical solutions”**

## Products of the month

### Hot water on tap with Rinnai

New range of water heaters provides instant, temperature-controlled hot water

As part of its H3 initiative (promoting hydrogen, heat pumps and hybrid systems), Rinnai has introduced the Rinnai Infinity 11i, 17i and 17e continuous flow water heaters. These are designed for domestic properties or small businesses that need instant, economic and temperature-controlled volumes of hot water.

The temperature range for all three models is 37-65°C, making them ideal for comfortable ablutions and heavy-duty high-volume commercial cleaning.

The H3 range is made up of products that are hydrogen/BioLPG ready, and includes hybrid heat pumps and solar thermal and a wide range of low global warming potential heat pumps.

The latest addition to the Infinity range is hydrogen-blend and BioLPG ready, and is stacked with a multitude of features that ensure long life, robust and durable use, customer satisfaction, and product efficiency.

The first two models in the range are internally mounted. The Rinnai Infinity 11i (11 litres per minute) and 17i (17 litres per minute) are hydrogen ready, suitable for 20% hydrogen-methane blending.

The systems are also ultra-low NOx, surpassing eco-design requirements. At only 14kg, the lightweight and simple wiring of this model makes installation easy.

Additionally, Rinnai's Infinity 11i and 17i include in-built frost protection and a push-fit flue system. The system operates on demand with direct electronic ignition, ensuring that the continuous flow water heater only fires when hot water is needed, providing temperature-accurate hot water instantly. Comparably, a traditional water-storage system keeps a body of water heated for when it is needed, resulting in unnecessary energy usage and cost.

Rinnai Infinity 11i and 17i models can be delivered to site in hydrogen blends-ready natural gas, LPG and BioLPG variations, ensuring that the units can cater for hard-to-reach industries and off-grid properties.

The final model in this range is the Infinity 17e



external continuous flow water heater. This is an external water heater, giving the added benefit of relatively unconstrained installation caused by flue-citing issues. The external variants are used widely in agriculture, glamping pods and leisure settings.

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

### Rinnai's carbon cost-comparison service

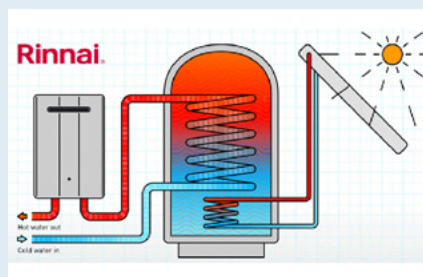
Free carbon cost-comparison analysis available for any site or application

Rinnai's carbon cost-comparison form offers a free appraisal of any site's current heating and hot-water delivery system, along with empirically gathered, data-driven recommendations for reducing the carbon intensity.

Users simply visit the manufacturers' website and submit the form. Rinnai will then complete a thorough analysis, returning the results to the user. Hard copies of the form are also available on request.

Rinnai offers a comprehensive range of carbon-reducing products, including hydrogen blends-ready hot-water heaters, heat pumps and solar thermal, to provide high product performance at the lowest possible costs and a reduction in carbon emissions.

The required data gathering is brief. Customers need to provide information on the current model and system, the maximum gross input power, quantity needed, type of outlet



**“Our carbon calculation service will compare our complete array of hydrogen blend-ready water heaters, hybrid systems and heat pumps”**

(eg, shower, wash basin) and how many peak demands there are in a day. The information is then passed to the Rinnai technical team, who will calculate the emissions and savings that can be made on both carbon load and fuel costs.

‘Our H3 initiative delivers capex [capital

expenditure], opex [operational expenditure] and carbon reductions for any application, while also providing a practical, economic and technically feasible solution to any site. The combination of renewable, gas-ready, solar thermal, low GWP [global warming potential] and electrical heating and hot-water systems enable a decarbonisation pathway for all build types. A full design service is also offered,’ said Chris Goggin, operations director.

‘Our carbon calculation service will compare our complete array of hydrogen blend-ready water heaters, hybrid solar and heat pump systems, and standalone heat pump solutions, providing our customers with market-leading low carbon solutions,’ he added.

H3 products and systems can be configured to any site and be powered by any fuel and appliance – electricity, natural gas, hydrogen-blends 20%, BioLPG, solar thermal, heat pumps, continuous flow water heaters. H3 products are designed to encourage decarbonisation and deliver a healthier way of living.

■ Visit Rinnai's carbon cost-comparison page at [bit.ly/CJMar23RinnaiCC](http://bit.ly/CJMar23RinnaiCC)

## › Products of the month

### Swegon strengthens Waterloo range with enhanced product choice and digital tools

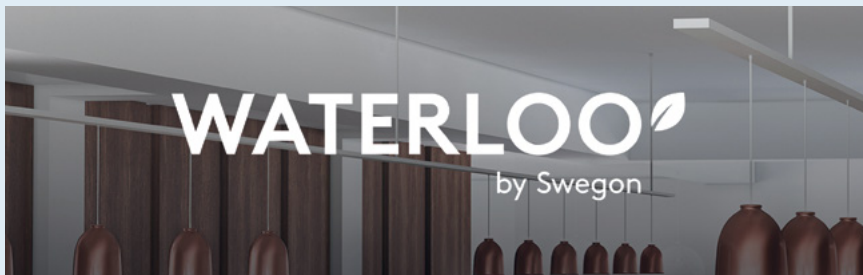
New brand aims to provide the product width, flexibility and choice that meets the specific needs of the UK market

Swegon is bringing together all the group's room unit brands of Waterloo, NACO and Air Diffusion under one brand identity, 'Waterloo by Swegon', to reflect its position as the UK's largest manufacturer of air terminal devices.

Since the acquisition of Waterloo in 2020, the HVAC group has been working on full integration and settling the combined business into the new Vantage Point factory in Kent.

This is consistent with the Swegon group's philosophy of investing in local manufacturing to service its key markets and strengthening well-known brands under the group umbrella, while also bringing in expertise and innovations from across global operations.

The Waterloo by Swegon range will provide



the product width, flexibility and choice that meets the specific needs of the UK market. To support this, there will be further investment in technical innovation, sustainability, and digitalisation initiatives.

Daniel Jones, UK&I room unit product manager, said: 'Our customers will have access to more great products, but with added benefits, such as Environmental Product Declarations, BIM, and cloud selection tools designed to make their lives easier.'

Andrew Collard, UK&I business unit director,

added: 'The new brand is an opportunity for our customers to benefit from our extensive technical expertise and the product selection flexibility afforded by such a wide range.'

'The consolidation of Swegon's room unit product portfolio is a natural fit, and creates exciting opportunities for the business and our customers.'

■ Visit [www.swegon.com/UK](http://www.swegon.com/UK) or [www.swegon.com](http://www.swegon.com) or contact [josh.emerson@swegon.com](mailto:josh.emerson@swegon.com)

### Aquatech Pressmain offers Aquapack AP pressurisation units with degassing options ›

Aquatech Pressmain's robust Aquapack AP pressurisation units precisely maintain the pressure in heating and chilled water, residential and commercial systems.

They are designed to be floor- or wall-mounted, for system content up to 50,000 litres water, temperatures 3°C to 90°C, and fill pressures of 0.8bar to 14.0bar.

All the units come with twin pumps and BMS integration as standard, with options for dual-system pressurising and vacuum degassing to save space and protect the system.

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



### Pump Technology launches new DrainKing Wastewater Pumping System ▾

The New DrainKing duty standby wastewater pumping system, incorporating twin Jung Pumpen pumps, offers improved pump control for greater reliability and easier operation, with lower invert levels for greater flexibility of installation.

Pump control is simplified and improved by eliminating older, cable-mounted on/off floats and using the pump's own rigid float arm with large triangular low-level float.

The control panel provides duty pump cycle, high-level alarm, pumps status, and three volt-free connections for greater BMS logic.

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



### ◀ Hamworthy offers cascade option for Tyneham heat pumps

The Tyneham heat pump is a monobloc air source heat pump available as 14kW or 18kW products.

It is a single unit with the refrigeration cycle contained within the outdoor unit, and has an inverter-controlled compressor to accurately match the heat demand.

The heat pump has low global warming potential because of using R32 refrigerant and has a coefficient of performance rating up to 4.85. Cascade systems can achieve higher output, making them suitable for larger installations.

There is a two-year warranty (extended to five years if commissioned by Hamworthy). Gold fin anti-corrosion coating comes as standard.

■ Visit [www.hamworthy-heating.com](http://www.hamworthy-heating.com)



### Apartment living made simple with Modutherm HIUs >

Modutherm has supplied its MTA heat interface units (HIUs) to The Linen Quarter development in Dunfermline, Fife, providing highly efficient heating and domestic hot water to 112 two- and three-bedroom apartments, and a commercial unit. The installation is part of the regeneration of Dunfermline's last remaining Grade A-listed linen works, creating a mixed-use neighbourhood.

The new apartment block has been connected to Dunfermline's district heating system, which supplies heat from a central source generated at the Recycling Centre. [Visit www.modutherm.co.uk](http://www.modutherm.co.uk)



### Trilux launches new OLISQ luminaire for sustainable refurbishments >

Trilux has added the OLISQ luminaire for walls and ceilings to its energy-efficient lighting portfolio.

The technical lighting company says light quality, long service life, and market-leading efficiency of up to 143 lm/W, means OLISQ qualifies for Breeam, Well, and other certification standards.

Trilux said that, with customisable materials and various choices regarding luminous flux, switches, and housing, OLISQ ensures optimal clarity and orientation.

A wide selection of lighting variants, offering distinct performance characteristics, enables a seamless installation without impacting the existing building, said Trilux. [Visit www.trilux.com/gb/products/olisq](http://www.trilux.com/gb/products/olisq)



### Elco supplies commercial heat pump to Frome Library

Frome Library in Somerset has transformed its heating system thanks to the installation of a new air source heat pump from Elco Heating Solutions. Delivering zero emissions, increased energy efficiencies and reduced operating costs, the new Aerotop L 88kW unit has replaced two ageing gas boilers as part of Somerset County Council's drive to decarbonise its estate.

As a result of the switch from gas-fired boilers to electric heat pumps, the project has delivered impressive energy savings thanks to a coefficient of performance (COP) of up to 4.0 from the Aerotop unit. The result is an estimated 71% reduction in the primary energy required to heat the property.

The heat pump is connected to an upgraded system consisting of new double-panel radiators with convectors (which have replaced single-panel models), and several new fan convectors. All emitters accommodate a low temperature heating circuit from the Aerotop unit, ensuring the heat pump continues to operate at maximum COPs of up to 4.0.

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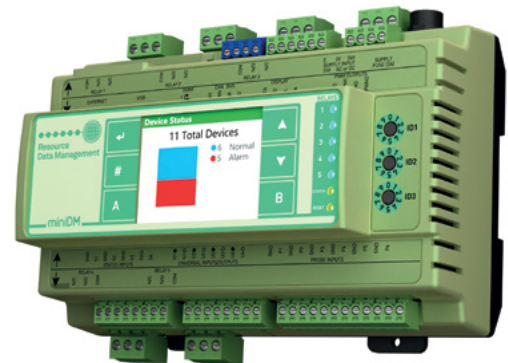
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### miniDM control device designed for monitoring of small premises

Resource Data Management's miniDM device is aimed at integrating services systems on smaller premises. It is designed to integrate mechanical, HVAC, lighting and electrical systems into one intelligent energy-monitoring and device-control portal.

The device provides data analysis, alarm handling, and local and remote centralised visibility of up to 32 HVACR control devices - such as air conditioning, boilers, ventilation, and utility metering - in settings such as shops, pharmacies and petrol stations.

Based on open protocols, miniDM allows third-party device integration, using protocols such as Modbus or BACnet. Its third-party integration capabilities make it the ideal solution for retrofits in any type of building.

A whole host of energy-saving control features has been included in the design for the HVACR devices, which helps reduce energy consumption. Despite its compact size, miniDM features 16GB of storage as standard, allowing for years' worth of vital data, documents and more to be stored at 15-second intervals on the device.

[Visit www.resourcedm.com](http://www.resourcedm.com)



# Rescue and recovery

**Increasing legislation and a rise in sustainable investing risks leaving property owners with stranded assets unless they act now to improve their estate. Mitsubishi Electric's Dan Smith explains**

Legislation on cutting energy use and demand from investors for sustainable buildings is putting thousands of properties in danger of becoming stranded assets. The UK government's proposals to raise minimum ratings for buildings' energy performance certificates (EPCs) from C to B will force many commercial buildings to undergo expensive improvements. Measures may include swapping gas boilers for heat pumps or improving the thermal performance of the façade. Properties that can't be upgraded because of cost or complexity risk becoming unlettable or having their sales value slashed.

The amount of commercial space affected is vast. For example, in the retail sector Savills notes that lifting the minimum EPC requirement to B will mean 83% of UK retail stock will have to be improved, which amounts to 1.4 billion ft<sup>2</sup> of retail space.

Last autumn, heat pump manufacturer Mitsubishi Electric published a guide to stranded assets ([bit.ly/CJMAR2023SA](https://bit.ly/CJMAR2023SA)) and, here, the company's sustainability and construction manager, Dan Smith, explains why owners of properties are being forced to act to protect the value of their assets.

## What is a stranded asset?

It is a building that is falling behind the increasingly stringent environmental requirements. Buildings must meet high standards of EPC rating and failure to do so will result in a less commercially appealing asset for landlords, investors and tenants. This is not just about the EPC rating, however, as a building could get stranded because it is not on the right pathway to net zero or still uses fossil fuels, which won't align with the aspirations of current or future tenants.

## What kind of buildings are most at risk?

All commercial building stock that requires an EPC rating is at risk, especially if

the building still uses fossil fuels and does not have a plan in place to remove it from site in the coming decade.

## Have you seen examples of buildings that are 'stranded' because they haven't been designed for net zero?

There is ongoing work to devise a Net Zero Carbon Buildings Standard, but – regardless of any progress on the definitions and standards required – we are still facing a roadmap with a clear destination of net zero by 2050 but no clear signposts as to how we get there.

This could mean some buildings that are currently in the design or early construction phase could be in danger of becoming a stranded asset even before they open their doors to potential buyers or tenants, especially if they do not have a clear plan of how they will reduce emissions on the road to net zero.

For existing buildings, there is ongoing work in bodies such as the UK Green Building Council and the Supply Chain Sustainability School, which are creating focus groups on the retrofit challenges – but, again, while we know the destination, we are currently on an open road with few signposts in place.

## Are regulations or the markets driving this?

There is a growing body of legislation driving reduction in energy consumption and pushing decarbonisation in our commercial building stock. While the Minimum Energy Efficient Standard is not mandated until 2023 for all existing commercial leases, tightening regulations will raise the requirement to C by 2030.

At the same time, we have seen a real appetite from the market to drive this further and quicker, with decarbonisation clusters or retrofit-focused teams appearing across the larger main contractors to capitalise on this opportunity.

## What is the financial benefit of ensuring your building is on the path to net zero?

While a very reasonable and valid question – the real question is: what is the danger if your building isn't on the path to net zero? Doing nothing is no longer an option for owners or investors. JLL research, in central London, suggests an 11% rental premium for a building with an EPC rating of A or B.

# EVENTS



## NATIONAL EVENTS AND CONFERENCES

### **CIBSE Technical Symposium** 20-21 April, University of Strathclyde, Glasgow

Titled 'Delivering sustainable, safe and healthy buildings for a net zero future'.  
[www.cibse.org/technicalsymposium](http://www.cibse.org/technicalsymposium)



### **Golden Thread series and Scotland Region Conference** 7-8 June, Glasgow

CIBSE Scotland Conference with a one-day conference, part of CIBSE's Golden Thread series, focusing on building safety and regulations specific to Scotland.



### **CIBSE Certification webinar: Net zero carbon, challenges and opportunities** 9 March

With speaker Simon Wyatt, environmental specialist and partner at Cundall. Registration ([gotowebinar.com](http://gotowebinar.com))

## CIBSE REGIONS AND GROUP EVENTS

Check the website for up-to-date information  
[www.cibse.org/events](http://www.cibse.org/events)

### **SoPHE Technical Conference 2023** 23 March, London

The conference will have a focus on fire and will present a range of peer and expert

presentations outlining the latest developments in fire safety and fire suppression for domestic and commercial premises, as well as the latest policy and guidance.

### **West Midlands: Water treatment masterclass** 7 June

**20 June for West Midlands YEN**  
One-day event covering the understanding of water quality, scale control, bacteria and legionella control, filtration and reverse osmosis, with visual demonstrations from Hydrotec.

## TRAINING COURSES

CIBSE's training courses are run both in-person and live online. Upcoming courses:

### **Fire Safety Building Regulations: Part B** 2 March, face to face, London

### **Energy Savings Opportunity Scheme (ESOS)** 3 March, face to face, London

### **Above Ground Building Drainage** 6 March, live online

### **Introduction to Heat Networks and Code of Practice** 6 March, live online

### **Energy Efficiency related Building Regulations: Part L** 7 March, live online

### **Low Carbon Consultant**



## CIBSE JOURNAL WEBINARS

The latest *CIBSE Journal* webinar, sponsored by Grundfos, titled 'Designing new pump technology into existing spaces' is now available to listen to on CIBSE Soundcloud, Apple and Spotify, [soundcloud.com/build2perform/podcast-designing-new-pump-technology-into-existing-spaces](https://www.cibse.org/build2perform/podcast-designing-new-pump-technology-into-existing-spaces)

### **Building Operations** 7-8 March, live online

### **Mechanical Services Explained** 7-9 March, live online

### **Low Carbon Consultant Building Design** 8-9 March, face to face, London

### **Mechanical Services Explained** 14-16 March, live online

### **Low Carbon Consultant Building Design** 8-9 March, face to face, London

### **Earthing and Bonding Systems** 10 March, live online

### **Emergency Lighting to Comply with Fire Safety Requirements** 14 March, face to face, London

### **Low and Zero Carbon Energy Technologies** 17 March, live online

### **Overview of IET Wiring Regulations (18th Edition)** 20 March, face to face, London

### **Heat Networks Code of Practice (CP1)** 20-21 March, face to face, London

### **Low Carbon Consultant Building Design** 20-21 March, live online

### **Building Services Explained** 21-23 March, live online

### **ISO 50001:2018 Energy Management System** 27 March, live online

### **Introduction to the Building Safety Act** 4 April, live online

### **Building Services Explained** 11-13 April, Balham, London

### **Energy Surveys** 11 April, Balham, London

### **Fire Safety Building Regulations: Part B** 12 April, live online

### **Below Ground Building Drainage** 14 April, live online

### **Energy Efficiency related Building Regulations: Part L** 17 April, Balham, London

### **18 April, live online**

### **Low Carbon Consultant Building Design** 17-18 April, live online

### **Mechanical Services Explained** 18-20 April, Balham, London

### **Low Carbon Consultant Building Operations** 20-21 April, Balham, London

### **ISO 50001:2018 Energy Management System / Low Carbon Consultant** 24-25 April, Balham, London

### **Electrical Services Explained** 25-27 April, Balham, London

### **Heat Networks Code of Practice (CP1)** 26-27 April, live online

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

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

## Membership webinars

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

To register for this and for all other membership webinars: [bit.ly/CJMar23memweb](https://bit.ly/CJMar23memweb)

**Upcoming webinars:**  
■ 7 and 14 March



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



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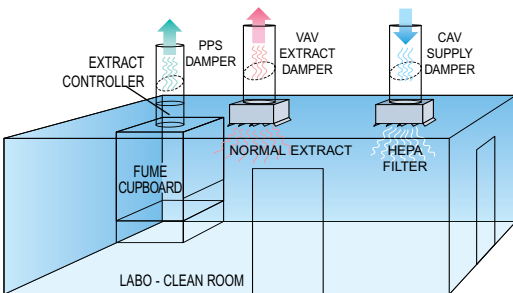


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