

# **CIBSE** **JOURNAL**

**#Build2Perform**

July 2021

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## **'THIS IS OUR ERA'**

**CIBSE'S new chief executive  
Ruth Carter on why engineers  
are taking centre stage**

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## Inclusive membership



International Women in Engineering Day was last month (23 June) and there was encouraging news on the growing number of women joining the engineering profession. According to EngineeringUK, women now make up 14.5% of all engineers in the country, which compares with 12% in 2018.

CIBSE's new CEO, Ruth Carter, says the recruitment of more women to the industry – alongside people from more diverse backgrounds – is an obvious way to close the industry skills gap. Echoing CIBSE President Kevin Kelly in last month's *Journal*, Carter says organisations would be foolish not to include the best talent on the basis of the way people look or behave.

'We need all hands on deck to make our industry great,' she adds.

Carter, who took over from Stephen Matthews in May, says she is keen to capitalise on what she sees as CIBSE's four areas of strength: its technical knowledge, certification, CIBSE Services, and membership (see page 22). She says the pandemic has meant people want more information, more often, and CIBSE has the challenge of providing 'hardcore' technical knowledge at an acceptable pace.

The Council will be more consultative under the leadership of Carter, and will reflect the views and opinions of the thousands of people who belong to CIBSE's wide range of Societies, regions and groups.

Members of the Council are already being consulted on the project to retrofit CIBSE's headquarters in Balham. Carter says she wants to tap into the expertise of Members to create a building that has net zero emissions and symbolises a modern, dynamic and exemplar engineering institution.

The retrofit of 1 Finsbury Avenue in London gives an insight into the challenge of refurbishing an existing building while reusing as much of the central plant as possible. Arup applied a process of 'test, appraise, use or abandon' to all existing plant, to ensure it was capable of functioning for the 15-year tenant lease period. This meant working with the original equipment manufacturers on site to survey the plant and provide recommendations on the work needed to extend its life. This fastidious approach resulted in 90% of the central plant being reused on the Grade II-listed building.

The recent fire at New Providence Wharf in London revealed issues around the building's smoke-control system and, on page 37, smoke-control experts share best practice on system maintenance. On page 40, engineers from Arup and the Fire Brigade look at how evacuation lifts could be used in tall buildings to provide another layer of protection to occupants.

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**Hywel Davies**  
Why the Building Safety Bill will only succeed if the procurement of buildings prioritises safety



**Roz Burgess**  
How CIBSE's TM50 Energy efficiency in commercial kitchens guide can save carbon and operating costs



**Peter Caplehorn**  
The voluntary Code for Construction Product Information aims to improve technical product information



**Tim Dwyer**  
This month's CPD looks at primary circuit design for commercial building hot-water systems

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# Overheating buildings will cause thousands of deaths

## Government must tackle overheating in building regulations, says CCC

The government's failure to address the challenge of adapting the built environment to climate change will condemn thousands of people to death in overheated buildings, according to a report by the independent Committee for Climate Change (CCC).

It urged the government to revise Building Regulations to tackle overheating in new and refurbished homes by introducing passive cooling measures. Since overheating was identified as a major risk in 2016, another 570,000 new homes had been built without climate-adaptation measures, said the committee, and a further 1.5 million were due to be built in the next five years.

'There is a major risk of lock-in if they are not planned and built to address overheating alongside energy efficiency and low carbon heating,' the CCC report added.

'Inaction now will create unnecessary

retrofit costs later, and could even leave many existing and new homes uninhabitable as temperatures rise.'

The committee said there were 2,500 heat-related deaths during the 2020 heatwave in England, higher than at any time since records began and, without mitigation measures, heat-related deaths would treble by 2050. The increase in the number of people now working from home would only make the problem worse, the CCC added.

Baroness Brown, chair of the CCC's adaptation committee, said policies aimed at achieving net zero did not address this problem because the climate was already changing, and would go on changing up to and beyond 2050.

'By better understanding and preparing for the coming changes, the UK can prosper, protecting its people, its economy, and its natural environment,' she added.

'A detailed, effective action plan that prepares the UK for climate change is now essential and needed urgently.'

## New 'future of SAP' report published

A report making recommendations on how to improve SAP and RdSAP for a net-zero future has been published.

*Making SAP and RdSAP 11 fit for net zero*, commissioned by the Department for Business, Energy and Industrial Strategy, was written by CIBSE, Elementa, Levitt Bernstein, WSP, University College London (UCL), Clarion Housing Group and Etude.

SAP is the calculation methodology used to estimate and regulate the energy and carbon performance of new homes and existing housing stock across the UK, from small works to large new developments.

The report summarises issues that it says should be addressed in the next version. These include current trends affecting housing, the energy system, technologies, and innovations such as performance testing and verification.

Its 25 recommendations are split into five areas: better alignment of SAP/RdSAP and its strategic objectives; improvements to the methodology; improvements to SAP/RdSAP and its ecosystem for net zero; a better evaluation of energy use; and support of decarbonisation of heat and electricity.

A CIBSE statement said: 'Implementing our recommendations would significantly assist the design and construction of net zero carbon-ready new homes and the low carbon retrofit of the existing housing stock.'

● Read the report at [bit.ly/CJJuly21SAP](https://bit.ly/CJJuly21SAP) For more information and any queries, contact CIBSE technical manager Julie Godefroy at [JGodefroy@cibse.org](mailto:JGodefroy@cibse.org)

## Housing added to benchmarking tool

CIBSE has announced the release of domestic energy benchmarks for its digital energy benchmarking tool.

The new benchmarks are available for a variety of properties, from detached houses to flats, electric-heated and gas-heated, and they represent the current national trends of energy use in homes.

Revised energy benchmarks for prisons and higher education buildings have also been made available on the tool.

This platform aims to gradually update and replace the energy benchmarks in table 20.1 of *CIBSE Guide F: Energy Efficiency in Buildings*.

Revised benchmarks have been introduced for the following building types: education – schools; entertainment; hospitals; local authority; offices; primary health care; public buildings; and sports and recreation.

Revised benchmarks are based on Display Energy Certificates analysed by UCL under a jointly sponsored project.

For more on the benchmarking tool, visit [bit.ly/CJJul21News1](https://bit.ly/CJJul21News1)



## Wolfson College to install heat pumps in decarbonisation drive

Wolfson College, Oxford is aiming to cut carbon emissions on its main estate by installing heat pumps and refurbishing windows with triple-glazed glass. The college is aiming to cut emissions from its estate by 75% by March 2022 and be net zero by 2030 at the latest.

Max Fordham completed the energy audit and decarbonisation plan. Senior partner Bill Watts said changing from single glazing and improving insulation would reduce building heat loss by 80%, while replacing gas boilers with CO<sub>2</sub> heat pumps would reduce the carbon footprint by 75%.

The government is funding half of the £10m cost through a grant aimed at decarbonising the public sector.

The planned refurbishment of the flat-roofed main buildings will see increased insulation and the installation of more photovoltaic panels, while all lighting will be upgraded to LED. A 1MWh electrical storage battery is planned to draw electricity at peak times.

Wolfson College expects that around 75% of the window-replacement programme will be completed by 2022.

## IN BRIEF

## Trade bodies dismiss F-Gas proposals

The ongoing review of the European F-Gas Regulation has come under attack from a group of international trade organisations.

The 15 bodies, including the UK's Federation of Environmental Trade Associations (FETA), are alarmed by the suggestion, made in a study commissioned by the EC, that hydrocarbon (HC) refrigerants could be used in up to 90% of small heat pumps by 2025, and in all large split air conditioners and variable refrigerant flow (VRF) systems by 2030. A ban on the use of R410A in new stationary air conditioners and heat pumps is also proposed.

The trade bodies claim the modelling used is lacking in detail, and that many of the changes would be economically unviable and ignore safety rules around flammability and toxicity that could restrict the use of alternatives. They also say the study did not consider the contribution of heat pumps to energy efficiency goals and reductions in carbon emissions.

The UK has agreed to mirror the measures in the F-Gas Regulation, which is due to be revised this year.

## Contractors must make net zero pledge

Contractors will be barred from bidding for public sector projects worth more than £5m unless they pledge to be net zero by 2050.

From September, they will have to provide a carbon-reduction plan showing the sources of their emissions and outlining their environmental management measures. The plan must be updated annually and published on the contractor's website.

## Professional institutions agree climate action plan

## Ten areas of work identified to help achieve UK's 2050 net-zero target

The Construction Industry Council (CIC) has launched *Carbon Zero: the professional institutions' climate action plan*.

Spearheaded by CIC's Climate Change Panel, and supported by professional engineering bodies, including CIBSE, the 10-point plan attempts to coordinate the efforts of all relevant

built-environment bodies to meet the UK government's 2050 net-zero emissions targets.

It identifies 10 areas of work, divided into short-, medium-, and longer-term priorities. The signatories have agreed to develop and publish an action implementation programme in time for the COP26 climate conference in Glasgow this November. They have also agreed to implement actions appropriate to them and support other institutions in delivering actions.

CIBSE technical manager Julie Godefroy said: '[The plan] includes significant steps that should deliver real progress towards net zero and climate adaptation, such as joint industry guidance, mandatory CPD, and working with higher education institutions.'

'The plan builds on our own CIBSE Climate Action Plan, first produced in 2019 and presented at the inaugural meeting of the CIC climate change panel. We look forward to continuing our work internally, with our members and other organisations.'



Balham HQ CIBSE

## Carbon reduction code published

A Carbon Reduction Code for the built environment has been published by the Construction Leadership Council as part of its 'Construct Zero' initiative.

The code appears on the website of the Cambridge Centre for Smart Infrastructure and Construction (CSIC) and is designed to support efforts to reduce emissions linked to design, construction, maintenance and operation of built assets.

A number of organisations are currently conducting trials of the code, and the CSIC believes collaboration will be crucial to the delivery of its aims. 'Carbon reduction is much more likely to happen when all organisations within a value chain are committed to working together to reduce their footprint and save costs,' said CSIC director Dr Jennifer Schooling.

The code was developed by the Achieving Net Zero Cross-Industry Working Group, formed in March 2020 to explore 'challenging yet practical ways to move the infrastructure and wider construction industry towards meeting the UK's goal of net zero carbon emissions by 2050'. It comprises around 40 representatives from consultants, contractors, industry groups and local and central government.

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## Building acted like 'broken chimney' in Poplar fire

**Managers urged to check smoke ventilation systems 'as a priority'**

The London Fire Brigade (LFB) said a high-rise residential block behaved like a 'broken chimney' when it caught fire, because of the failure of its smoke ventilation system.

The fire at New Providence Wharf in Poplar, London started in a fuse board, but escape routes were quickly blocked when smoke poured into the corridor through a flat door that had been kept open accidentally.

LFB investigators found that the smoke detectors in the 8th-floor communal corridor failed to operate the automatic opening vent (AOV) and the cross-corridor fire doors. They pointed out that it is the responsibility of the building owner or manager to make sure the AOV, which is designed to ventilate and extract smoke during a fire to help residents escape, operates correctly, and urged high-rise building managers to check smoke ventilation systems 'as a priority'.

The report concluded that the ACM cladding 'did not significantly contribute to the external spread of the fire', but that it was helped by timber decking on balconies. The LFB is asking all building owners and managers to check the materials used on balconies and modify them if required.

'The smoke ventilation system inside New Providence Wharf acted like a broken chimney, leading to a potentially life-threatening situation,' said deputy commissioner Richard Mills. 'Had it not been for the exceptional actions of our firefighters and 999 control officers, this could have had tragic consequences.'

Mills added that this incident needed to be 'an urgent wake-up call' for all building owners and managers – adding that, despite the lessons of the Grenfell tragedy, 'we are sadly still not seeing a culture change in all those responsible for fire safety in high-rise buildings'.

See page 37 for more on smoke control.

## Fitzgerald's Covid work recognised

CIBSE Royal Academy of Engineering Fellow Dr Shaun Fitzgerald has been made an OBE in the Queen's Birthday Honours for his services to the pandemic response.

Fitzgerald (right) worked closely with CIBSE from the early days of the emergency to provide guidance on the role of ventilation in reducing transmission of the Covid-19 virus. He was praised for providing clear and consistent advice to the public, in print, online and through the broadcast media. CIBSE said this had made a significant contribution to public understanding of the role of ventilation and the engineering profession in maintaining public health.

F-Gas pioneer Mike Nankivell has also been made an OBE for his services to the UK refrigeration and air conditioning industry. Nankivell is a former president of the HEVAC association, chairman of the FETA board of directors, president of the Heat Pump Association, and chairman of the Air Conditioning and Refrigeration Industry Board F-Gas Implementation Group. He is also a fellow of the Institute of Refrigeration. He retired from full-time work in 2015, after almost half a century in the sector, but remains a co-opted member of the ACRIB Technical Committee.



Dr Shaun Fitzgerald

## Covid-19 purifier ad banned by watchdog

An advert for an air purifier that claimed it was 'proven to destroy coronavirus cells' has been banned by the advertising watchdog.

The Advertising Standards Authority (ASA) said the claims for the Go-Vi Eradicator 19 purifier were misleading and could not be substantiated.

The advert appeared on a website called 'protect-nhs' run by the company, and not affiliated with the NHS. The ad claimed the £570 device was more than 99.9% effective at destroying the H5N1 bird flu virus, according to testing done in France. But the ASA said the average reader would be led to believe it was similarly effective against Covid-19.

Go-Vi disputed the ASA's challenge and provided reports that, it said, supported its claim. But ASA found this was not adequate proof that the product could destroy the virus, either on surfaces or in the air, or that it was better than any other method of ventilation.

ASA referred to guidance published by the government's Sage scientific advisory group saying that air cleaning devices 'had limited benefit' in places that had adequate ventilation and that they 'should be discouraged unless there was strong evidence of their efficacy'.

## School sprinkler plans are a 'safety lottery'

The government has been criticised for new plans stipulating that only schools more than 11 metres high must be fitted with sprinklers.

The Department for Education launched a consultation on building design for fire safety in schools, which will lead to the updating of Building Bulletin 100. The government wants to examine if more fire safety measures should be included and 'whether there is content that is no longer needed'.

But school insurance specialist Tilden Watson, from Zurich Municipal, said the plans would leave 'the vast majority of schools and pupils exposed to blazes'.

'By limiting sprinklers to schools above 11 metres, the government is, effectively, writing off a significant proportion of the school estate,' Watson said.

## Safety champions sign up to change culture

The Building a Safer Future (BSF) Charter has launched a 'Charter Champion' initiative to help companies identify building safety problems and develop continuous improvement plans.

It is hoped this will play an important part in averting tragedies such as the Grenfell Tower fire, 'where failure of leadership and culture were key underlying causes'.

Twelve companies have already signed up to complete the benchmarking and independent assessment process required to achieve 'Charter Champion' status.

## Coalition calls for heat-pump deal

A group of companies, energy suppliers, environmental campaigners and anti-poverty groups have backed a 'Fair Heat Deal' to manage the switch from gas boilers to heat pumps.

The coalition is urging the government to make sure heat pumps are affordable to install and operate for all households, and to provide them free of charge to low-income households. It says a Fair Heat Deal could help stimulate the heat pump market and, by accelerating take up, subsidies could be reduced quickly.

The Fair Heat Deal would include: removal of environmental levies from electricity bills to ensure heat pumps are cheaper to run; grants to equalise the cost of a new heat pump with a gas boiler; financial incentives, including zero VAT on green home products and installation; and green Stamp Duty to reduce the cost of low carbon homes. The group also wants a 'Warm Homes Agency' to train installers, create jobs and maintain standards to protect consumers.

# Planning for beauty is vague and 'unworkable', say MPs

## Committee criticises government for lack of detail in its proposed reforms

A group of MPs has urged the government to rethink its plans to shake up the planning system. The Housing, Communities and Local Government Committee said the proposal to 'fast track for beauty' – first proposed by the Building Better Building Beautiful Commission – should also be abandoned, dubbing it 'unworkable' and vague.

It criticised the lack of detail contained in the government's White Paper on the future of the planning system, adding that 'beauty was difficult to define' and 'must not detract from other important aspects of design'.

The committee said that, historically, the role of good design had been undervalued and too many new housing developments should not have been built because they were poorly designed and shoddily constructed. It called on the government to ensure local planning authorities were given the resources to employ



more specialists to help address design issues.

'The government's aim of developing a planning system that enables buildings to be built more quickly and with greater input from local communities is welcome, but it is far from clear how the current proposals will achieve this,' said committee chair Clive Betts, who criticised the 'three areas' proposal that makes assumptions for designated areas of renewal, growth and protection.

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# Transition period for product testing likely to be extended

**Government accepts 1 January deadline for UKCA compliance is unrealistic**

The government is planning to extend the post-Brexit transition period for new construction product certifications.

All products are supposed to be tested in line with the new UKCA standard by 1 January 2022, but after consulting with test houses and certification bodies, officials at the Ministry of Housing, Communities and Local Government have accepted that this is not realistic.

Currently, construction products carry the European CE mark and are due to be retested to meet the new UK standard, but thousands of products – including many structural steel, insulation, glass, and cladding systems – will not make the deadline.

UK legislators are continuing to accept the CE mark to designate that a product complies with health, safety and environmental rules, and it is likely that this will continue into next year – and possibly beyond.

Engineering services body Actuate UK said the shortage of approved bodies and testing facilities made it impossible to get all products UKCA accredited in time. It estimated that as much as 64 years' worth of testing would need to be carried out over the next six months.

'The issue affects a vast swathe of products, and it could lead to cancellations, delays and contractual problems for the supply chain and its customers,' it said in a statement.

# UK CA

## Construction will need 217,000 more workers

The Construction Industry Training Board (CITB) says the sector will have to recruit another 217,000 workers by 2025 to meet demand, because the economic recovery is moving faster than predicted.

Its Construction Skills Network has revised up its earlier predictions and now expects the industry to rebound to 2019 levels of output next year – three years earlier than forecast. This will drive up demand for a wide range of skilled tradespeople, including interior fit-out workers, construction managers, and electrical installers.

The Midlands, along with Scotland and Wales, are expected to see particularly strong demand, with only one region – the North East – seeing a slight decline.

Office-based professionals and IT support workers are also expected to be in high demand over the next two to three years – and there will need to be greater investment in training for specific digital and low carbon skills, according to the CITB.



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## IN BRIEF

### BDP appoints Fairham as CEO

Nick Fairham has been appointed as chief executive by BDP and will take over from John McManus, who is retiring later this year.

Fairham studied at the Bartlett School of Architecture and joined BDP in 2006. He is currently responsible for leading the Bristol, Cardiff and MENA studios.

'As BDP prepares to celebrate its 60th anniversary, this is an exciting time to take up the role of chief executive,' he said.

### Yates succeeds Beattie at FETA

Chris Yates has been appointed as the new chief executive of the Federation of Environmental Trade Associations (FETA). He will take over from Russell Beattie, who has been in the post for seven years, in September.

Yates has worked in the low carbon and renewable heating and ventilation sector since 1998 and, most recently, has been running the Corgi brand licensing business. He has worked for the Energy and Utilities Alliance and was a steering group member of the Microgeneration Certification Scheme. He is also a former chair of Oftec.

### More women working in engineering

The number of women working in UK engineering occupations rose by nearly 26% between 2016 and 2020, new data from the Labour Force Survey has revealed. The number of women engineers rose by almost 200,000, from 721,586 in 2016 to 906,785.

The proportion of women in engineering has also risen. Women now make up 14.5% of the workforce compared with 12% reported in 2018, according to EngineeringUK.

Dr Hilary Leever, chief executive of EngineeringUK, said: 'It's encouraging to see nearly 200,000 more women working in engineering over the past four years – something for us to celebrate on International Women in Engineering Day [23 June]. Nevertheless, the fact that women represent only 14.5% of those working in engineering is a serious concern.'

# SMEs' mental health epidemic

## Late-payment problem adding to stress despite construction sector's recovery

The economic recovery is concealing a growing mental health epidemic among small and medium-sized enterprises (SMEs) in construction, according to a new online survey carried out by YouGov.

Despite an upbeat forecast for growth across the UK economy this year, and a rapid recovery for construction and its related sectors, firms are continuing to report serious conditions among workers, including panic attacks, insomnia and depression.

Employees in construction SMEs are more than twice as likely to have suicidal thoughts as people employed in other sectors.

Displays of extreme anger resulting from late payment are also 50% more likely in SME construction firms than in businesses of a similar size in other industries, according to the survey.

Rather than improving the situation, the speed of the sector's recovery seems to have added to the stress experienced by many construction SMEs, with the perennial problem of late payment often to blame.

The survey, commissioned by the Building Engineering Services Association and the Electrical Contractors' Association during Mental Health Awareness month (May), revealed a strong link between late-payment practices and serious mental health issues.

It showed that extreme responses, such as suicidal thoughts, depression and panic attacks, in construction SMEs are now 6% higher than in sectors experiencing a slower economic recovery.

More than a third of respondents to the survey reported chronic mental health conditions in their workforce. The rise in mental health problems also increases physical health and safety risks, putting even more lives in danger, the survey found.



Construction workers are more than twice as likely to have suicidal thoughts as workers employed in other sectors

## PV capacity to double in a decade

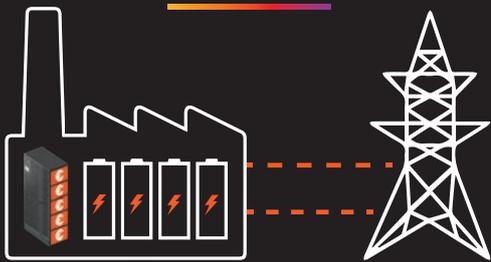
UK solar PV capacity is set to more than double over the next decade, but is still not going fast enough to meet net-zero targets, according to Solar Energy UK.

In a new report, the trade body says an additional 40GW of solar capacity developed this decade would deliver 13,000 new jobs, £17bn in additional economic activity, and a 4.7% cut in total UK carbon emissions. It adds that this level of progress is needed to meet the recommendations of the Committee on Climate Change.

The report also looked at how improving building standards for homes and commercial buildings, along with funding of solar retrofits, could help the country hit its carbon targets.

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Scale With Confidence

## New entry process for Building Performance Awards 2022

The 2022 CIBSE Building Performance Awards have launched with a new standardised data entry format for project categories, to allow data from buildings entered to be included in the CIBSE Energy Benchmarks.

Hywel Davies, CIBSE technical director said: 'The new forms make clear what we are asking for and make it easier to provide. Sharing the data is optional, but those who are willing to share ensure that the accumulated understanding around each building adds to industry knowledge.'

The awards recognise and reward the proven performance of buildings in use, rather than their design intent. The awards include categories to recognise the best consultancies, individuals and teams, but the highlight of the event is always the exemplar buildings in the project categories.

In another change this year, the awards no longer separate building types. Instead, entries are encouraged for all projects, with judges selecting the best overall submission using the newly standardised data to make fair comparisons between buildings with very different purpose and function.

For details on the new template, see 'Making data count', *CIBSE Journal*, May 2021. The closing date for entries is 1 September, and the awards will be held on 24 February 2022.

For the full list of categories, and to enter, visit [www.cibse.org/bpa](http://www.cibse.org/bpa)

## New SLL President calls for increased diversity

**Dr Ruth Kelly Waskett pledges to continue the work of former SLL president Liz Peck**

Dr Ruth Kelly Waskett has been appointed as the new President of the Society of Light and Lighting (SLL), taking up her role at the SLL AGM in May.

In her Presidential address, Kelly Waskett acknowledged that, while the SLL looked forward to Covid-19 restrictions being lifted, the increase in virtual Society events has made them more accessible to members and the lighting community globally. She said the SLL intended to build on this increased reach by continuing to host online events.

Acknowledging the importance of daylight in the Society's work, she said: 'One of the key roles that SLL has is to ensure that the importance of daylight in buildings is kept high on the agenda of any design guidance in the built environment. The SLL is in a unique position to be able to talk about daylight and artificial light, as part of the same continuum.'

Kelly Waskett said she wanted to continue the legacy left by previous SLL president Liz Peck, who died in 2020, with a focus on increasing the diversity of SLL membership.

The SLL must increase its visibility to connect with all who work in lighting, said

Kelly Waskett. Taking a lead from the Women in Lighting project, she added that the Society would work towards ensuring a 50/50 gender split for speakers at SLL events. The team behind the Women in Lighting project will be publishing a selection of interviews and videos from women within the SLL.

Along with improving inclusivity, diversity, and representation for the SLL, Kelly Waskett highlighted the Society's responsibility in spreading the message about light and health. She concluded with a rallying call for unity. 'Let's go forward together in hope of a brighter year ahead,' she said.

Dr Ruth Kelly Waskett



## Could you be a future Officer, or Board or Council Member?

There's no better way to make a contribution to our profession than to be a member of one of the bodies that shapes its future. We know we will only maintain our position at the forefront of the industry if we continue to champion new ideas and provide a platform to those who seek to inspire change.

That's why, this year, we are actively seeking participation from members who may not have considered nominating themselves before to take office at the AGM in May 2022.

You can nominate yourself to the Board or the Council, or suggest a colleague who would like to be considered and who you believe meets the eligibility criteria.



Kevin Mitchell will be CIBSE President in 2022

**The Board** is the Institution's governing body. It is made up of the seven Officers – President, president-elect, three vice-presidents, honorary treasurer and immediate past-president – and five elected members. Under the new arrangements, the vice-presidents and honorary treasurer are appointed by

the Board, but the president-elect and board member positions may be subject to election if there are more candidates than vacancies.

**The Council** is a much larger consultative body that advises the Board on Institution policy. It is made up of representatives of the regions, Societies, groups and Standing

Committees, and has a number of places for elected members.

Your nomination for the Board or the Council will be considered by the nominations panel, which will make recommendations to the Board. If your board nomination is not progressed by the Board, you can ask for 10 Corporate Members to support you to take part in a ballot to members.

Remember that the nominations are open to all members who fulfil the eligibility requirements. CIBSE is actively seeking nominations that reflect the breadth of our membership. We would particularly encourage anyone who feels people with their background, heritage or life experiences are currently not represented at Board or Council level to come forward.

Details on the process, role descriptions and eligibility requirements can be found at [www.cibse.org/nominations](http://www.cibse.org/nominations) along with the nominations application form, which must be completed for all candidates. It must be submitted by Monday 30 August 2021.

# For the record

Have you been wanting to improve your CPD records but struggle to find the time?

Stephen Page, from CIBSE's CPD panel, provides some useful tips for recording your CPD

**A**s a member of an accredited institution and a practising qualified engineer, the recording of continuing professional development (CPD) is a vital aspect of your personal development.

Most professional institutions recommend from 30 to 50 hours of CPD annually, with those registered as Low Carbon Consultants or Low Carbon Energy Assessors required to complete a minimum of 21 hours. This shouldn't be considered as a target – it's the quality, not the quantity, that counts.

The most crucial aspect to undertaking CPD is to be reflective. This can mean discussing what you have learned with a colleague or, if you've been on a structured course, presenting the findings back to your team. This will benefit you, as well as your peers, by enabling you to absorb more knowledge.

Using a reflective approach should help to highlight subject areas that require further study and this can, in turn, help you to build your development goals and objectives.

I've been a member of the CIBSE CPD Panel since 2013 and, in that time, we have ramped up the number of



members selected at random that have their CPD records reviewed each year.

There is a section in the MyCIBSE portal to record CPD. CIBSE is currently looking at making this more mobile-friendly.

CPD hours don't always need to come from a structured course or a CPD-approved webinar. I recently took a report-writing course to conduct my first expert witness project. I then sat with a colleague who wanted to brush up his skills ahead of a report he was working on. I was able to add the CPD hours passing on this knowledge.

CPD activities can also include learning a language. During my time working in Egypt,

I learned the daily pleasantries, making it much easier to break the ice with the local team of consultants, contractors and clients. Although I didn't record this in my CPD log, if I'd taken an Arabic language course and began to speak with technical terminology it certainly would have contributed.

● For detailed guidance on CPD activities and how to record them, visit [cibse.org/cpd](http://cibse.org/cpd)

■ **STEPHEN PAGE** is a principal mechanical engineer at Brinson Staniland Partnership

## Lighting community celebrated at annual awards



Florence Lam FSLL has been awarded the 2020 Society of Light and Lighting (SLL) President's Medal at the annual SLL Lighting Awards.

Lam, who was the first woman to be named Lighting Designer of the Year by the Lighting Design Awards and received the SLL Lighting Award in 2014, was recognised for her significant lifetime contribution to lighting.

Lam started her career in lighting by studying engineering at Cambridge. She then undertook the Bartlett MSc in lighting design before co-founding a specialist lighting team at Arup, which has grown to more than 120 designers across 12 countries.

At the online awards, the 2021 SLL Jean Heap Research Bursary was awarded to Jeevun Grewal, for his research into non-visual responses to light and, specifically, wellbeing and sleep-wake cycles.

Two technical awards were presented for best published papers in *Lighting Research & Technology (LR&T) Journal*. The 2020 Leon Gaster prize went to Timur Dogan and Daniel Park for their paper *Testing the residential daylight score: comparing climate-based daylighting metrics for 2,444 individual dwellings units in temperate climates*. The Walsh Weston award went to Adrie de Vries, Jan Souman and Professor Yvonne de Kort for *Teasing apart office illumination: isolating the effect of task illuminance on office workers*. Both papers are available to members at [bit.ly/CJJul21CN1](http://bit.ly/CJJul21CN1)

Other awards presented on the night included: SLL Regional Award – Katerina Konsta MSLL, for her contribution to the North West region; 2020 Lighting Award – John Aston FSLL, for outstanding service to the Society; and Honorary Fellowship of SLL, awarded to Professor Geoff Cook, former chair of the *LR&T* editorial board, for his significant contribution to the Society and the wider industry.

## IN BRIEF

### Don't miss closing date for membership

The next opportunity for those based in the UK to apply for the Associate (ACIBSE) or Member (MCIBSE) grades, with IEng or CEng registration, is fast approaching. Applications should be made through our online portal before the 1 August deadline. For further information on how to apply, visit [www.cibse.org/closingdate](http://www.cibse.org/closingdate)

### CIBSE members win at WICE Awards

CIBSE members Mike Burton and Jennifer Cox have both won at the Women in Construction and Engineering (WICE) Awards.

Cox, an electrical engineer at Aecom, and CIBSE Graduate of the Year in 2020, won the award for Best Young Woman Engineer.

Burton, director at Aecom, won for Best Male Mentor.

The WICE awards acknowledge and celebrate the achievements of women in the construction and engineering sectors.

# Bridging the procurement gap

The long-awaited Building Safety Bill will create a new regulator and make radical changes to the way we build. It will create a new safety regime for around 12,000 residential buildings – but is it enough to change the way we build, asks Hywel Davies

The Draft Building Safety Bill is a foretaste of the new world of building safety regulation. The building safety regulator (BSR), based in the Health and Safety Executive (HSE), will have new powers for many residential buildings in operation. This includes a new statutory role of building safety manager (BSM) for all residential higher-risk buildings, sometimes referred to as ‘buildings in scope’. As well as a BSM, they must have a safety case that persuades the regulator the building is safe to occupy and its management systems are adequate to keep it that way. They will also need to adopt the ‘golden thread’ (see details at [bit.ly/CJJul21HD](https://bit.ly/CJJul21HD)), and to show they have the information about their building to support its safe occupation and operation.

Beyond the 12,000 or so buildings in scope, a new system of competence assessment and recognition will apply to all building professionals of all disciplines working on all buildings, with a growing focus on regular, relevant, robust and meaningful continuing professional development and regular revalidation of professional registrations. New statutory duty holders will be introduced for all buildings, with a principal designer and a principal contractor role, extending the scope of current construction design and management requirements.

There are changes to the building control system too,



intended to level up standards across public and private sectors and drive greater focus on delivering safe outcomes from construction or refurbishment works, whatever the building and whoever the building inspector. The new regulator will control enforcement, with a clear remit to deliver meaningful and effective enforcement action that increases the risks and penalties of being caught and enforced against.

At present, there is a widespread lack of awareness of these changes. It seems that many think the whole building safety programme only addresses residential buildings over 18m or six storeys high. Many seem totally unaware of mandatory CPD, new duty-holder roles and the new regime. There is a real gap between the reality of what is proposed and general understanding in the industry.

But there are other gaps. It is common practice for invitations to tender to say that bidders must meet all relevant legislation and regulation. This is fine in theory, but if the client does not understand the requirements of the new regime, they cannot assess which bidders understand it – let alone whether they comply with it. If work is awarded to bidders who failed to price for working to the new regime, the contract price will simply be inadequate. And we all know where that leads: corner-cutting, cost-cutting and another lap of the ‘race to the

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



**Staff  
Stock  
Service**



Davies: If clients do not understand the new regime requirements, they cannot assess which bidders comply with it

“There is a real gap between the reality of what is proposed and general understanding in the industry”

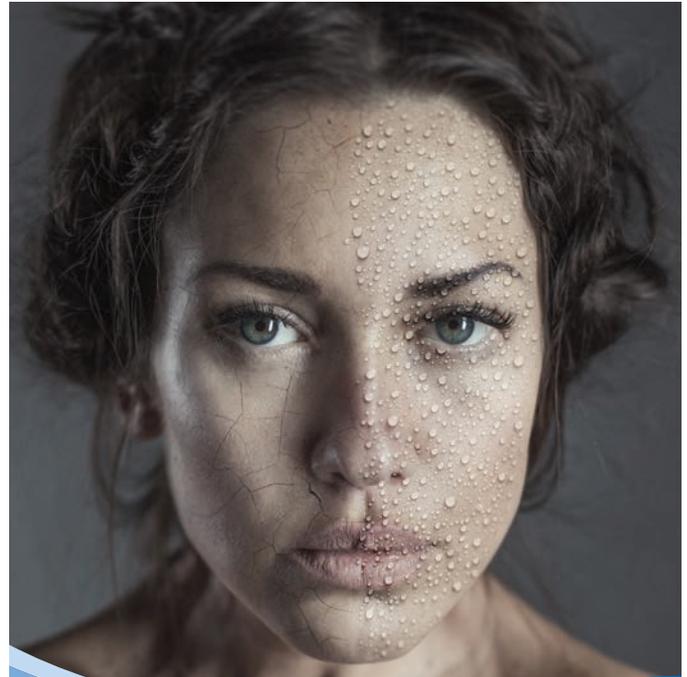
bottom’, as Dame Judith Hackitt described it. It will not improve the prospects of safe outcomes or a robust golden thread from the project.

As well as client awareness, there is a real gap between how bids are evaluated and the requirement for safe outcomes. Quite simply, how many invitations to tender will articulate any requirement to deliver safe outcomes? And how many will evaluate bids against the potential to deliver safe outcomes that are compliant with the new regime?

Unless there is a real change in the behaviour of clients, the supply chain will struggle to fully adopt the changes set out in the draft bill. Indeed, unless clients are seen to be rewarding those who seek to comply with the new regime, and those that do not comply experience commercial disadvantages from their non-compliance, this will be another burden on the law-abiding.

In addition, unless clients are clear about what they need to get from the supply chain, and are clear about getting it, they will have real problems satisfying the regulator that their building is safe.

Unless the procurement of buildings prioritises safety and demands the data that underpin safe management of the occupied asset, it is very hard to see how the Building Safety Bill can succeed. CIBSE members will need to be very clear in their advice to clients, and fully informed about the bill and its requirements.



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# Code aims to clear a path to safer buildings

Following recommendations in the Hackitt Review to improve product marketing information, the Construction Products Association has developed a code to drive up standards, as Peter Caplehorn explains

The importance of Dame Judith Hackitt's Independent Review of Building Regulations and Fire Safety will not be lost on all those working in the built environment post-Grenfell. Her review, and the subsequent public inquiry into what went wrong at Grenfell, has made clear the need to address the marketing practices of construction product manufacturers. We must have more robust frameworks to encourage transparent and accurate product information.

To address the relevant findings of Dame Judith's report, the Construction Products Association (CPA) established its Marketing Integrity Group (MIG) in 2018. We appointed Siderise CEO Adam Turk to chair the group and help drive through change in marketing practices and how product information is presented. A team of marketing and technical experts, with extensive knowledge and experience across different building materials sectors, was brought together, along with representatives from government and trade bodies and professional organisations.

After an initial Call for Evidence Survey in 2019, MIG set about creating a new code of conduct, to ensure information from construction products manufacturers is robust, reliable and accurate. Whether written in a brochure, a presentation or on a website, or said in conversation, the code would help to provide users of product information with accurate, factual information when making decisions about specifying or installing products.

The result of this work is the Code for Construction Product Information (CCPI) and its 11 Clauses (see panel right), which tackle many important areas, from responsibility for product information, to transparency of performance, proof of stated claims, general information and competency. The CCPI is built around five 'acid tests', derived from the Call for Evidence Survey, in which most people told us that, to be trustworthy, product information must be clear, accurate, up to date, accessible and unambiguous.

The code was put out to industry for a further sense



"Good product information on its own is not enough; those that use them must be competent to do so"

check in a new consultation earlier this year. Respondents represented a cross-section of product sectors, and included 35 trade and professional organisations. Nearly all of the industry groups (97%) said it was very or fairly important for members to comply with the code, with these respondents also rating all 11 Clauses high for relevance to their members.

Among providers, 87% thought it was very or fairly important to their organisation to comply. The majority of respondents – 94% of trade and professional bodies, 93% of providers and 83% of users – said the code met their expectations completely, almost, or in part.

Comprehensive feedback also highlighted a number of valuable suggestions for each Clause, which have been taken on board to finalise the code before it is handed over to Construction Product Information (CPI) – an independent, not-for-profit organisation set up by the Considerate Constructors Scheme to administer and manage the CCPI when it is launched later this year.

While the code will be voluntary, there will be encouragement to join and achieve widespread compliance. The alternative could be something devised and imposed by the government, developed with minimal input and involvement from the industry.

The aim is that organisations will insist on only working with code-compliant manufacturers. We have already heard this intention from a number of businesses, including many of the leading main contractors and specifiers – but also from key clients, keen to ensure their contractors are only using products for which the performance can be trusted.

We anticipate and hope that this will include government, and cover all forms of publicly procured construction work. This will ensure that the majority of firms will have to become code-compliant and focused on good practice in order to remain competitive.

The CPA initiated the thinking behind the CCPI, but it will be for CPI to take the scheme forward and set up its operational functions and auditing processes. Amanda Long, CEO of the Considerate Constructors Scheme, will

**PETER CAPLEHORN**  
is chief executive  
of the Construction  
Products Association

be driving this, and I'm confident the scheme is in capable hands. Long and her team have already been developing a robust and independent assessment and verification process that underpins the CCPI.

CPI is aiming to launch its new CCPI website by the end of July, and its task will be to demonstrate how code compliance can add real value to businesses – something the team behind the scheme is already doing.

To minimise the internal cost of compliance for manufacturers, CPI is designing its assurance process and tools to share common data across a group of companies, brands and product sets, ensuring minimal duplication of data input. It will also be working with industry bodies and trade associations to create a database of regulation, standards, certification, classification, and codes of practices, to automate verification of product-set compliance as far as possible.

I'd encourage all those interested to visit [www.buildingsafely.co.uk](http://www.buildingsafely.co.uk), where you can find blogs from Amanda Long on the set up of CPI.

I believe the CCPI will achieve meaningful and permanent change in our industry, providing users of construction products with information they can trust.

This work, however, must go hand in hand with the activity of Working Group 12 – a sub-group of the Industry Response Group's Competence Steering Group, which is led by the CPA and aims to raise the bar on competence in the use of, and interaction with, construction products.

Simply put, good product information on its own is not enough; those that use them must be competent to do so, understand what they are reading, and be able to apply the performance information appropriately.

The CCPI is simply one, but nevertheless crucial, part of how we can drive safer building performance and ensure tragedies such as Grenfell never happen again.

■ CIBSE will shortly offer advice on supporting the delivery of accurate, unambiguous product information.

## THE 11 CCPI CLAUSES

1. Have a sign-off process for creating product information
2. Have version control for all product information
3. Do not use misleading or ambiguous wording, phrasing or imagery
4. Back up any claims of compliance to – or achievement of – any certification, classification or industry standard
5. Verify performance claims that are outside of this
6. Make available descriptive and physical characteristics of the construction product
7. Ensure the product information is consistent with the product supplied
8. Make information relating to handling, installation, operation, maintenance and disposal of construction products accessible
9. With regards to guarantees and warranties, be clear about what is covered, excluded and required
10. Make technical helpline contact information visible
11. Ensure your people are competent to the level of knowledge required for their role.

# SCA webinar series covers key themes

Common escape routes and CFD design of smoke systems are among topics hosted by the Smoke Control Association, says **David Mowatt**

The Smoke Control Association (SCA) is to host a series of CIBSE-certified CPD webinars featuring speakers with expertise in the field of life-safety smoke ventilation systems.

These free-to-attend sessions, hosted on Zoom, have been pitched to have broad appeal, and will be of interest to building consultants, engineers, contractors and designers. CPD certificates will be issued as downloads and each webinar will run for approximately 50 minutes. The four webinars are listed below. Email [chrisb@feta.co.uk](mailto:chrisb@feta.co.uk) with 'SCA webinars – CIBSE Journal' in the subject line, and highlight the webinar(s) in which you are interested.



### Guide to common escape routes in apartment block buildings Tuesday 20 July, 12 noon

As well as describing appropriate types of products and installations, the webinar will clarify the BS/EN standards to which smoke-control systems must adhere to meet competency and compliance standards. It also covers what designers and building inspectors should consider for fire and smoke control in apartment blocks.

### Guide to CFD design of smoke systems Tuesday 27 July, 12 noon

Developed by SCA members involved in designing smoke-control systems for buildings or car parks, to ensure that they perform as intended. It will provide an overview of the CFD design on smoke flow within a building to optimise the location of smoke-removal products and highlight the importance of using competent designers.

### Guide to smoke shaft acceptance and testing Tuesday 10 August, 12 noon

This webinar will discuss the commissioning process for smoke-shaft systems commonly installed as part of a fire-engineered approach to safety in buildings, and the key data that should be recorded.

### Design of car park smoke-control systems by CFD Tuesday 14 September, 12 noon

This webinar will provide an overview of the design of smoke-control systems for underground car parks, detailing the products used and the use of CFD in car park system designs.

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



# Repeat performance

For adoption of offsite manufacturing to succeed, products should be combined to form components that can be replicated from project to project. Ramboll's Chris Soley explains the value of componentisation

Offsite manufacture and pre-fabrication yield savings in programme, cost and waste. However, we've probably all had projects where the aspiration for bathroom pods is scuppered by the sequencing of the façade installation; where the cash flow required to prefabricate façade panels isn't viable; or where the MEP can't be built offsite because the design isn't finished early enough in the programme.

Perhaps the key is to move away from a binary view of whether to manufacture packages offsite and, instead, look for opportunities for 'componentisation'.

The idea of componentisation was first applied to software design more than half a century ago. Code is broken down into reusable components at every opportunity and combined to form a functioning program. This approach is embedded in pretty much every bit of software you use. It is one of the reasons people can develop the variety of applications they do, at the cost that they do.

In the construction industry, we have an ever expanding range of products at our disposal, and are pretty good at using these to develop more and more complex systems that meet the needs of a modern building. An enlightened design team might undertake reviews at the start of the project to ensure we don't miss offsite opportunities, but until we start seeking opportunities to componentise these systems, we are leaving value on the table.

Instead of creating systems out of products, we should first ask ourselves where we can combine products to make optimised, repeatable components to replace parts of our systems. This not only creates opportunities for offsite manufacture, but manages complexity to enable us to design better and get the most out of our digital tools. You probably already do this with 'typical details' – you just don't call them components.

At Ramboll, we started our componentisation journey looking at risers (zones for vertical MEP distribution), which are a common target for offsite manufacture, are complex, and affect the usable area of a building. A single chilled water riser, for example, will include pipes, various products (valves for example), insulation, and access zones. We develop staff to have the knowledge and experience to know how to coordinate all these



"We should ask where we can combine products to make optimised, repeatable components to replace parts of our systems"

products efficiently into a space, in an installable and maintainable way.

Every building is different, so every riser is different. However, the approach to how we design a riser, given a set of inputs and constraints, is generally the same – so there is an obvious opportunity to think of a riser as a component that is consistent across all our projects.

For a developer or client, change and iterating through options create exceptional buildings. As engineers, we want to accelerate the rate at which we get 'front loaded' information to our clients, but abortively redesigning elements in detail leads to fees that don't offer a client value, and 'rules of thumb' don't generate the lean buildings we want to provide. Componentisation offers the ability to go further, faster, by reducing complexity to leverage digital tools. If a MEP riser is a component that automatically sizes itself based on its performance requirements and available riser depth, we can rapidly and parametrically assess options without losing detail.

Risers are just one of many elements that an architect needs to coordinate a building. Collaboration is key and componentisation allows the designers of a building to exchange components digitally, for others to coordinate with

their work. An engineer passing a movable component to an architect in Revit or Rhino seems more effective than the awkward dance of trying to interpret each other's information and agree a compromise.

In a lot of cases, components can be defined long before the design is complete. This will allow integration with supply chains and contractors to optimise the performance and buildability of the components, understand cost and cash-flow considerations, and incorporate specific logistical requirements.

For inspiration, let's look to the automotive industry. A modern car maker produces a vast array of car 'recipes' from relatively few 'component' ingredients. For example, Volkswagen uses standardised components (its MQB platform) to make hundreds of different cars under 12 brands across 125 factories.

We, too, have the skills to be better, and to create unique and exceptional buildings out of common optimised components – we just need a change of gear.

## CHRIS SOLEY

is director, buildings: MEP and sustainability, at Ramboll



# OUR TIME IS NOW

CIBSE's new chief executive, Ruth Carter, says the Institution is on the cusp of an exciting new era, in which building services engineers will be integral to the creation of a new generation of net-zero buildings that will put occupants first



**C**IBSE's new chief executive, Ruth Carter, believes she couldn't have taken charge of the Institution at a better time. 'Building services engineers have come of age,' she says. 'Everything CIBSE stands for is coming front and centre, whether through environmental governmental pressures or consumer pressure. This is our era.'

Carter succeeded Stephen Matthews at the helm in May, and speaks enthusiastically of how CIBSE can lead delivery of the safe, net-zero carbon buildings required to meet new carbon emissions targets and building safety rules. 'Suddenly, the emphasis isn't just about making a building beautiful or cost-effective, it's about creating a building that performs. We're at the front of that wave,' she says.

To ensure CIBSE grasps its opportunity to bring engineering to the fore in net-zero building design, Carter is intent on creating a modern, exemplar, professional engineering institution that can respond to the needs of the building services community.

She says her first task as CEO is to understand what that means by listening to CIBSE communities, within and outside the Institution, and working out how best to serve them.

One thing she is clear about is that CIBSE is in a position of strength; Carter says the Institution came through the pandemic and lockdowns 'phenomenally' well: 'We were strong in how we facilitated the objectives of our community, and the way we quickly flipped into a

digital environment was overwhelmingly positive. This is not a burning platform. It's a great place to be.'

Alongside its depth of knowledge, CIBSE's communities are one of its greatest strengths, says Carter. 'I love the concept of community and tribe. People like to belong to a sizeable community. The feeling of safety, power and reach. But people also like to belong to elite, niche, agile tribes that can react quickly and seize opportunities. We have that combination with the CIBSE umbrella providing community and our Societies, groups and regions providing the agile tribes.'

Carter has worked with business communities for much of her career as a senior manager in the events industry. She has been managing director of three high-profile companies in the sector – EMAP, UBM Conferences and, most recently, Telegraph Events. She believes there are great similarities between the commercial events business and the role of CIBSE, in that both involve serving communities in the most impactful way possible.

CIBSE may not have the same commercial pressures as for-profit organisations such as Telegraph Events, but Carter says healthy finances are still key. 'Unless we're feeding the funnel with income, we can't do the things,

as a charity organisation, that we want to do,' she says. 'We want profitable growth.'

One of the biggest challenges of her role is making sure CIBSE focuses on those areas that have the greatest impact. 'Prioritising can be a nightmare when there are so many good things you could be doing,' Carter says. 'Everything must be impactful.'

To understand the needs of CIBSE communities, Carter will be lifting the lid on different parts of the organisation over the next three to six months. There will be no rush. 'Make snap decisions about value, people and structure at your peril,' she warns. By 2022, Carter says there will be a clear roadmap, and a plan to ensure the infrastructure is in place to realise CIBSE's objectives.

She predicts 20-30 streams of activity, each tracked with key performance indicators. 'Some will be sprints, some will be ambles, while some will sit quietly, waiting to be triggered at a later date,' she says.

While Carter will take time devising a strategy for CIBSE, she has a firm idea where opportunities lie: technical information; CIBSE Services, certification; and the membership.

### The source of truth

CIBSE's reputation as a knowledge provider and 'source of truth' offers it huge advantages, says Carter. 'At the pace the environment and societies and communities move, hardcore, deep, rich knowledge and content is always going to win.'

The opportunity will be to repackaging the information in different ways for different communities. Sometimes, this might mean putting out information more quickly. 'The past 18 months have changed the pace of information requirements. It's about responding to that need and providing quality at an acceptable pace.'

There are also many opportunities in CIBSE Services, says Carter, in part because so much of what's offered – such as events and CPDs – is attractive both to members and the wider industry (non-members make up 55% of users). 'We have a really good route to a wider community, and there are markets in terms of different sectors, functions and products. We can provide solutions that will help people do their job more effectively.'

Members are the bedrock of CIBSE, and Carter acknowledges that there is a really good membership team in place doing a 'fantastic job'. Automation, she adds, could potentially allow the team to have more personal interaction with regions and groups.

Carter is keen to ensure the CIBSE groups, regions and Societies continue to be recognised and listened to. 'We need to think about those niche small tribes in CIBSE and understand they all have a voice. We need to find a way of capturing discussions and ensuring information isn't static.'

She cites the example of a regional presentation on bullying in the workplace that she believes deserves wider attention. 'We need to be sharing that presentation. We need to capture it and spread it across the membership base, so that timely, relevant information is at people's fingertips.'

## "I love the concept of community and tribe. People like to belong to a sizeable community. The feeling of safety, power and reach"

Carter is also keen to funnel ideas and information from CIBSE's communities. 'Their strength is proximity to members. Let's tap into their expertise and the 22,000 individuals they represent,' she says.

A more consultative Council, which represents these communities, is one way of drawing on expertise from across CIBSE, adds Carter, who believes that Council meetings are a good opportunity to put problems to experts representing CIBSE communities.

'At the last Council, we broke people up into groups and they came up with really interesting suggestions and ideas. We had people heading up different regions and societies in the same room, which really sparks debate and a creative way of thinking.'

Opinions of the Council will be sought for the refurbishment of CIBSE's Balham headquarters in London, although Carter says not 'every' opinion can be taken on board. 'If we have a thousand ideas, we may end up taking a handful of them – but, by doing so, we will have a better result,' she says.

CIBSE must accommodate a broad range of people representing society, says Carter. 'We must make sure we don't have that homogenised board – not only physically, but also behaviourally.' >>



» She believes that change put in place at CIBSE can spread into the membership and radiate out into the sector. 'The issue is about accommodating people with different ways of operating and different beliefs. We have to foster inclusion and belonging.'

Organisations would be foolish not to include the best talent on the basis of the way people look or behave, Carter adds. 'We need all hands on deck to make our industry great. We talk about skills shortages in the engineering sector; why wouldn't you welcome everybody you can?'

Young engineers will also be an important feature of CIBSE under Carter's stewardship, and she is keen to give young people the training and support that will prepare them for their future careers.

'There's nothing more exciting than crafting young talent. I'd like to see a mirror CIBSE board that will give people under 25 a taste of hardcore decision-making while nurturing and steering them in the right direction,' she says.

Even though young engineers will be busy developing their careers, Carter is keen to get them involved. 'I'd rather someone who is young, hungry and talented spare me a bit of time than none at all,' he says.

CIBSE's strategy under its new chief executive will be unveiled in time for the Institution's 125th anniversary next year, an occasion that Carter is looking forward to celebrating. 'Our 125-year anniversary is a phenomenal platform for ensuring our voices are heard,' she says. 'Next year will be our year.' 

BALHAM HEADQUARTERS



One of Ruth Carter's first tasks as chief executive is to oversee the refurbishment of CIBSE's headquarters in Balham - and she says the retrofit will be an exemplar net-zero project.

'The building has to reflect who we are - a modern dynamic and exemplar engineering Institution - and be the heartbeat of the community,' says Carter.

However, she is keen that the retrofit be within the budgets and skill sets of typical organisations. 'We could create the space station of the future because we've got the technology and know-how, but are we creating something that's out of reach of humans?'

It needs to work for CIBSE Balham, the membership, and the wider community it serves, Carter adds.

'It's about creating something that, when someone comes to CIBSE Balham, they think: "Wow I could do this," not "wow, but I could never afford this."'

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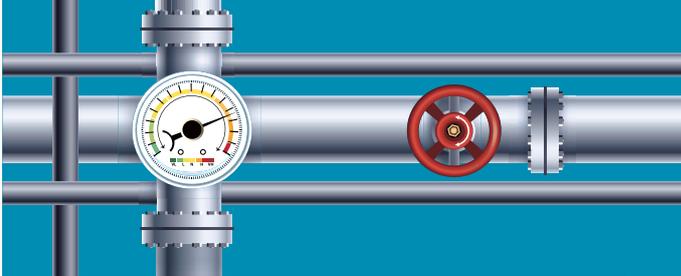
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# BACK IN SERVICE

Arup reused as much MEP plant as possible when transforming a 1980s City office into a stripped-back space aimed at London's dynamic tech sector. **Andy Pearson** looks at how embodied energy use at 1 Finsbury Avenue was minimised in a major £60m retrofit

**W**

hen it was built, 1 Finsbury Avenue was a pioneer of high-tech, high-end office buildings. Designed by Arup Associates and built in 1984, at the time of the stock market Big Bang, the eight-storey spec-office building was one of the first to be completed as part of London's Broadgate development.

The office – with its deep floor plates illuminated by a central glazed atrium and distinctive, glazed, black steel façade, featuring its prominent diagonal bracing and brise soleil – was intended for a single finance tenant.

Almost 40 years on, and 1 Finsbury Avenue is still a pioneering development. It now has listed building status; its banking tenant has moved out; and it has undergone a major refurbishment designed by architect Allford Hall Monaghan Morris (AHMM) to make the building attractive to a new type of tenant – the silicon-tech crowd from nearby Old Street and Shoreditch.

Radically, rather than gut the building and rebuild it anew, the focus of its refurbishment has been to reuse as much of the original as practical to extend the life of this office.

Elements that would normally be replaced in an office refurbishment have been renovated and reused, including 90% of the central plant. 'Reusing the plant was hard work for everyone, which couldn't have been undertaken without a team effort,' says Mike Beaven, director – and Fellow – of Arup, the project's building services engineers.

The refurbished building features a new pared-back aesthetic. Ceilings have been removed from the office floors; the basement car park has been replaced with cycle parking and showers; the basement squash courts are now a two-screen cinema; and the roof has been opened

up to provide an eighth-floor outside terrace. Externally, the biggest change is that the ground floor has been opened up to make the building more permeable, with the addition of retail units, cafes and restaurants, which open onto the street and to the atrium.

Developing a building services solution that used much of the existing services was quite a challenge. The eight-storey building had been occupied from completion by investment bank UBS Warburg. During that time, the original building services systems had undergone multiple interventions to adapt them to the changing needs of its tenant, including conversion of the original overhead variable air volume (VAV) air conditioning system to an underfloor system.

More major interventions included flooring over the atrium at Level 3 to create a dealing floor supported by a data centre squeezed



## PROJECT TEAM

**Client:** Joint venture between British Land and GIC  
**MEP consultant:** Arup  
**Acoustic and fire, façade and sustainability consultant:** Arup  
**Architect:** Allford Hall Monaghan Morris  
**Structural engineer:** Arup  
**Quantity surveyor:** Equals

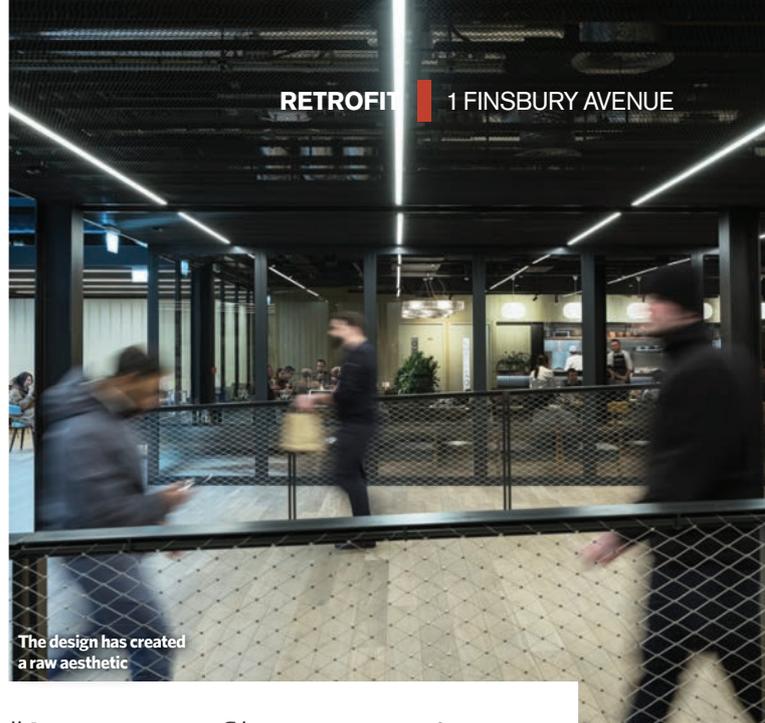


All the floor plates were gutted, including stripping out suspended ceilings

onto the floor below. Beaven describes it as ‘a banking factory with lots of cooling, chillers and power’. This banking factory was serviced by four giant, roof-mounted air handling units (AHUs), each supplying  $20\text{m}^3\text{s}^{-1}$  of air to a VAV air conditioning system. The AHUs were located in pairs, two above the service riser in the north core and two above the south core riser.

Each core also incorporates a cooling tower connected to a large centrifugal chiller in the basement, as part of the landlord’s primary cooling system for the VAV AHUs. Additional air-cooled chillers had been squeezed into spaces around the roof to provide the cooling to the data hall.

Under the refurbishment, all the floor plates were gutted,



The design has created a raw aesthetic

## “A process of ‘test, appraise, use or abandon’ was applied rigorously to all existing plant”

including stripping out the suspended ceilings and all the existing services. ‘We thought about reconfiguring the VAV [on the office floors], but the market place wanted water-cooled because it is more efficient and saves on carbon emissions,’ explains Beaven.

Two-pipe fan coil units (FCUs) now provide cooling to the refurbished office floors. Fresh air is ducted to the units at a rate of  $16\text{L}\cdot\text{s}^{-1}$  per person, based on an occupant density of one person per  $8\text{m}^2$  of floor area. The FCUs, along with all of the other services installed under the Category A fit-out – including a new sprinkler system – have been left exposed to give the offices a more raw aesthetic.

A major challenge of fitting out this 40-year-old building to serve the current market is that its floor-to-soffit height is less than in today’s speculative offices. ‘The slab-to-slab height was comparatively low compared with today’s offices, so, by exposing the services, we were able to push them up between the beams to minimise their visual impact,’ says Dave Pearce, associate director at Arup.

Originally, British Land had intended to fit out one office floor to show potential tenants what could be achieved, but the landlord was so impressed with the solution it decided to adopt it across all floors.

Level 2 was the most challenging office floor to fit out. It had originally housed the bank’s data centre and, as such, contained some very large chilled water pipes and pumps that Arup wanted to retain to service the refurbished building. Its fit-out was further complicated by the need to accommodate existing ductwork fitted to extract smoke from high level in the floored-over lower section of the atrium to outside.





The building has retained its distinctive facade

» Fortunately, the building had been point-cloud surveyed at the outset, making it easier to accurately coordinate the new with the existing services and structure. ‘Having a point cloud scan was really important. It gave us a really good 3D model to work from to ensure we could maintain the clear height on the office floor,’ explains Beaven.

**Smart controls**

The services on the refurbished floors also include Internet of Things gateways on each



The new tenant roof terraces

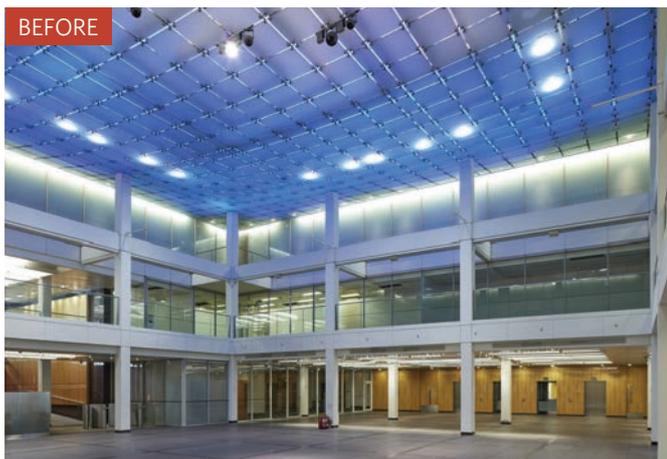
system to provide smart control. Beaven says that, as far as Arup is aware, ‘it is the first existing building, as opposed to it being a new building built from scratch, that has been made smart’. He says the control is there for current and future tenants to manage lighting and comfort conditions, ‘if they want it’.

Fresh air to the offices is supplied predominantly from the two existing roof-mounted VAV AHUs above the building’s south core. These have been refurbished and heat recovery systems added. The units now run at a reduced capacity. ‘The old VAV system [supplied fresh air and office cooling] on a recirculation basis, so it was pushing a lot of air around the space,’ says Pearce. ‘Switching to FCUs and a fresh air-only system enabled us to reduce the volume of supply air.’

In addition to the two existing AHUs, fresh air is supplied from a new 19m<sup>3</sup>-s<sup>-1</sup> AHU located above the north core. This unit replaces the two giant VAV AHUs that have had to be removed to create access to the new tenant roof terraces.

‘Moving to a FCU enabled the architects to provide lifts and stair access to the roof level for the two roof terraces,’ says Pearce. It was not easy: ‘We spent an awful lot of blood, sweat and tears routing pipework to create the roof terraces, because there were an awful lot of services running between the two services cores,’ Beaven adds.

Chilled water to the AHUs is supplied from the existing cooling towers and basement chillers. The cooling towers had new impellers,



“The load profile works well; in the morning everyone cycles in and uses showers, then, for rest of the day, most hot-water use is retail”

belts and bearings fitted. “They were stainless steel, built to the original, exceptional Arup specification, so they were relatively simple to refurbish,” laughs Beaven. The chillers originally installed by the bank to cool the data hall have also been reused to provide chilled water to the FCU system. “We capacity tested them using a heat bank and they delivered almost 100%, even after running for 20 years at 24 hours a day,” says Beaven. “So they are still really good chillers, in good nick, which meant we were able to retain them.”

Beaven says a process of ‘test, appraise, use or abandon’ was applied rigorously to all existing plant, to ensure it was capable of functioning for the 15-year tenant lease period to meet the team’s ambition for reuse. This included getting the original equipment manufacturers on site to survey the plant and provide a report and recommendations on the work needed to extend its life.

“It was an exhaustive process of testing, getting results back, seeing what interventions or improvements were needed, and then applying them before the plant could be offered as a going concern,” Beaven adds. The team was helped in this process, he says, by the

RETAINING THE HEATED FAÇADE

The façade is a proprietary system manufactured by façade specialist Gartner. It is heated by circulating hot water through the transoms and mullions, which help offset perimeter heat losses from the office floors. The hot water is supplied at a temperature of around 40°C on a bay-by-bay basis from a perimeter heating flow-and-return loop at high level on each floor plate. A thermal break separates the heated internal skin from the external skin. “We had an option to put in radiators, but the façade was mentioned in the building’s listing, so we decided as a team that it was a good idea to retain it,” says Beaven.

As part of the reuse strategy, thermal imaging was used to prove the façade was still performing as intended. It was also tested for airtightness, to see how it compared with current Building Regulations requirements for air leakage: “It was pretty close – just a sniff off,” says Beaven. Concerns about the condition of the mullions and transoms internally were allayed when a link bridge was removed, which provided the opportunity to access the façade panels. “We were able to cut sections to ensure it was still in good condition,” Beaven adds.

bank having maintained the plant properly; Beaven describes it as ‘like having a car with a full service history’.

Pearce says reusing the plant and distribution pipework was key to enabling the landlord to get the building back onto the market as soon as possible. “If we’d stripped out all the major plant, especially the distribution pipework in the risers, it



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» would have had major programme implications, which would have added months to the completion date.’

The reuse strategy was applied pragmatically on the building services plant. For example, Beaven says the boilers were ‘pretty good’, but it was ‘much cheaper to replace these than to refurbish them in situ’.

One element of the building that had to be retained was its distinctive heated, black-steel and glazed façade system, which was fundamental to keeping the perimeter of the refurbished office floor plates comfortable in winter (see panel, ‘Retaining the heated façade’).

Reusing the façade had major implications when it came to converting the ground-floor offices into shops and restaurants. ‘Normally with retail, we’d put a big louvre at top of the façade. This was not possible because the façade was listed.’ Instead, new louvres have had to be installed in the reveals formed in the recesses created by the building’s four perimeter stair towers; these cannot be seen when the building is viewed in elevation. The louvres ensure tenants can duct fresh air in and exhaust air out of their demise.

In addition, the landlord supplies chilled water, hot water, domestic hot water, cold water and power to each retail unit. Because of the amount of retail on the ground floor, new calorifiers had to be installed to serve the shops and restaurants and the new cyclists’ showers in the basement.

‘The load profile works well; in the morning, everyone cycles in and uses showers, then, for rest of the day, most hot-water use is retail,’ Beaven says.

Once the project was finished, the team were able to take a step back to assess the impact of reusing plant and systems. While plant reuse requires additional input from the consultants, ultimately, it is the landlord who carries the risk for service provision to the tenant. In this instance, Beaven says the risk was something British Land was prepared to take

PERFORMANCE DATA

Heating and hot water load 38.43kWh·m<sup>-2</sup> per year

Total energy load (based on Part L energy modelling by Arup)

- 121.16kWh·m<sup>-2</sup> per year regulated + unregulated
- 76.23kWh·m<sup>-2</sup> per year regulated
- 44.93kWh·m<sup>-2</sup> per year unregulated

Carbon emissions (all) 28.2kgCO<sub>2</sub>·m<sup>-2</sup> (based on Part L energy modelling)

Annual mains water consumption (BREEAM Wat 01 methodology)

- 4.70m<sup>3</sup> per person per year (including fixed uses)
- 5.12m<sup>3</sup> per person per year (including fixed uses such as cleaning, food preparation, vessel filling)

Airtightness at 50Pa 7.24m<sup>3</sup>·h<sup>-1</sup>·m<sup>-2</sup> (sample of the existing façade on level 7)

Overall thermal bridging heat transfer coefficient (Y-value) 0.38W·m<sup>-2</sup>K

Embodied/whole-life carbon 11.55kgCO<sub>2eq</sub>·m<sup>-2</sup> (value refers to structure manufacture + construction processes A1-A5. Estimated using Arup’s embodied carbon tool PECC. Assumes 0KgCO<sub>2eq</sub>·m<sup>-2</sup> for retained curtain wall façade and mainly retained central plant).



The refurbishment has changed the nature of the working space

on because of the benefits to be had from retaining the systems. The building is managed and operated for British Land by Broadgate Estates. ‘Because it’s not brand new, we expect it will require more maintenance on a day-to-day basis,’ says Beaven.

Although reusing the plant means the consultants have to do much more work than they would if they simply specified a chiller from new, Beaven expects plant reuse to be something Arup will get more involved with in the future: ‘It’s not easy, but until the circular economy is running and we have a market to provide refurbished bits of kit, we have to make the best use of what we have.’



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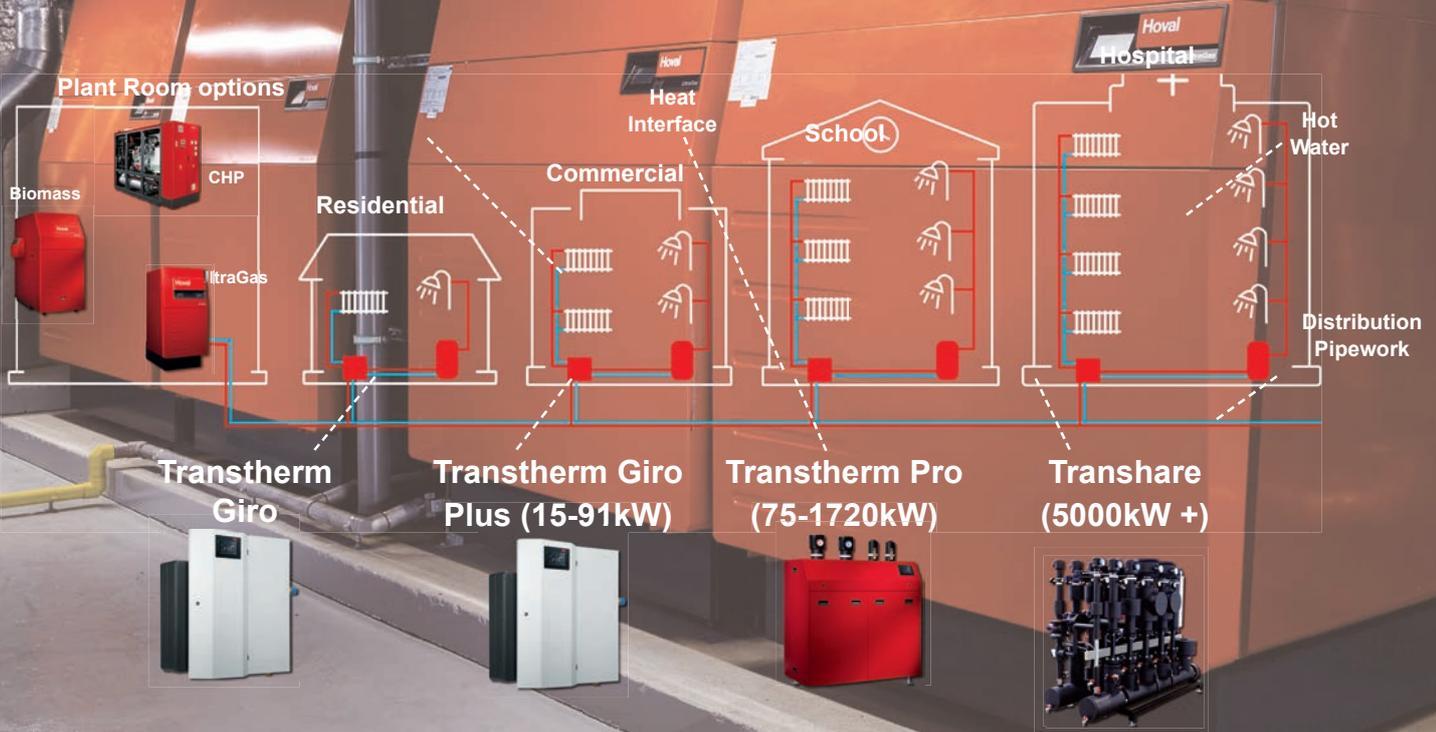


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# SOLAR FLAIR

Naked Energy's VirtuPVT technology was a clear winner in the CIBSE Building Performance Awards in the Product or Innovation of the Year – Thermal Comfort category.

**Phil Lattimore** looks at how combining solar photovoltaic and thermal technology offers an alternative solution for low carbon heating and power

“The product initially stemmed from exploring ideas around the hyper-efficient transfer of heat, which were then married with the concept of combining heat and power”

**A**s a novel product that combines both solar photovoltaic (PV) and solar thermal technology to provide heat and power generation in a single solution, Naked Energy's VirtuPVT was described by the judging panel of the CIBSE Building Performance Awards 2021 as 'head and shoulders above the rest' as it took this year's Product or Innovation of the Year – Thermal Comfort title.

The hybrid VirtuPVT system is a commercially available, low-profile modular solar system that delivers a combined solar heat and power solution, which the judges said 'achieves cleaner integration of renewable technologies in buildings to meet 21st-century energy needs'.

The system uses Naked Energy's patented PVT technology. Each unit includes a novel solar thermal flat plate absorber to heat water flowing through the system with 60% efficiency, which can be used for sanitary hot water or process heat up to 80°C. Additionally, monocrystalline PV cells bonded to the absorber convert solar energy to produce electricity with typical PV efficiency of around 20%. The absorber is housed in an evacuated

## THE ACTIVE OFFICE

The Active Office was built by Specific – a UK Innovation and Knowledge Centre (IKC) based in the College of Engineering at Swansea University – as part of a demonstration of its 'Active Building' building design concept. VirtuPVT was deployed on a vertical façade, in combination with thin-film PV on the roof, battery storage and an air source heat pump. The aim was to create the UK's first energy-positive office, where more energy is generated than is consumed.

The building was constructed using offsite manufacturing techniques. VirtuPVT is fully integrated with thermal and electrical storage systems in the building. This was the first large-scale commercial installation of VirtuPVT and is generating 2.5kWp electrical energy as well as 10kWp thermal energy. An array of 40 VirtuPVT tubes are installed on the south-facing façade of the building, designed to maximise solar thermal outputs in the autumn, winter and spring when the sun is lower in the sky. During the first year of operation, the VirtuPVT array avoided CO<sub>2</sub> emissions equivalent to 722kg (Scope 1) and 472kg (Scope 2) that would have resulted from traditional forms of heat and electricity generation being used.



borosilicate glass tube, with the vacuum minimising thermal losses to ensure optimal heat output.

Combined, Naked Energy says the technology offers total efficiencies of up to 80%, which, the firm claims, makes VirtuPVT the highest energy-density solar technology in the world.

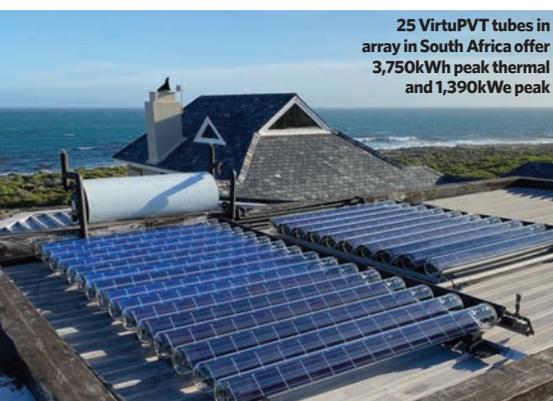
The installation of the system is novel, too, compared with regular solar arrays. Its low-profile, versatile mounting system means it can be installed on pitched or flat roofs without the need for typical racks or A-frames to achieve the optimal angle to the sun. Instead, the tubes can be mounted either in the vertical or horizontal plane, and the absorber panel PV/thermal receiver angle can be tilted within each tube to align for an optimal solar performance, with the units spaced to avoid self-shading in winter months.

The low profile of the individual units – 26.5cm off the roofline – is also designed to optimise visual impact while reducing wind shear. They are self-ballasting and have integral reflectors to minimise shading, while the individual units are small and light enough to be carried by hand for installation. At an operational level, system requirements are no different from conventional PV or solar thermal systems, with standard connectivity

The combined solar heat and power solution features PV cells as well as a solar thermal flat plate absorber



Vertical façade installation in Swansea



25 VirtuPVT tubes in array in South Africa offer 3,750kWh peak thermal and 1,390kWh peak

for heating and electricity systems, and require similar maintenance procedures.

Each tube is capable of delivering a maximum of 275kW thermal and 70kW electrical energy; in the UK the typical yield is expected to be around 213kWhth and 60kWhpe per tube.

### Development

The development of VirtuPVT combination system concept began in 2009, after Naked Energy's co-founders, CEO Christophe Williams and CFO Nicholas Simmons, began exploring innovative solutions for sustainable energy. The patents for the technology were filed in 2012 and granted in 2018.

Alex Mellor is senior technologist at Naked Energy, with more than 10 years' experience working in solar energy technology innovation. He says that the product initially stemmed from exploring ideas around the hyper-efficient transfer of heat, which were then married with the concept of combining heat and power. 'The co-founders saw very early on that renewable heat was going to be important – something that the world is starting to wake up to now. The VirtuPVT design brings that together through the combination of PV panels and highly efficient heat transfer through thermal solar and the

evacuated tube design to reduce heat loss.'

The original prototype was first tested in Malta in 2016, as part of a desalination plant for Climate-KIC, with further testing on a revised prototype at a UK retailer's building near Gatwick from 2017. This was followed by five installations in the UK and Europe. Experience gained from these trials informed the development of the product and improvements to the design and performance.

'One of the beauties of our products stems from the CEO's background in marketing and digital design,' says Mellor. 'His father was an engineer in the field of renewables, but Christophe's design sensibility means that he tends to see things a little differently from how an engineer might see them. We have really good engineers and scientists in the team, but we also have that kind of design-led impetus.'

Elements such as ease of installation and the system's low profile on flat roofs, for example, and consideration of how the visual impact of the installation affects a building façade, are informed by this approach,' says Mellor.

Naked Energy has partnered with technology manufacturer Jabil in the development of the final commercially available production model, which is now 'simpler, more reliable and mass-producible', Naked Energy says. Multiple



» design iterations have been performed to minimise manufacturing costs and installation complexity, enhance visual appeal, and so on. The firm has engaged with suppliers, installers, early customers and other stakeholders to incorporate feedback into the process.

The production model has been installed in a number of systems across Europe and in South Africa. A vertical installation was carried out at UK innovation and knowledge centre Specific's Active Office in Swansea – designed to be the UK's first 'energy positive' office (see panel 'The Active Office') – while a system was installed at Deltares in the Netherlands to replenish ground heat as part of a ground source heat pump system; at a guest house in Hermanus, South Africa; and at the Medical Research Council's Harwell facility in Oxfordshire. Recent customers include the University of Westminster in London, while another 'high-profile building in central London' is in the pipeline, Mellor says.

### Distribution

With the system now in full commercial production, Naked Energy is looking to expand its distribution globally. 'We're developing distribution partnerships in the UK and abroad, with new partnerships in Australia, the Netherlands, South Africa and Switzerland,' says Mellor. For innovative technology, one of the challenges involves buy-in from potential customers, he says. 'It's about how to convince your customer that your technology is so much of a step forward, they want to buy it rather than the tested and proved incumbent, solar PV, which has been widely used for a decade.

'But we've found getting customers to understand the value of renewable heat is getting easier. CIBSE Members will already understand the necessity of decarbonising heat when calculating the carbon intensity of a building portfolio.'

While Naked Energy is currently developing larger-scale installation projects for VirtuPVT, the company is also keen to broaden the application space for deploying the solution. 'Storage is one area we're exploring. We've just put a grant application into BEIS for an innovation project on the scale of a single home, looking at seasonal storage, using our PVT and a number of other innovations – exploring what we call "beyond net zero housing",' says Mellor. 'For example, storing heat in the ground in the summer to use for winter demand. If we can unlock that, it increases our potential market penetration possibly by a factor of 10, because it means

An 88m<sup>2</sup> array in the Netherlands



Housing project in the UK



you can do much larger projects for any given customer. And it also opens up the market for customers that only have a winter heating demand, such as offices and other non-domestic applications. There's a lot more opportunity there, while areas such as heat-driven cooling are extremely interesting too.'

### Solar heat's potential

Winning a CIBSE Building Performance Award for VirtuPVT has been an important accolade for Naked Energy, says Mellor. It offers welcome recognition for the product's innovative technology while raising its profile within the key building services engineering community. 'It's really valuable for us to receive this award from a highly respected organisation whose members are at the forefront of sustainability and driving the low carbon agenda in building services. It's recognition in the context of the people we are dealing with, the key decision-makers who are integrating systems into buildings.'

Mellor believes VirtuPVT has the potential to be a mass-market solution. 'How we solve the heat decarbonisation crisis will be a mix of technologies, but I see no reason why solar heat can't be the answer to a large percentage of that. And in the UK, I don't see why it can't be our product. Internationally, solar heat in general is going to be on the rise in the coming years, and we're one of the most innovative companies out there with an available product. So, we're all very much tuned into this being a mass-market product.' **CJ**

"It's really valuable for us to receive this award from a highly respected organisation at the forefront of sustainability"



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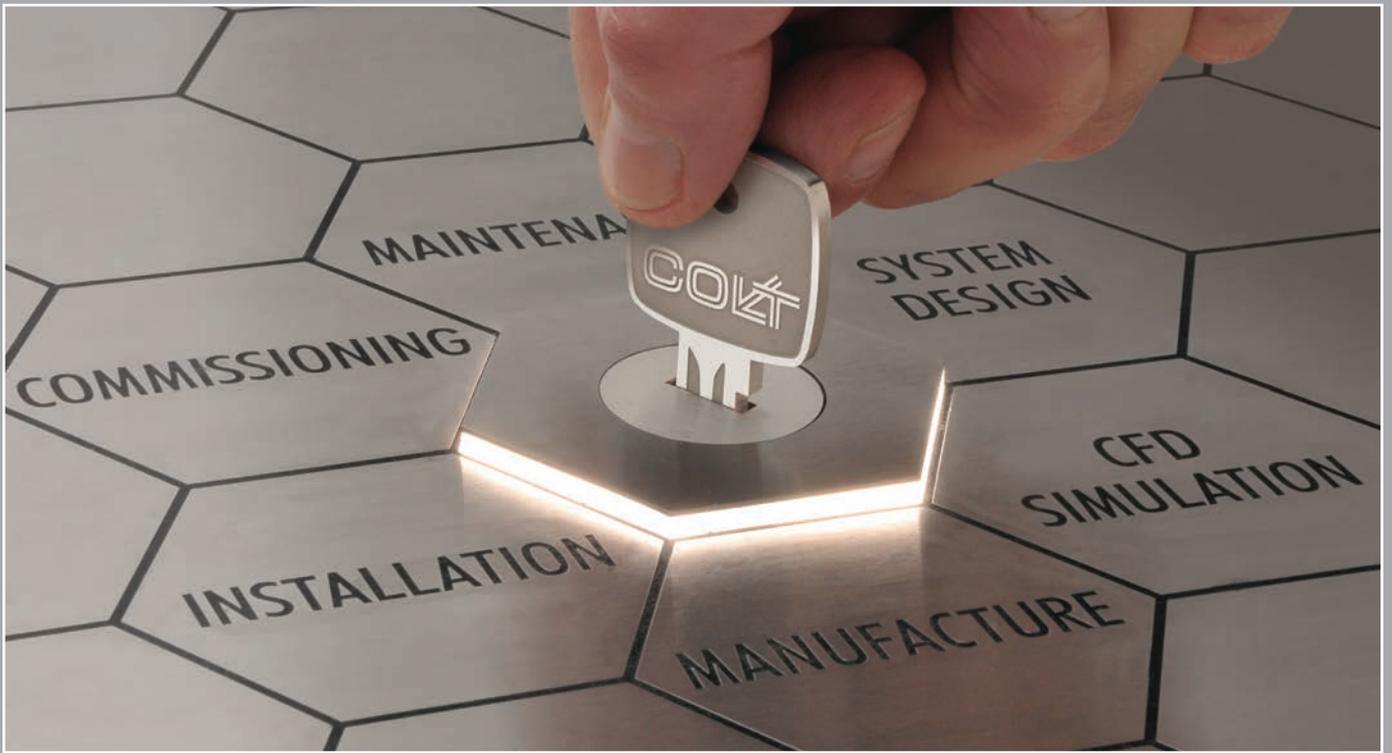
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Right: Testing the operation of input relays

Smoke control systems must remain operational to protect occupants of high-rise buildings but, too often, proper maintenance can be overlooked – as recent fires have demonstrated. Phil Lattimore reports



## SAFETY IN OPERATION

**S**moke-control systems play a critical role in protecting occupants of high-rise buildings, and it is vital they remain operational. So why is the proper maintenance of such life-critical systems often neglected or overlooked, and how can we ensure this part of essential building maintenance is addressed properly?

Recent high-profile fire reports have put the failure of smoke-control systems in the spotlight. The London Fire Brigade's (LFB's) preliminary report into the fire in a high-rise apartment building at New Providence Wharf, London, on 7 May revealed a serious failure of a smoke-control system. This resulted in the building acting like a 'broken chimney', leaving residents' only escape route smoke-logged. Smoke detectors had failed to operate automatic opening vents (AOVs) and the cross-corridor fire doors in the building.

LFB deputy commissioner Richard Mills called this latest fire 'an urgent wake-up call to all building owners and managers'. Describing the scenario, he said: 'The smoke-ventilation system inside New Providence Wharf acted like a broken chimney, leading to a potentially life-threatening situation. Had it not been for the exceptional actions of our firefighters and 999 control officers, this could have had tragic consequences.'

Mills continued: 'Despite our response to this fire, and drawing on the many lessons learned from the Grenfell Tower fire, in many cases we are, sadly, still not seeing a culture change in all those responsible for fire safety in high-rise buildings.'

The report into the New Providence Wharf fire came

after it emerged earlier this year – in evidence given to the inquiry into the Grenfell Tower disaster of 2017 – that a former smoke-control system installed in the high-rise building had been inoperative for more than a year before a refurbishment began.

### No surprise

While such revelations may shock the public, Allan Meek, director of smoke-control specialists Group SCS and a representative of the Smoke Control Association (SCA), says revelations about Grenfell Tower's smoke-control system came as no surprise 'In our experience, it is common for clients to leave reported defects for many months before authorising corrective action,' he says.

And it remains a major concern, he suggests, citing a March 2020 Fire Engineering Thematic Technical Report of audited buildings with mechanical smoke-ventilation systems, in which the London Fire Brigade found that 20% of inspected systems failed to operate. This, says Meek, indicates that the problem of defective smoke-control provision may be widespread.

### Contributory factors

So why is the maintenance of smoke-control systems in high-rise buildings a continuing issue four years after the Grenfell Tower fire? According to Meek, there are common themes in high-rise residential buildings that can contribute to a catastrophic



» system failure of the type experienced at Grenfell.

One of the most frequent, he says, is the availability of people on site to complete regular tests. This is recommended by the Regulatory (Fire Safety) Reform Order 2005 and safety operating instructions, which detail the requirement for smoke-control maintenance of life-safety systems.

However, Meek says these can often be overlooked or not fully understood. Often, he adds, the weekly and monthly checks will be carried out by general maintenance personnel, who have had basic hands-on training from the manufacturer/installer of the system. Tests can be problematic, particularly for high-rise residential buildings where there is no onsite maintenance presence and, as a result, checks are frequently overlooked.

Guidance on smoke control in multi-occupancy residential buildings has been issued by the Ministry of Housing, Communities and Local Government<sup>1</sup> and the SCA,<sup>2</sup> and this stresses the importance of professional advice, and building owners understanding what type of smoke-control system they have. The guidance says smoke-control systems should be tested weekly by the building owner to ensure they are operating effectively, and a full system inspection and test should be carried out by a suitably qualified person at least annually.

To ensure regular safety checks, Meek believes the specialist provider should offer training to site personnel and a logbook, so checks can be recorded and monitored.

*BS7346-8 Components for smoke-control systems. Code of practice for planning, design, installation, commissioning and maintenance* gives detail of the maintenance requirements and templates for test records and service certificates.

Meek says testing a smoke-control system is more involved than a regular fire-alarm test, particularly in a high-rise residential building, for which a test will involve visiting every floor. For residential buildings, there is rarely a permanent onsite maintenance presence, and it can be costly to employ someone to complete these tests, he adds.

Unfortunately, this has led to them being ignored, says



Group SCS's Allan Meek (left) and Colt Group's Conor Logan

**"A full smoke-control system inspection and test should be carried out by a suitably qualified person at least annually"**



Annual service check on a local fan control panel

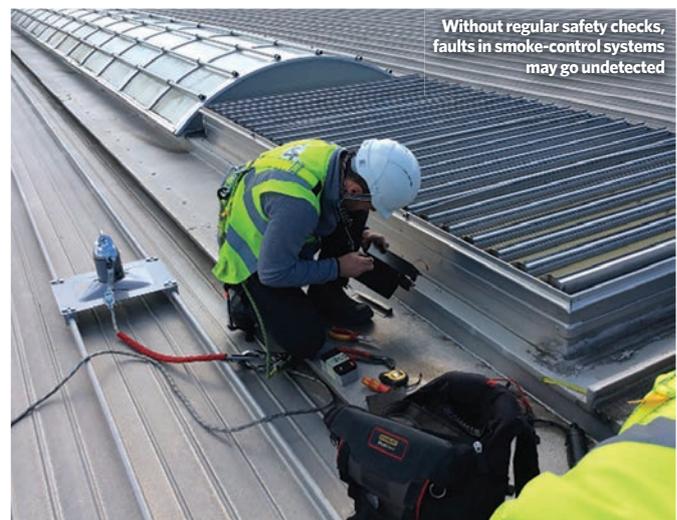
Meek, who believes a culture change is required to ensure that building owners understand the importance of smoke-control systems and make sufficient provision for regular testing and reporting of faults. Without regular safety checks, faults may go undetected and systems could remain inoperable until the next scheduled maintenance visit.

'Even when smoke-control systems are equipped with visual and audible fault alarms, these are often ignored in residential buildings without onsite security personnel,' says Meek. 'Under this regime, there is a very real risk of system failure in an emergency.'

Conor Logan, technical director at smoke-control systems specialist Colt Group, says the accountable person plays a vital role in ensuring that systems are maintained properly, as there are so many things that can go wrong as a result of smoke equipment being misused by tenants. He cites disconnected fire alarms; incorrect advice from unqualified maintenance contractors, and confusing a smoke test with a service. 'A successful smoke test will confirm that your system is working now. However, there may be elements within it that are not functioning properly,' Logan adds.

**Smoke-control system maintenance**

Neither of the organisations responsible for the maintenance of the Grenfell Tower project were smoke-control specialists. This is not unusual, says Meek. A fire-alarm or mechanical and electrical



Without regular safety checks, faults in smoke-control systems may go undetected

## “Tests can be problematic, particularly for high-rise residential buildings where there is no onsite maintenance presence”

contractor is unlikely to have an appreciation of the smoke-control strategy, or an understanding of the products installed, but often the smoke-control maintenance is bundled in with other services, such as fire alarms or building management. This, Meek adds, can result in a deterioration of systems over time, as minor faults go unattended or unnoticed.

The skill set of a smoke-control engineer is very different from that of a fire-alarm engineer, he says, encompassing airflow and pressure-differential measurement, fan, damper and ventilator testing, as well as smoke and CO detection.

Meek recommends that those responsible for the maintenance of smoke-control systems in high-rise residential buildings use a competent smoke-control specialist, such as a member of the SCA. ‘Ensure the smoke-control system provider is accredited and has third-party certification,’ he says.

‘It is concerning that smoke-control maintenance is sometimes combined with fire alarms and security, and then subcontracted out to ‘smoke vent’ or ‘AOV’ operatives,’ adds Colt’s Logan. ‘This can be dangerous, because not all of these companies are fully accredited or certified to carry out maintenance on complex smoke-control systems.’

### Rectifying defects

The failure of a client to sanction rectification of defects may be because they don’t appreciate the seriousness of the system being inoperable – or it could be down to a lack of budget, says Meek. This, however, is a false economy, he adds: ‘If a fire breaks out in a building that is under your control, and the smoke-control system fails, lives are at serious risk and you could face prosecution.’

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

For older buildings Meek says owners should employ a competent contractor to assess the installation and produce a report detailing the required information.

Once the performance criteria and cause and effect are established, keeping the system in good working order should be a simple matter of regular testing and maintenance, he adds. **CJ**

### References:

- 1 *Advice for building owners of multi-storey, multi-occupied residential buildings*, MHCLG, January 2020 [bit.ly/CJJul21SC1](https://bit.ly/CJJul21SC1)
- 2 *SCA guidance on smoke control to common escape routes in apartment buildings (flats and maisonettes)*, revised January 2020, [www.smokecontrol.org.uk/resources](http://www.smokecontrol.org.uk/resources)

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# ALTERNATIVE ESCAPE ROUTE

Evacuation lifts have the potential to offer a safe route out of a building. Arup's **Eoin O'Loughlin** and **Harry Wiles**, and **Matthew Ryan** of The Fire Surgery, look at the challenges and opportunities of incorporating them in fire strategies

**I**n the UK, fire safety legislation and associated guidance are currently undergoing an unprecedented process of scrutiny and change. As part of this, many of the common assumptions and 'norms' relating to the design of buildings are being reviewed. Opportunities to improve and develop safer, more inclusive, and more sustainable approaches are being identified.<sup>1,2,3</sup>

With increasing numbers of mid/high-rise buildings, and growing numbers of people that may have difficulty getting out of a building, the traditional solutions for vertical evacuation need to be reconsidered. In residential apartment buildings especially, people should be able to safely evacuate regardless of their physical, cognitive or sensory capabilities to navigate stairs safely.

An obvious strand of tackling this vertical evacuation challenge would be to increase the use of lifts in emergencies. However, the public have generally been taught that: 'in the event of fire do not use the lift'.

This article aims to highlight some primary considerations about the use of lifts for the evacuation of people who cannot use stairs. It identifies a number of challenges and opportunities to be addressed as part of enabling their incorporation in fire strategies.

## What are we aiming for?

When a building is designed/constructed, or significantly refurbished or extended, it must be demonstrated that the building can satisfy the relevant functional requirements of the Building Regulations 2010 (as amended). The design must also enable the responsible person for the building (typically a building manager or owner) to comply with fire safety management requirements imposed under legislation such as the Regulatory Reform (Fire Safety) Order 2005 (FSO).

Further explanation on the intent of the Building Regulations is provided in Approved Document B (ADB), the statutory guidance to the legislation, with ADB Volume 1<sup>4</sup> for dwellings and ADB Volume 2<sup>5</sup> for buildings other than dwellings.

ADB Vol 1 and 2 clarify that building designs and building management plans should not rely on the fire service or other emergency services to evacuate residents who need assistance. ADB Vol 1 and 2 also state that the fire safety measures in a building should take account of the needs of everyone who may access the building. (See the version of this article at [www.cibsejournal.com](http://www.cibsejournal.com) to see a summary of applicable legislation and guidance in England and Wales. Similar regulatory frameworks apply in Scotland and Northern Ireland, and elsewhere.)

## The status quo

In buildings other than residential apartments (for example, offices, places of assembly, and hotels), persons for whom using stairs is not possible or safe are typically expected to wait at a protected refuge position. The responsible person(s) is expected to address responding to refuges and assisting those using them as part of their emergency plans and personal emergency evacuation plans (PEEPs). [The latest Home Office consultation on Personal Emergency Evacuation Plans can be found at [bit.ly/CJJul21PEEP](http://bit.ly/CJJul21PEEP)]. Manual carry-down equipment/procedures are typically implemented to assist with the onward evacuation of wheelchair users from these refuge areas.

In apartment buildings, 'refuges' are not typically provided, nor are they included in current UK guidance. The only means of vertical escape is usually via stairs, as standard 'passenger' lifts would typically be grounded and therefore discounted for emergency escape. Those who cannot use a stair



**"The traditional solutions for vertical evacuation need to be reconsidered"**

therefore have no means of self-evacuating or communicating with management (if there is any on site). (See full article for information on guidance for non dwellings).

ADB Vol 1 (for dwellings and flats) mentions neither refuges nor evacuation lifts. The alternative UK standard for fire safety of apartments, BS 9991:2015<sup>6</sup> notes that: 'Providing an accessible means of escape should be an integral part of fire safety management..' which '...should take into account the full range of people who might use the premises, paying particular attention to the needs of disabled people.'

BS 9991: 2015 notes that responsibility for achieving these objectives rests with building management but provides only high-level



**Time for a rethink? The public have generally been taught 'in the event of fire do not use the lift'**

guidance. It encourages consideration of inclusive features such as evacuation lifts when designing escape routes. Some contradictory commentary is provided however, suggesting that occupiers also have responsibilities (see full article for more).

BS 9991:2015 Clause 8.4 does reference the use for evacuation lifts where considered necessary for people needing assistance, and points to the guidance in BS 9999:2017. The BS 9999:2017 approach requires the lift to be driven by a trained member of staff, so is not viable where there is no suitable onsite management presence, which includes many residential buildings.

Therefore, stair refuges plus carry-down/carry-up procedures remain as the prescribed alternative. However, such approaches can bring their own safety risks. They can also be unrealistic or even impossible for building operators to implement, particularly in taller buildings. It is evident that for flats, there is a lack of prescribed solutions for safe and inclusive evacuation of persons who cannot evacuate on their own in the event of fire. However, these shortcomings do not obviate the need for designers to meet the legislative requirements, stated intention and functional objectives set out in statutory guidance. They also do not relieve building operators of their duties under the FSO.

**Current lift design guidance benchmarks**

Two main lift types provided in buildings

that are designed to be used in the event of a fire are evacuation lifts and firefighters' lifts (note: the latter could also be used to assist with the evacuation in certain situations). Older standard lifts for fire service use (for example, lifts referred to as firemen's lifts) may also be present in existing buildings. The level of functionality and protection afforded to these older lifts vary. It is also possible that a lift installation not explicitly designed as an evacuation/firefighters' lift could be used for egress purposes as part of a case-specific fire risk assessment/fire strategy.

Guidance relating to lifts to be used in the event of fire is spread through documents originating from both the fire and lift industries. Table 2 in the online version of this article provides a list of current UK guidance documents.

**Evacuation via lifts – options, challenges, opportunities**

There are opportunities in progress to improve current fire safety guidance relating to evacuation lifts. ADB is undergoing ongoing technical review by the MHCLG and a revision to BS 9991:2015 is also under way (see online article for examples).

The recent draft prEN 81-76 captures some emerging thinking on how evacuation lifts could operate, and outlines specification options for three different types of evacuation lift operation – see Table 1. However, as a draft, prEN 81-76 is not a standard and should not be used for design.

The Lift and Escalator Industry Association (LEIA) has published guidance<sup>7</sup> clarifying the status of the draft prEN 81-76, including its reference within the draft guidance to the new London Plan on the Greater London Authority (GLA) website.<sup>8</sup>

Other challenges and opportunities that appear to need addressing to implement more progressive thinking in relation to evacuation lift provision:

■ **Increased dialogue between the fire safety and lift industries:** It is crucial that those with design and specification responsibilities relating to fire safety and lift installations have a practical understanding of each other's needs, and potential opportunities/limitations of lift technology.

Lift evacuation mode	Description	Commentary
Driver-assisted evacuation	A trained member of staff drives the lift car from within the lift car	Approach acknowledged in UK fire safety guidance BS 9999:2017 Annex G
Remote control evacuation	A trained member of staff drives the lift car from a remote location	While technically achievable in theory, there are challenges around who the remote driver of the lift needs to be, where they are located, what technological tools/infrastructure is required, what live information and communication is available to them, and so on
Automatic (self-evacuation)	A lift that continues to operate in the event of a fire but with landing calls prioritised according to the evacuation strategy	Challenges that would need to be addressed include the applicable control logic, prioritisation of the lift response depending upon the fire scenario, the level of information provided to the user(s), and overcoming traditional instruction of 'do not use lifts in the event of a fire'

Table 1: Summary of the three possible lift evacuation modes set out in the draft prEN 81-76



The traditional solutions for vertical evacuation need to be reconsidered

» ■ **Increased prescriptive guidance relating to evacuation lift provision:**

For most building types, there is a lack of prescriptive guidance relating to evacuation lifts (for example, when to provide them, how many, how to protect the lifts). As a result, there is a temptation to focus on achieving minimum standards compliance, and the clear benefits of providing evacuation lifts may not be fully considered. There is a need to shift the outlook on evacuation lift provision from ‘nice to have’ to ‘should we have?’

■ **Increased awareness of the implications of not providing an evacuation lift:**

Lifts are often seen as a significant tool in the improvement of accessibility in buildings. Similarly, evacuation lifts could be promoted as integral to ensuring safe egress for all. Without an evacuation lift, evacuation of people from refuge areas to a place of ultimate safety will rely upon a building management team response such as manual carry-down. This can be difficult, and may present challenges for the Responsible Person discharging their duties under the FSO and as part of the future ‘safety cases’ to be required by the forthcoming Building Safety Bill [2].

■ **Proactive consideration of retrofitting for existing buildings:**

A culture change is needed, away from the common ‘make things no worse’ approach to identifying what safety enhancements can be made. In particular, in a refurbishment, the additional works required to provide functionality for use in fire can be cost-effective and should be encouraged. Providing protection to the lift spaces and lobbies, and providing secondary power supplies, can present challenges, but can be overcome.

■ **User familiarity, and the psychology relating to using lifts during a fire:**

Staff must have familiarity with lifts to be used in the event of fire. Occupants also need to know which lifts can be used, how they may operate, and what level of staff assistance will be provided, if any. Human psychology, behaviours and perceptions relating to the use of lifts must also be considered. In some buildings, the provision of relevant information, training, and pre-event



“There is a need for a multidisciplinary approach, to develop practical interventions to increase the use of lifts for evacuation”

planning could be suitable. For occupants who do not need to use a lift for evacuation, additional information may be necessary to encourage them to continue to use the stairs, in order to avoid overloading the lift(s).

■ **Learning from existing lift evacuation strategies:**

A number of existing buildings (in the UK and globally) use lifts as part of their evacuation procedures. Valuable lessons in terms of building management could be learned from these.

**The way forward**

This article discusses the importance of lift evacuation to help overcome the current shortcomings in inclusive fire safety in existing UK building stock, and which still proliferate in current design practices. The article identifies a number of challenges that will need to be addressed.

There is a need for a multidisciplinary approach to the subject, to develop practical interventions to increase and improve the use of lifts for evacuation. Opportunities are also emerging to embed the increased use of

lifts for evacuation within the UK regulatory framework and guidance/design standards. The authors wish to stimulate debate among those involved in the fields of building design, fire safety, accessibility, and lifts, to help bring about the step-change required in regulations, standards and practices relating to inclusive design for fire safety. **CJ**

■ **EOIN O’LOUGHLIN** is a senior fire engineer and **HARRY WILES** is a fire engineer at Arup, and **MATTHEW RYAN** is an associate director at The Fire Surgery

**Acknowledgements**

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**References:**

- 1 *Building a Safer Future - Independent Review of Building Regulations and Fire Safety: final report,* MHCLG, 2018.
- 2 *Draft Building Safety Bill,* MHCLG, 2020.
- 3 *Fire Safety Act 2021,* MHCLG, 2021.
- 4 Approved Document B (fire safety) volume 1: Dwellings, 2019 edition incorporating 2020 amendments, MHCLG, 2020.
- 5 MHCLG, Approved Document B (fire safety) volume 2: Buildings other than dwellings, 2019 edition incorporating 2020 amendments, MHCLG, 2020.
- 6 BSI, *Fire safety in the design, management and use of residential buildings - Code of practice,* BSI, 2015.
- 7 *New London Plan - evacuation lifts guidance,* Lift and Escalator Industry Association. [bit.ly/CJJul21Lift1](https://bit.ly/CJJul21Lift1) (Accessed 03 06 2021).
- 8 *Draft Guidance Sheet for the New London Plan Policy D5(B5) for Evacuation Lifts,* GLA [bit.ly/CJJul21Lift2](https://bit.ly/CJJul21Lift2) (Accessed 03 06 2021).

SmokeCommand damper from Swegon

fire safety in the design, management and use of buildings. It also supports the healthcare sector's technical documents HTM 03-01 for heating and ventilation and HTM 05-02 for fire safety in healthcare premises.

BS9999 requires all installed dampers to be tested by a competent person at regular intervals 'not exceeding one year', and that spring-operated dampers should be tested annually, with those installed in dust-laden atmospheres checked even more regularly.

### The guidance

VH001 explains how dampers should be located – in line with the responsibilities of the system designer and as part of a building's fire strategy – and accessed for testing, as well as the levels of competence required to carry out this work. It says an inventory of all dampers should be created and every manually resettable damper must be individually released to ensure the spring-loaded shutter remains operational. All this needs to be backed up with photographic evidence showing the condition of each damper before, during and after inspection and testing. Without this evidence, the process is not compliant. The document also sets out a comprehensive plan for providing reports to clients and any findings that need action, including damaged and missing dampers. It also highlights key elements needed to put a planned maintenance regime in place for fire and smoke dampers linked to the association's digital maintenance tool SFG20.

This is helping to address a potentially damaging impression that it is possible to reduce the frequency of damper testing to as little as every five years by carrying out risk-based assessments. This is simply wrong and dangerous, but has become quite common practice, even in critical environments such as hospitals and other healthcare facilities.

The guidance explains that one of the most important aspects of fire and smoke damper testing is pinpointing the dampers that cannot be tested, often because they cannot be found or easily reached. If you cannot test something, you must propose remedial work such as installing access panels or builders' hatches. It is no longer acceptable – or compliant – to put in the test report that a damper simply could not be reached or needed cleaning. Remedial work must be carried out so the test can be completed and the building owner can comply with their legal responsibilities. [C](#)

■ Download the free guide at [bit.ly/CJJul21VH001](https://bit.ly/CJJul21VH001)

■ **GRAEME FOX** is head of technical at BESA

# CRITICAL TEST

The 100 million fire and smoke dampers installed in UK buildings should be tested annually – but only a tiny proportion of building owners meet this requirement. BESA's new guidance aims to help the industry get to grips with this huge potential fire safety weakness, as **Graeme Fox** explains

**D**ampers play an important role as a first line of defence in stopping the spread of smoke and fire through ventilation systems, but they are often ignored. With the new Fire Safety Act strengthening existing regulations, we believe this is a once-in-a-generation opportunity to get this aspect of fire safety firmly entrenched as a routine maintenance activity.

According to the most recent market figures produced by BSRIA, around 146,000 mechanical curtain dampers and 70,000 motorised dampers are installed in the UK every year. These are for new-builds and replacements, which account for just 1% of the annual market, suggesting that the total number of dampers already installed in UK buildings could be as high as 100 million.

To support the industry's efforts to improve the overall safety of buildings, the Building Engineering Services Association (BESA) has updated its freely available technical guidance for *Fire and Smoke Damper Maintenance (VH001)*. It builds on the association's industry standard for ventilation safety and maintenance TR/19, and will shortly be incorporated into DW/145, the industry standard for damper installation.

The guidance is also in line with the Hackitt Review and the newly enacted Fire Safety Act. As a result, a growing number of building and facilities managers are subcontracting this aspect of fire compartmentalisation to specialist contractors.

As with any growing market, there are untrained, uncertified firms seeking to cash in, but they are not technically capable of providing the comprehensive service required to keep people and properties safe. Building owners must understand this, and recognise they have a legal responsibility to check their systems properly.

VH001 was produced in response to urgent calls for a methodology that could help the building services industry comply with the British Standard (BS9999) for



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Reducing or preventing smoke in occupied areas should be a safety priority

# SAFETY FIRST

With building safety top of the agenda, school building owners should consider fitting smoke stoppers in roof-support perforated trays to limit smoke transmission if there is a fire, say AKH Services' Allan Hurdle

**I**t has been well documented that fire-related deaths are often a result of toxic smoke inhalation. Three breaths, and you could be unconscious. So, reducing or preventing smoke in occupied areas, including escape routes, must be a priority.

Depending on the size of the premises, it is estimated that pupils could take up to 20 minutes to evacuate a school building. Therefore, raising the level of fire protection and prevention in schools is needed to reduce the risks to school-users and firefighters, protect the education of students, and protect community assets by reducing the damage caused by smoke and fire.

One potential area of risk is perforated roof beams that do not have fire stops installed. The danger is that smoke from a fire travels through the beams into adjacent corridors and escape routes. This article will look at one potential solution.

## Fire safety in schools

Firefighters have been called to nearly 2,000 school blazes over the past three years – a staggering 40 incidents every month. As a result, almost 20,000 schoolchildren have had their education interrupted or been displaced from their usual school building.<sup>1</sup>

In 2019 alone, more than 271 primary



## BUILDING OWNERS' CHECKLIST

If your building has perforated decks, you should check if:

- The perforated deck is visible from below
- The deck beam passes across the building corridor
- Only ceiling tiles are below the perforated beams
- The perforated beam is fitted over an office area
- Smoke stoppers or plugs have been fitted to the perforated deck around the vertical wall areas to stop smoke escaping in times of fire.

schools and 209 secondary schools suffered fire damage.

Malfunctioning appliances or equipment, faulty electrics, arson and kitchen blazes are among the leading causes of school fires. Larger fires in schools cost, on average, £2.8m to repair and, in some cases, more than £20m.

Despite being more at risk from fire than an average property, many schools lack the equipment and adequate fire protection needed to prevent small fires becoming major disasters. Of more than 1,000 school inspections carried out by Zurich Municipal, two-thirds (66%) were rated as having 'poor' fixed fire-protection systems, such as sprinklers.

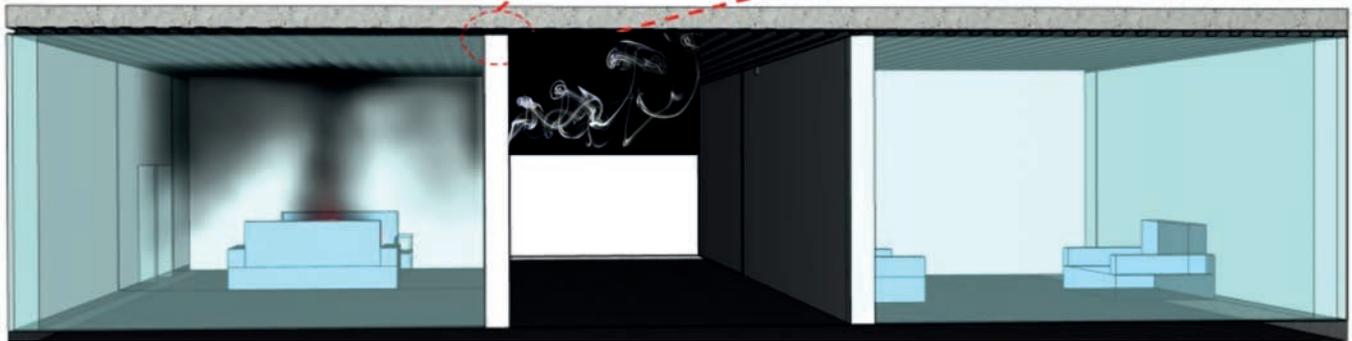
## Importance of smoke stoppers

The lack of smoke stoppers in roof perforated decking is a fire and smoke safety area that should be addressed urgently.

In a number of buildings, trapezoidal perforated decks, or beams, are used to span galvanised purlins and laid across the school



Smoke can pass from the fire room into escape corridors if there are no plugs in the perforated beams



» building's corridors or 'means of escape' as roofing support, reducing roofing build costs. Each perforated beam should have a trapezoidal smoke stopper fitted, each side of the beam across the corridor.

Thameside Fire Stopping's school surveys suggest a number of schools built since the year 2000 do not have smoke plugs fitted into the perforated decking because, at the time of build, their importance may not have been understood, and their role in smoke control may have been deemed unnecessary.

During sign-off, building control or building risk inspectors may not have been trained on – or aware of – the risks in buildings where smoke stoppers are not fitted over escape corridors.

Currently, no provision exists in Approved Document B for perforated lining decks to have smoke plugs installed between walls. It relies on 'best practice', competence and the training of installers to ensure safety is number one in their locker when installing roof perforated trays or cross-beams, and fitting smoke stoppers across escape routes or corridors in schools.

If smoke stoppers were specified by the building designer, but not installed at the time of roof build, this is a 'latent defect', and a symptom of non-compliance and lack of competence, as – with the roof fitted and closed off – it would be difficult to rectify the problem.

If smoke plugs have not been placed within the roof decking, and a fire starts in a classroom adjacent to the means of escape, smoke would pass upwards to the ceiling, travel around the fire room and into the perforated beams. As it cools, it could drop through the perforated decking above the dividing wall and into the escape route, potentially creating a smoke-logged area. Smoke could travel along the corridor's length through each perforated cross-beam, flowing into

other classrooms and leading to rapid smoke spread throughout the building.

### Solving the problem

One fire-prevention product designed to prevent smoke from a fire spreading through perforated beams into an escape route is the Cori-Seal System, from Thameside Fire Stopping Services. It is aimed at schools with unplugged perforated decks and involves fire-resistant material being sprayed or brushed onto the underside of perforated cross-beams over school corridors. The material hardens and creates a protective seal that hot smoke cannot penetrate. When tested, the material met a 30-minute fire test for smoke at 600°C.

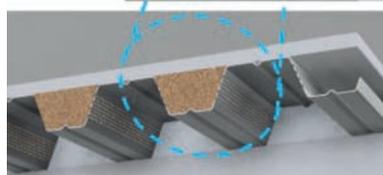
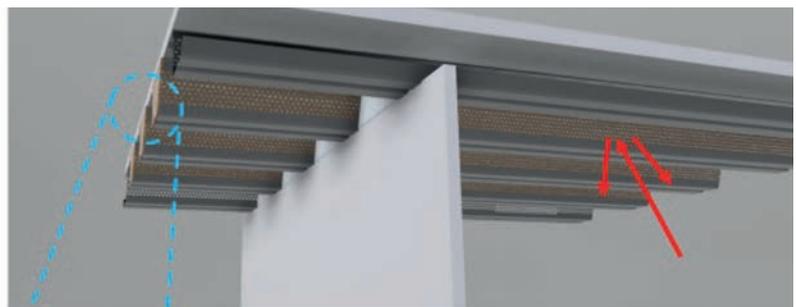
The company originally considered drilling additional holes into the perforated deck to inject fire-resistant foam. However, perforated deck supplier Tata Steel warned this would weaken the decks' strength. Support beams or decks are perforated with holes to achieve the designated acoustic or noise level; this also reduces beam weight, while still maintaining the specified roof-beam strength.

When they come into effect, new building safety regulations will take breaches of building safety seriously, especially where a smoke and fire issue has been raised and not addressed. So, check perforated decks, and don't leave fire and smoke safety control measures to chance. **C**

**■ ALLAN HURDLE** is smoke control consultant at AKH Services and a consultant for the Cori-Seal System

### References:

- 1 Information compiled by the Zurich data science team through a freedom of information request to the UK Fire and Rescue Services.



Trapezoidal trays across ceilings fitted with smoke plugs

## THE ORIGINAL LOW RESISTANCE METAL AIR BRICK



### Titon FireSafe® Air Brick

The Titon FireSafe® Air Brick Range is a unique non-combustible high flow terminal designed for powered ventilation systems. Offering low resistance to airflow, but high resistance to fire as set out in Approved Document B (fire safety) volume 1: Dwellings, 2019 edition.

Constructed from sheet steel (A1) and polyester powder coated to classification A2-s1, d0, the Titon FireSafe® Air Brick is designed to be built into external wall types during construction.



- Material 1mm electrogalvanized sheet steel, fire class A1 'no contribution to fire'
- Designed for both 204x60 & 220x90 ducting
- Bezelled version for use with exterior cladding instead of brickwork
- Extensive versatile range for different installation options
- Optional lengths available at request
- Polyester powder coating meeting EN13501-1 classification A2-s1,d0
- Performance tested to BS EN13141-2:2010
- Corrosion resistance - salt spray tested to BS EN ISO 9227:2012
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# BUILDING BETTER FOR A SAFER FUTURE

**The continuing focus on building safety should be welcomed, but all hazards need to be identified and put under the spotlight, says Wrexham Mineral Cables Commercial Manager Steve Williams.**

**F**or the past four years, building safety has rarely been out of the headlines. In the aftermath of the 2017 Grenfell Tower tragedy, Dame Judith Hackitt's independent review set out more than 50 recommendations regarding the delivery of a more robust building regulatory system. In response, the government has sought to introduce legislation to address these concerns – such as the draft Building Safety Bill – seen by many as the most sweeping changes to building safety in the past 40 years.

## Building a safer future

While such reform will make everybody in the supply chain more accountable throughout the various stages of the building's existence, we can only truly make buildings safe by putting the unidentified hazards, such as the installation of inferior fire-resistant cables, under the spotlight. It has also become clear that steps need to be taken to ensure the tests to which construction products are subjected are relevant and can be relied upon, especially in tall buildings or anywhere that requires extended evacuation times.

Sadly, the recent fire at New Providence Wharf in London highlighted how much work still needs to be done. Indeed, London Fire Brigade Deputy Commissioner Richard Mills commented: "The New Providence Wharf fire needs to be an urgent wake-up call to all building owners and managers. Look at the fire-safety solutions inside your building and take action if they are not performing correctly. It is too late to wait for a fire to see if they work."

## Higher classification needed

As a leading manufacturer of fire-resistant cables, we have been calling for more stringent testing standards for years, and we believe all enhanced fire-resistant cables should undergo true fire scenario tests. They play a fundamental role in ensuring that the emergency and building critical systems are supported – including emergency lighting, sprinkler systems, extraction systems, smoke dampers and shutters, emergency generators, pressurisation fans, emergency voice comms and fire alarms – in the event of a fire, providing vital time for the safe passage of occupants out of the building, and allowing for shutdown procedures to take place.

Due to its unique construction, no polymers or plastics are used to aid fire protection on MICC cables. This means more than 85% of the entire MICC range fall in the under 20mm category. Currently, only fire-resistant cables that are greater in diameter than 20mm must undergo testing for direct impacts to reflect falling debris and effects of water on a single test sample. For fire-resistant cables under 20mm, no direct impact takes place and different stages of each test are carried out on different samples of cable.

As the call for mandatory sprinkler systems in taller buildings gathers momentum, it becomes even more concerning that smaller fire-resistant cables [under 20mm] may not survive fire, water and direct impact – a true fire scenario.

We strongly believe tests should represent real-world conditions and that there should be a higher classification of cables introduced to help specifiers and designers identify those that can survive, rather than simply resist fire.

In an era of greater accountability, there should be no compromise, and, as an industry, we can no longer aim for minimum compliance to get the job done.

● For more information, contact [technical@wrexhammineralcables.com](mailto:technical@wrexhammineralcables.com)

# World Refrigeration Day focuses on cool careers

Events held over two weeks around annual celebration on 26 June

This year's World Refrigeration Day focused on careers in the refrigeration, air-conditioning and heat pumps (RACHP) industry, with events held over two weeks either side of 26 June.

Collectively titled 'Cooling champions: cool careers for a better world', the events aimed to inspire students and young professionals in all countries to meet the challenges faced in their communities.

In addition, to mark International Women in Engineering Day (23 June), the Institute of Refrigeration (IOR), an ally organisation, offered free online events organised by its Women in RACHP Group. These included 'How women are inspiring the next generation of engineers', which featured engineers in various disciplines describe what inspired them to embark on a career in refrigeration (listen back at [bit.ly/CJJul21WRD](https://bit.ly/CJJul21WRD)).

As *CIBSE Journal* was going to press, the IOR was due to hold two other events: 'Cool careers in RACHP' on 24 June, with presentations showing the range



of people and IOR initiatives promoting careers in our industry; and 'Beyond refrigeration - next steps to net zero' on 1 July.

- See IOR's events at [ior.org.uk/events](https://ior.org.uk/events) and visit [worldrefrigerationday.org](https://worldrefrigerationday.org)
- Linda McVittie, of J&E Hall, has been named in the Women in Engineering Society's (WES) Top 50 Women in Engineering for 2021. McVittie has worked in the RACHP industry for 39 years.

## Trane launches low-GWP chiller

Trane has launched its latest addition to the scroll-compressor chillers, heat pumps, multi-pipe units and rooftops portfolio, featuring the low global warming potential (GWP) R-454B refrigerant.

The Sintesis Advantage CGAF air cooled chillers with R-454B are available in capacities ranging from 150kW to 670kW. According to the manufacturer, the units deliver up to 5% better cooling efficiency and an equally wide operating map compared with equivalent models with R410A.

The R-454B refrigerant - a non-ozone depleting hydrofluoroolefins/hydrofluorocarbons (HFCs) blend - has a GWP level of 467, the lowest among the refrigerants available today for scroll-compressor technology.

R-454B offers a 76% reduction in direct GWP impact against R-410A, and a 34% reduction against R-32 HFC refrigerant. This answers customers' need for a sustainable refrigerant option that future-proofs their investment and mitigates the increasing tax rates put on refrigerants across Europe.

Trane introduced R-454B across its entire scroll-compressor portfolio, and will soon complete its offering of heating, ventilation and air conditioning systems with low and ultra-low GWP refrigerants across all product ranges.



## Scotland Covid-19 test centres use Carrier cooling and heating

The indoor climate at NHS Scotland's new Covid-19 testing laboratories is being maintained by cooling and heating systems from Toshiba Carrier UK.

Air cooled chillers and heat-recovery variable refrigerant flow (VRF) and split air conditioning systems were supplied by the company for the new testing facilities at Gartnavel Hospital, Glasgow, and Lauriston Place, Edinburgh.

The installations are part of a rapid rollout of testing laboratories converted from existing healthcare facilities across Scotland. The labs operate around the clock, and the HVAC systems are designed with full N+1 redundancy to ensure plant is always on standby for continuity of cooling.

The manufacturer says the air cooled liquid units, based on scroll compressors, are designed for fast installation and commissioning, with integrated hydraulic modules, streamlined electrical connections, and easily removable panels.

## Samsung introduces new DVM S2 range

The next generation of its Digital Variable Multi (DVM) S platform was launched for the European market by Samsung Electronics Air Conditioner Europe (Seace) last month.

According to the manufacturer, the DVM S2 range offers a seasonal energy efficiency ratio up to 7.51 and artificial intelligence (AI) control capabilities to optimise climate conditions based on diverse environments. Seace added that it has used a scroll compressor with advanced flash-injection technology, an enlarged heat exchanger with optimised refrigerant flow, a multi-serration fan, and an enhanced power module.

The heat-transfer area of the heat exchanger is 36.2% larger on the small platform, and 23.7% bigger on the large platform, compared with the DVM S. Seace said the multi-serration fan minimises the turbulence of the air vortex, applying different serration considering the air velocity of the edge and the inside of the blade respectively. The hybrid path is designed to optimise the refrigerant flow corresponding to the airflow profile, and the insulated gate bipolar transistor reduces the loss of conducted electricity.

Active AI recognises the conditions of the installed environment, supplying optimised cooling and heating, and real-time refrigerant leakage monitoring, Seace added.

# COOLING INSIGHT

The CIBSE Technical Symposium taking place on 13-14 July is focusing on the new 'normal' after the global pandemic. **Phil Lattimore** previews four papers on cooling



Henrique Lagoeiro, from LSBU, will present plans on cooling the London Underground

**F**eaturing more than 70 presentations over two days, this year's CIBSE Technical Symposium is focusing on the building services sector as it emerges from the pandemic. Speakers will present virtually on the theme *Engineering the built environment for a new 'normal'*.

Topics to be covered include: responding to the pandemic; application of IT and artificial intelligence tools; climate in urban centres; building simulation; and development of heat networks.

Ensuring buildings are comfortable in a warming climate is one of the big challenges for engineers, and the symposium has a number of papers on cooling, four of which are summarised below.

## Case study: Validating the energy saved through improved cooling controls

**Ant Marsh, Arup**

When various cooling generation and distribution issues were identified in a large energy centre serving a multipurpose development, a programme of works was undertaken to address the problems, including reprogramming the BMS strategy and recommissioning of the mechanical systems. The aim of the modifications was to improve automated control of the cooling system, in turn reducing the energy

consumption related to mechanical cooling. To estimate the resulting energy savings, four years of weather data, heat-meter data and electrical data for cooling were analysed. Results showed that the modifications led to an annual reduction in the electrical energy required for cooling of around 500MWh (or 65tCO<sub>2</sub>e per year).

## Waste heat recovery from underground railways: evaluating the cooling potential

**Henrique Lagoeiro, London South Bank University**

This paper explores the Bunhill waste heat recovery (WHR) system, the first scheme of its kind, which will recover waste energy from a ventilation shaft of the London Underground network. The system is based on the installation of a heat recovery heat exchanger that consists of cooling coils and a reversible fan.

The coils are connected to a heat pump that supplies low carbon energy to the Bunhill heat network in the London Borough of Islington.

The Bunhill WHR system is able to operate in a way that not only provides heating to the local heat network, but also simultaneously supplies cooled air to the Underground tunnels, depending on the operation of the reversible fan.

## Forecasting the future cooling energy demand patterns for existing office buildings in tropical regions

**Rawisha Serasinghe, University of Moratuwa, Sri Lanka**

This paper highlights the importance of assessing future cooling demands of existing buildings under different climate-change scenarios.

With space heating and cooling a major contributor to building energy consumption – accounting for nearly half of global energy production – projected increases of temperature will increase energy demand for cooling significantly. A considerable portion of the world's population lives in tropical, humid climate zones, where the cooling demand is predicted to be affected hugely by global warming. Forecasting of energy demand and planning is an important step in building energy sustainability in these regions.

## The case for sustainable environmentally friendly heating and cooling systems.

**Don't take a chance on corrosion. Change!**

**Gordon Pringle, HASL**

This presentation will give an overview of the environmental benefits associated with the implementation of an alternative approach to water treatment and the use of continuous monitoring in the prevention of corrosion in closed systems. It will explore the operation of such systems, the minimal initial cost, and the sustainable savings associated with this enhanced process. **CJ**

## Ticket information

CIBSE member tickets are £80 + VAT; standard tickets are £150 + VAT; part-time CIBSE student member tickets are £40 + VAT.

To book your place, visit [www.cibse.org/technical-symposium](http://www.cibse.org/technical-symposium), email [symposium@cibse.org](mailto:symposium@cibse.org) or phone +44(0) 20 8675 5211.



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# A STEP TOWARDS NET-ZERO COOLING

Air conditioning giant Gree has been recognised as joint winner of the 2021 Global Cooling Prize for creating an air conditioning prototype with five times less climate impact than a standard product. Gree UK's **Tim Boxall** reveals the innovations behind its winning solution

Gree has combined a number of technologies to create an air conditioner capable of achieving net-zero carbon emissions



**G**ree's Zero Carbon Source cooling technology, which jointly won the 2021 Global Cooling Prize, innovatively integrates a number of technologies. It achieves a climate impact just 20% of a standard air conditioner when tested employing the Indian seasonal energy efficiency ratio (ISEER) test, with temperatures that reached a high of 36.2°C, an average of 25.6°C, and a wide range of relative humidity levels, with a high of 80.1%.

Advanced vapour-compression refrigeration, photovoltaic (PV) direct-driven technology, plus evaporative cooling, and ventilation – using free cooling sources (air and water) – were combined with environmentally-friendly refrigerants to reduce energy consumption and carbon emissions significantly. Linked to energy storage, the system can easily achieve net-zero carbon in operation.

The assertion that Gree Zero Carbon Source cooling units had 'five times lower climate impact' was tested by the organisers of the Global Cooling Award as part of the entry criteria – all participants had to prove climate-impact reduction.

## How does Zero Carbon Source work?

Zero Carbon Source air conditioning significantly improves the

energy efficiency of vapour-compression refrigeration systems while maximising the efficient use of natural and renewable cooling and power.

Using low-humidity air when available reduces heat and moisture load, while water is used for evaporative cooling and outdoor falling film evaporation, employing a specific type of vertically-orientated heat exchanger.

Cascade heat exchange and vapour-compression refrigeration cycles work in parallel. A new type of compressor, low global warming potential (GWP) refrigerant (R152a), dual-temperature evaporators, and evaporative condensers ensure efficient operation and precise control of cooling and dehumidification.

Depending on the outdoor weather conditions, the system intelligently selects one or more of the three modes of vapour-compression cooling, evaporative cooling and ventilation. Photovoltaic-sourced power is employed whenever possible.

The prototype designed for the Global Cooling Awards was for the residential market, but the system could be scaled up and adapted for commercial applications. >>

» Installation is fairly straightforward, in the same way that any household air conditioning system is fitted. The ventilation system needs to be installed on an exterior wall or window, while the photovoltaic panels would typically be installed on the roof.

**Parallel compression cycle with dual evaporation temperature**

Traditional unit air conditioners employ single-stage compression refrigeration. There is only one suction pressure for the compressor and, during cooling, there is only one evaporation temperature at the corresponding evaporator.

Using the innovative cascade heat exchange and parallel compression refrigeration cycle means there are three suction pressures while the triple-cylinder rotary compressor is working in cooling mode.

The three suction inlets are connected with low- and high-temperature evaporator and flash tank discharge outlets, from low to high pressure, respectively. The indoor air return flow passes through both evaporators in turn, creating cascade heat exchange, while the refrigerant at the condenser outlet entering into the flash tank achieves sub-cooling through the first-stage throttle.

The cascade heat exchange and flash tank sub-cooling both improve the efficiency of the refrigeration cycle and, therefore, the overall energy efficiency of the air conditioning system.

**Climate adaptive residential air conditioning**

‘Climate adaptive’ means the system can intelligently select one or more of the three modes of vapour-compression refrigeration, evaporative cooling and ventilation, depending on the outdoor weather conditions.

For example, ventilation is selected when the temperature and humidity are low, and evaporative cooling when the temperature is high but the humidity is low (see Figure 1, ‘Control strategies in different climates’).

When it is available and appropriate to do so, the mechanical ventilation system brings in cool, dry air directly. If the outdoor air is warm but relatively dry, and the evaporative cooling mode requirements are met, the water pump will be switched on to create a wet film in front of the ventilator fan, cooling the high-temperature outdoor air before it enters the room.

If the indoor temperature and humidity requirements cannot be met with these ‘free-cooling’ modes, the system will turn on vapour compression in joint operation with evaporative cooling.

**A new type of compressor**

The triple-cylinder, rolling-rotor compressor has three suction inlets and one discharge outlet. Together, combined with other components of the refrigeration system, a cascade heat-exchange, parallel-compression refrigeration cycle is achieved, improving the efficiency of the refrigeration cycle.

Zone	Outdoor climate	Control strategy
1	Low temperature, low humidity	Mechanical ventilation
2	High temperature, low humidity	Evaporative cooling + vapour-compression refrigeration (when needed)
3	High enthalpy, low humidity	Ventilation (for dehumidifying) + vapour-compression refrigeration (when needed)
4	Others	Vapour-compression refrigeration

Figure 1: Control strategies in different climates

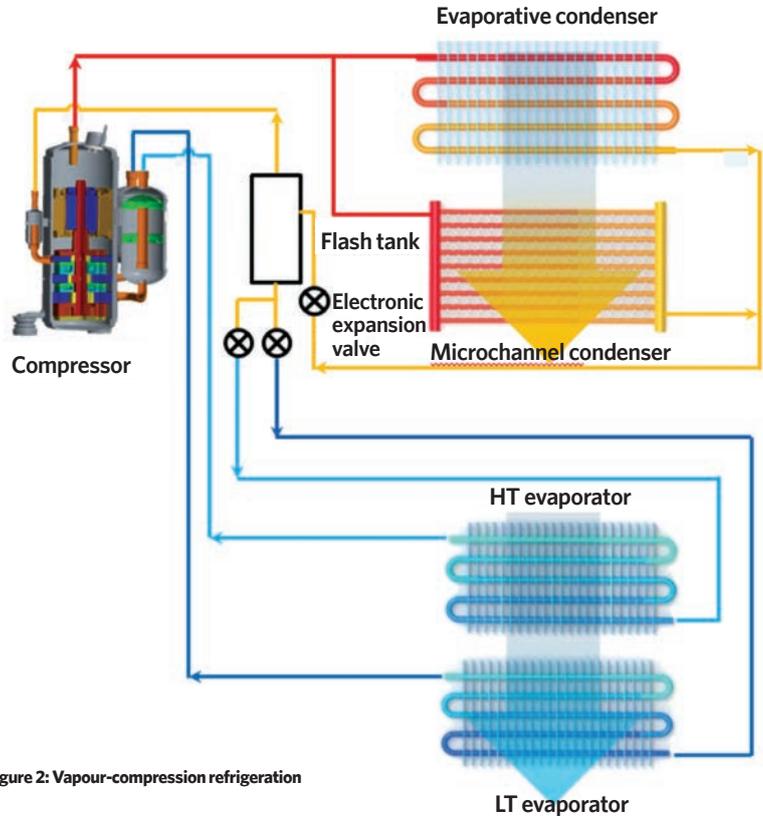


Figure 2: Vapour-compression refrigeration

**Vapour compression refrigeration explained**

The ultra-efficient vapour-compression refrigeration system consists of the triple-cylinder rolling-rotor compressor, as described above, separate falling film evaporative finned-tube condenser and microchannel condenser, first-stage expansion valve, flash tanks, two secondary expansion valves, and two evaporators, which are connected to form a completely enclosed refrigeration system.

The outdoor finned-tube condenser is sprayed with evaporator condensate or tap water to reduce condensation temperature.

**Photovoltaics**

The air conditioning system uses the PV power preferentially, but can seamlessly switch between PVs and the grid when required.

The prototype entered into the Global Cooling Awards was not completely net zero because of the size limits, but with further adoption of energy storage and PV grid connection, zero carbon emissions is achievable. CJ

■ Visit [globalcoolingprize.org](http://globalcoolingprize.org) for more information about the Global Cooling Prize. Gree will publish a paper about this new technology at a later date - [www.gree.uk.com](http://www.gree.uk.com)

■ **TIM BOXALL** is technical sales support manager at Gree UK

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## Aspects of primary circuit design for effective commercial heating systems

This module explores key factors in successful primary circuit design for commercial building hot-water systems

Practically every commercial building has a hot-water requirement, whether for domestic hot water, heating, or some other process use. This CPD article will consider some of the aspects that will underpin the successful operation of the so-called 'primary circuit', which will typically include at least one low thermal capacity, high-efficiency, condensing boiler.

As discussed in CIBSE Guide B1<sup>1</sup> a hydronic heating system, regardless of size or complexity, can be thought of as comprising three sections: the primary circuit, which contains the heat generators; the secondary circuits that contain the heat emitters; and the hydraulic connection between the primary and secondary circuits.

The basic performance of the heat generator will typically be mandated through local regulations. For example, in England, the *Non-domestic building services compliance guide* provides the minimum requirements for 'seasonal boiler efficiency' for individual boilers and multi-boiler systems, for both new buildings and replacement systems. These requirements are similar to those used across the UK and Europe. Additional credit, which assists in compliance, is given for system characteristics such as: ensuring installed boilers are sized not more than 120% of the building heating load; the use of multiple boilers in larger systems; providing controls that include appropriate implementations of weather compensation and optimum start/stop; and encouraging operation to be overseen by a building management system.

Guide B1 suggests that the design of the primary circuit, together with the control of the heat generator (and any associated pumps), should ensure the following requirements are met:

- The total heat output from the heat generators matches the heating demand in the secondary circuits reasonably closely
- The system is stable under all conditions
- Energy consumption/carbon emissions are minimised
- Thermal stress and acid corrosion of the heat generators is minimised.

As discussed in CIBSE AM14 *Non-domestic hot water heating systems*,<sup>2</sup> modern boilers operate efficiently at part load. Historically, systems employing high thermal capacity boilers were designed to operate as close to maximum capacity as possible to reduce standing losses. High-efficiency boilers, which are the minimum standard for new and replacement installations, will have some – or all – of the following characteristics: >>

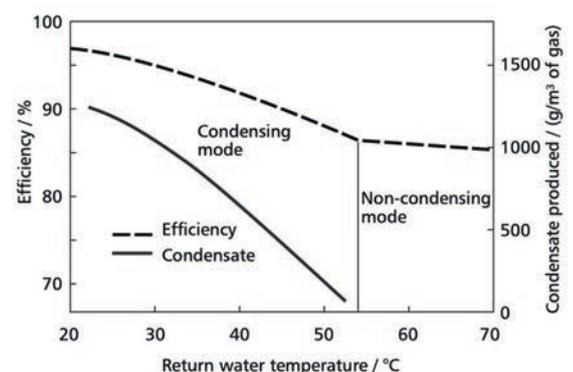


Figure 1: Operation of condensing boilers – lower return-water temperatures lead to more condensation, resulting in higher efficiencies (Source: CIBSE Guide F<sup>3</sup>)

- » ■ Low water content and/or thermal mass
- Rapid response to demand
- Typically, stainless steel or aluminium heat exchanger with a multi-pass arrangement
- Peak efficiency at low firing rate (for both condensing and non-condensing boilers)
- A packaged modular arrangement
- Compact form, with high levels of thermal insulation.

Increasingly, in commercial applications, some – or all – of the secondary circuits will be variable flow, and that would typically be supplied from a primary circuit that is likely to include at least one gas-fired, condensing, low thermal capacity boiler. The basic performance of condensing boilers is directly associated with the temperature of the water entering the boiler’s condensing heat exchanger, as graphically illustrated in Figure 1. The lower return-water temperatures available from variable volume systems are particularly useful when condensing boilers are used, as their efficiency increases with lower return-water temperature. A note in the England Building Regulations compliance guide suggests that ‘condensing boilers will meet projected efficiencies only when they operate with a system return temperature between 30°C and 40°C for 80% of the annual operating hours’. So, although high thermal efficiencies are attainable from currently manufactured boilers – as indicated in the examples from CIBSE AM14 in Table 1 – an inappropriate primary circuit design or control regime will prevent the highest efficiencies.

Most modern boilers, particularly those with low water content, require a minimum flowrate while they are being operated. The flowrate passing through the boiler will become smaller as the design temperature difference increases. However, there is a minimum flow required by the boiler to prevent ‘kettling’, overheating and potential heat-exchanger failure. Conversely, increasing flowrates beyond manufacturers’ recommendations will cause unreasonably high water-pressure drops, excessive noise, and can eventually erode system parts such as aluminium heat exchangers.

Most non-domestic heating systems incorporate more than one heat generator. In addition to providing a degree of standby capacity, this can result in improved overall system efficiency. Larger systems that require higher operating temperatures may benefit from having multiple boilers, with the lead boiler being a condensing type, and the remaining (potentially non-condensing, high-efficiency) boilers

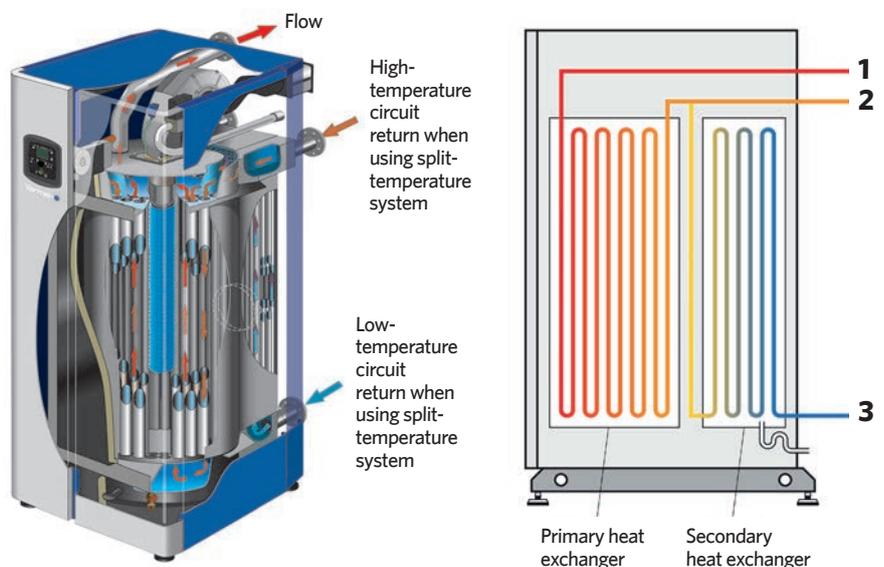
Operating conditions	Efficiency
Full load at 80/60°C (non-condensing)	89%
Minimum load 80/60°C (approximately 20% full load) (non-condensing)	90%
Full load at 50/30°C (condensing)	91%
Minimum load (approximately 20% full load) 50/30°C (condensing)	95%

**Table 1: Approximate gross efficiencies for modular-type condensing boilers (Source: CIBSE AM14:2010)**

employed to provide heat only when peak loads (and higher temperatures) are needed. Alternatively, where there are loads in a building that can be divided into circuits of those with higher temperatures (above 56°C), and those with lower return-water temperatures, a condensing boiler employing a split heat exchanger – such as the example in Figure 2 – may be used. As noted by Struck,<sup>4</sup> at what were the traditional operating temperatures of 80/60°C flow/return, a condensing boiler will only achieve marginally higher efficiencies than a high-efficiency non-condensing boiler. If operating temperatures are reduced, typically to 50/30°C, or the temperature differentials can be widened to offer a lower return temperature (80/50°C), then there are significant opportunities for efficiency gains. The lower return temperatures will increase condensation rates for condensing boilers, and maintaining a higher flow temperature will satisfy loads such as heating domestic hot water in a calorifier or through a plate heat exchanger. If using a boiler with maximum 20K differential, the flow temperature could be reduced to 70°C to allow 50°C return (enabling condensing operation); however, the heat-up times for hot water would be longer, or the heat transfer area would have to be greater to deliver the same performance.

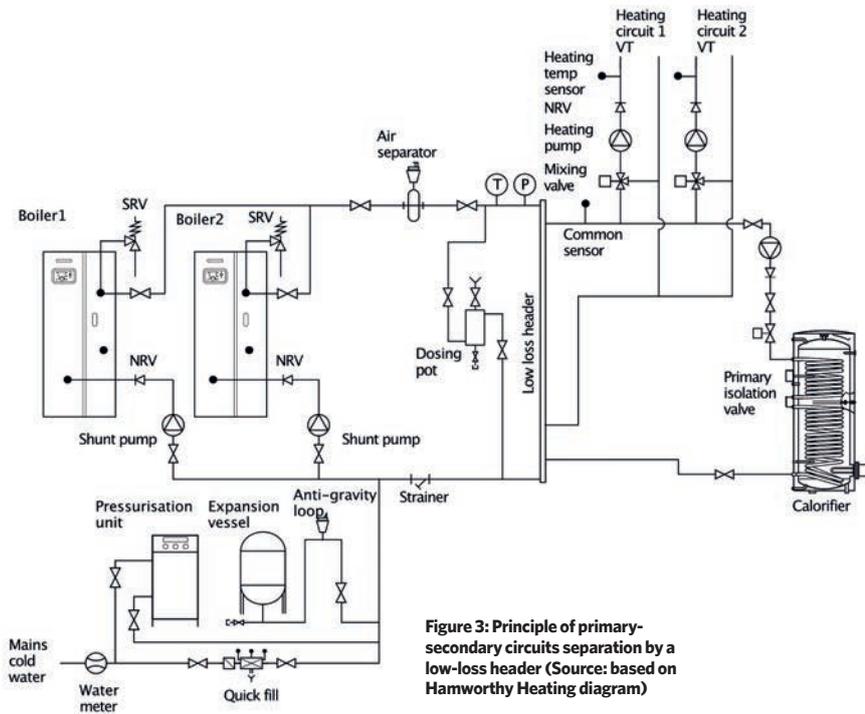
By operating with a wider differential temperature and lower flowrates, the pressure loss will be reduced through a hydronic system. Considering an example commercial 250kW condensing boiler operating at a ‘traditional’ 11K temperature difference ( $\Delta\theta_{f-r}$ ) with a flowrate of 5.4L.s<sup>-1</sup> would have a pressure loss in the order of 130kPa. Operating at 30K temperature difference would reduce the flowrate to 2L.s<sup>-1</sup> with a pressure loss of just 18kPa (see boxout, ‘Heat generator power relationship’, for calculation method).

Pump power P (W), may be calculated from  $P = \frac{Q \times p}{\text{Pump efficiency}}$  where Q is water volume flowrate (m<sup>3</sup>.s<sup>-1</sup>) and p is system pressure loss (Pa). So, for an 85% efficient pump, the peak pump power to move water through this boiler would reduce from 826W when operating at an 11K  $\Delta\theta_{f-r}$  to 42W at 30K  $\Delta\theta_{f-r}$ . This will deliver



- 1 Flow to all circuits
- 2 Return to primary heat exchanger. High-temperature circuit return with split-temperature system
- 3 Return to secondary heat exchanger. Low-temperature circuit return with split-temperature system

**Figure 2: An example of a modern 127kW condensing boiler. The boiler may be used with a split-temperature return or, in the case of a common return, the top inlet connection is blanked off and the lower connection is used for the combined return (Source: Hamworthy Heating)**



**Figure 3: Principle of primary-secondary circuits separation by a low-loss header (Source: based on Hamworthy Heating diagram)**

significant potential savings on pump capital and operational costs, energy use and environmental impact.

The interface between the secondary and the primary circuits should be designed to prevent the flowrate in any one circuit significantly influencing the flow in any other circuit. The increasing use of low thermal capacity boilers and variable flow secondary circuits has led to the widespread adoption of the relatively simple vertical low-loss header, as shown in the example circuit in Figure 3. (Alternative methods of hydronic separation between primary and secondary circuits may be provided by, for example, heat exchangers, buffer tanks, ‘close-coupled tees’ or, potentially, the more extensive Boddle-Orchard circuit.<sup>5</sup>) The total pressure throughout the length of the low-loss header should be very nearly constant and so, by necessity, it has a relatively large hydraulic diameter with low-velocity water flow and low pressure loss. They are designed to provide a neutral pressure point in the system. The commonly employed single vertical low-loss header normally includes an automatic air valve at the top and a purge connection at the base to remove the accumulated sludge. (In the May 2021 *CIBSE Journal*, David Palmer provides extensive discussion of the dimensioning of the vertical low-loss header.)

Undersized headers will not work as a low-loss header and will produce unwanted circuit interaction (where pumping in one circuit impacts another), whereas an oversized header –aside from taking up additional space and adding to cost – will not cause a significant issue and, if vastly oversized, tends to act as a small buffer vessel.

The primary pumps may be: integral to each boiler; as external pumps on each separate boiler sub-circuit; or as a single primary circuit pump. The choice of pumping arrangements must meet the requirements for load diversity and minimum flowrates, and the decision is likely to depend on a balance between system redundancy, controllability, and cost. So, for example, in a critical application, such as a prison or hospital, redundancy over cost tends to be the primary deciding factor and may lead to the installation of individual pumps on each boiler sub-circuit. Condensing boilers are normally individually pumped because of their higher water-pressure loss and the need to maintain flow through the low thermal mass heat exchanger. If a primary circuit has a single primary pump feeding multiple boilers, then a ‘reverse return’ pipework configuration should be used to ensure that flow is evenly distributed across all boilers.

Corrosion is controlled in condensing boilers by having suitable materials (stainless steel, aluminium or polymers) in contact with the cool combustion gases and condensate – some manufacturers’ pipework kits include this as a standard. Heat exchangers are often designed such that the flow of condensate helps to clean the heat exchanger surface, aiding efficiency and reducing the chance of hotspots or local corrosion pits forming.

The primary circuits for non-condensing boilers should be designed so that the

average boiler water temperature does not fall below about 56°C – the dewpoint of the flue gas. Low-temperature boiler corrosion would be likely to occur at the smoke box prior to the flue connection and is often referred to as ‘back-end corrosion’. Maintaining the return-water temperature above 56°C, along with keeping flue gases above 140°C, can provide protection from this type of corrosion – known as ‘back-end protection’. However, this can limit achievable burner turndown. At start-up, a thermostatically controlled bypass between the flow and return connections can be used to blend a small proportion of hot flow water with cooler return water, typically to ensure that the return temperature into the heat exchanger remains above 60°C.

Circulation is achieved either by a small shunt pump or by connecting the flow end of the bypass pipe to the primary pump discharge and controlling the flow/return blend through a three-port valve. In each case, the bypass is isolated automatically when the system return temperature reaches the pre-set minimum and, if fitted, the shunt pump is stopped.

‘Flow prevention’ (reportedly often confused with ‘back-end protection’) refers to the unwanted water circulation through inactive boilers (and other heat generators), which would otherwise increase the boiler ‘standing losses’. Higher thermal mass boilers commonly employ a single primary pump to supply multiple modules. Flow through individual boilers may be controlled with a two-port isolation valve (potentially also employing variable flow primary pumping) or a three-port diverting valve for each module, integrated with safety control to ensure boiler overrun periods and to prevent excessive boiler temperatures. For condensing boilers that, in any case, have significantly lower standing losses, flow prevention is typically effected by stopping the individual pump serving the module (subject to safety interlocks). As in Figure 3, a non-return valve is also used to prevent reverse-flow through the boiler when the pump is not operating.

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➤ Turn to page 60 for further reading and references.

## HEAT GENERATOR POWER RELATIONSHIP

The relationship between heating power, flowrate and temperature difference of a heat generator is given by equation  $\phi = m C_p (\theta_i - \theta_r)$  where  $\phi$  is the heating power of the heat generator (kW),  $m$  is the water flowrate through the heat generator ( $\text{kg}\cdot\text{s}^{-1}$ ),  $C_p$  is the specific heat of water ( $4.2\text{kJ}\cdot\text{kg}^{-1}\cdot\text{K}^{-1}$ ),  $\theta_r$  is the flow water temperature leaving the heat generator ( $^{\circ}\text{C}$ ) and  $\theta_i$  is the inlet returning water temperature ( $^{\circ}\text{C}$ ).



# Module 182

July 2021

» 1. If a condensing boiler had water returning at 30°C, what is the maximum boiler gross efficiency that could be expected?

- A 65%
- B 75%
- C 85%
- D 95%
- E 105%

2. Which of these is least likely to result from excessively reducing water flow through a boiler?

- A Erosion of components
- B Kettling
- C Overheating
- D Potential heat-exchanger failure
- E Reduced pressure drop

3. If 5kg·s<sup>-1</sup> water are entering a boiler at 30°C and leaving at 50°C, how much power is being added to the water by the boiler?

- A 20kW
- B 42kW
- C 100kW
- D 142kW
- E 420kW

4. What is the approximate lowest temperature that will prevent condensation in flue gas and reduce opportunities for corrosion?

- A 46°C
- B 51°C
- C 56°C
- D 61°C
- E 66°C

5. What was the term used to describe the avoidance of water being circulated through the heat exchangers of inactive boilers?

- A Back-end protection
- B Corrosion protection
- C Flow prevention
- D Overrun protection
- E Standing loss prevention

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### Further reading:

For details of control of boiler systems, see CIBSE Guide H.

CIBSE Guide B1 considers the application of boilers into heating systems.

CIBSE AM14 includes extensive discussion on primary and secondary circuits.

### References:

- 1 CIBSE Guide B1, Heating, CIBSE 2016.
- 2 CIBSE AM14 - Non-domestic hot-water heating systems, CIBSE 2010.
- 3 CIBSE Guide F, Energy efficiency in buildings, Chapter 10, CIBSE 2012.
- 4 Struck, T, Using wide temperature differentials to improve the efficiency of heating systems, [bit.ly/CJJul21CPD](http://bit.ly/CJJul21CPD) - accessed 6 June 2021.
- 5 Teekaram, A et al, BSRIA AG16/2002 Variable-flow water systems - Design, installation and commissioning guidance, BSRIA 2002.



# Will you help shape and steer CIBSE's future?

We are looking for members who can lead, empower, champion and inspire our committed community and help guide the Institution. Nominations from CIBSE's membership are sought for future Officers, Board Members, and members of the consultative Council of the Institution.

Stepping up to an Institution governance role will challenge you to guide CIBSE to enable our membership and Institution to have more impact. The Nominations Panel is looking for a diverse range of candidates from across our community.

Find out more, nominate & check eligibility [cibse.org/nominations](http://cibse.org/nominations)

Forms must be submitted to [jwigglesworth@cibse.org](mailto:jwigglesworth@cibse.org) by **Monday 30 August**

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## Products of the month

### Rinnai N Series hydrogen-ready now

Sensei N Series range gets the green light following extensive testing of lower-carbon gas mix

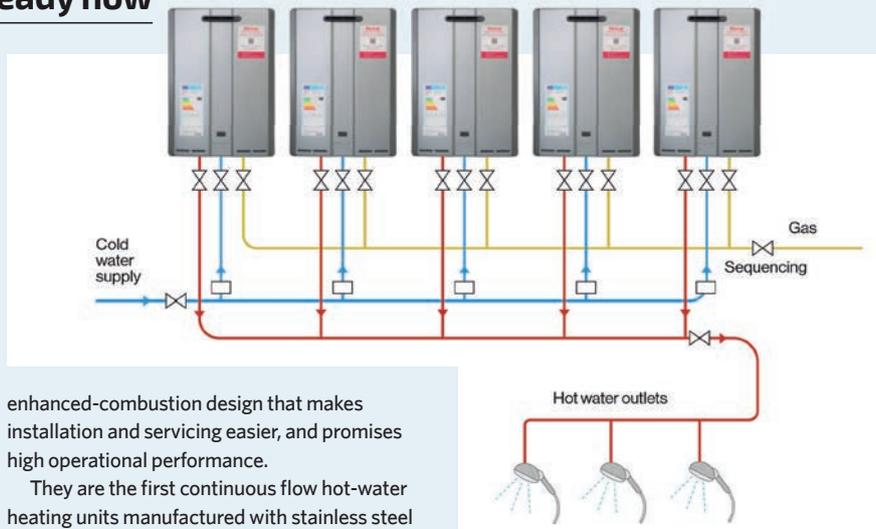
**H**ot-water heating unit and system manufacturer Rinnai has announced that, after an extensive testing and verification process, its current Sensei N Series range is 'hydrogen ready'.

The Sensei N Series can be powered by a blend of up to 30% hydrogen, and Rinnai UK is also in advanced development of a product that will be able to handle a total hydrogen-gas supply.

The appliance – an 'out of the box' design, originally engineered and approved for use with natural gas – has undergone a conversion and recommissioning process in the field to allow it to operate safely and efficiently on pure hydrogen.

The launch of this next-phase Rinnai appliance will align with the planned grid gas-blend upgrade, to ensure normal product lifespans can be maintained. All units are guaranteed to supply limitless volumes of temperature-accurate hot-water flows, provided fuel and water connections are constant.

The Rinnai Sensei N Series continuous flow hot-water heater range offers a more compact,



enhanced-combustion design that makes installation and servicing easier, and promises high operational performance.

They are the first continuous flow hot-water heating units manufactured with stainless steel heat exchangers to be available in the UK, claims Rinnai. This extends the working life at optimum performance of all four models in the range. All have extended warranties.

The four models are: the N1600i, giving 954 litres per hour (l/hr); the N1600e (external), also giving 954l/hr (at 50°C); the N1300i, giving 775l/hr; and the N1300e, also giving 775l/hr at 50°C. The two 1600s have load profiles of XXL and are water efficiency class A-rated, while the 1300s are load profile XL and water efficiency class A-rated.

The Sensei N Series range is also low-NO<sub>x</sub>, and the future-proofed continuous flow water heaters

have several global patents on components.

Integral controls on the units enable the water heater to achieve high efficiencies because of advanced burner control and high modulation ranges, Rinnai says. This wide range means energy usage is optimised, as the water heater, through smart inbuilt controls, will only heat the water to the temperature required, thus saving energy.

■ Call 01928 531 870, email [engineer@rinnaiuk.com](mailto:engineer@rinnaiuk.com) or [sales@rinnaiuk.com](mailto:sales@rinnaiuk.com), or visit [www.rinnaiuk.com](http://www.rinnaiuk.com)

### Mitsubishi invests in Turkish facility

Mitsubishi Electric has announced a \$18m investment in its Turkish factory to boost air conditioning production and start the manufacture of air source heat pumps.

The 40,000m<sup>2</sup> facility in Manisa, just inland from the Aegean Sea port of Izmir, started manufacturing in 2017, and produces around 500,000 room air conditioners (indoor and outdoor) per year. It will begin production of air-to-water (ATW) heat pumps in August next year to complement production of Ecodan units from the company's factory in Livingston, Scotland.

The investment is projected to achieve a combined annual production of one million units. Increased output of room air conditioners will start this October to serve the European market.

Fossil-fuel boilers are rapidly being replaced with ATW heat pumps in line with decarbonisation policies. In addition, the need for air conditioners has risen because of stay-at-home protocols implemented in response to Covid-19. Demand for room air conditioners is expected to continue rising.

John Kellett (pictured), divisional manager of Living Environment Systems, responsible for sales and marketing of heat pumps and air conditioning in the UK, described the move as 'positive'.

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



John Kellett

### Pump Technology is a one-stop shop

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**Domus Ventilation launches non-combustible Solis Air Brick >**

Domus Ventilation has launched the new Solis Air Brick range of low-resistance, non-combustible metal air bricks, which are fully compliant with the revised Building Regulations Fire Safety Approved Document B.

The bricks - 204x60mm single metal air brick, and 220x90mm and 220x126mm double metal air bricks - come in a range of architectural grilles and colours.

For customers wishing to know more about the changes to the Building Regulations, Domus Ventilation has launched a CPD-accredited course. It can be booked by emailing [megan.bennett@domusventilation.co.uk](mailto:megan.bennett@domusventilation.co.uk)

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



**nVent's UFH thermostat gets smart update >**

The premium nVent Raychem Senz Wi-Fi electric underfloor heating (UFH) thermostat has been updated to allow users to control their heating using voice commands via a smartphone app or home-hub device. Enabled by the development of an open application programming interface, the new feature allows the thermostat to be integrated with leading smart-speaker devices and building management systems, bringing connected underfloor heating to any application.

■ Call +44 (0) 7836 236 534 or email [david.perry@nVent.com](mailto:david.perry@nVent.com)



**< Elco launches new range of air source heat pumps**

Elco Heating Solutions has added two new models to its Aerotop range of air source heat pumps. All models in the range are reversible and can be supplied with flow and return manifolds for arrangements of up to four heat pumps, while 16 units can be managed by a cascade controller. The company says the range, designed with commercial use in mind, reinforces its commitment to renewable technology.

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



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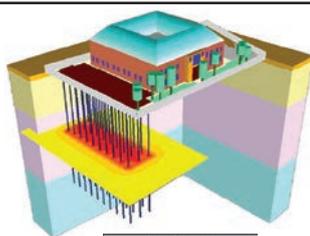
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*All applications must be directed to Maxwell Stephens to be considered – **Closing date for all applications will be 23/07/21.***

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A holistic approach ensures project areas are not considered in isolation, says Burgess



Roz Burgess

## Food for thought

**TM50 Energy efficiency in commercial kitchens cuts emissions and costs, says lead author Roz Burgess**

The new and expanded TM50 *Energy efficiency in commercial kitchens* offers updated advice for designers, installers and operators of these facilities on how to minimise their energy consumption, realising efficiencies in carbon emissions and operating costs. It has been prepared by a range of industry experts, including coordinating author and principal design consultant at A&E Catering Design, Liz Rose, to provide practical recommendations that can be applied to all commercial foodservice facilities. Here, Roz Burgess, the guide's lead and coordinating author, and principal at Intelligent Catering, explains how the guide can help users. Read the guide on the CIBSE Knowledge portal at [bit.ly/CJJul21TM50](http://bit.ly/CJJul21TM50)

### Who is the guide aimed at?

The sectional format enables a variety of readers to dip into the sections that have particular relevance to them; however, everyone involved in food-service would gain understanding from this guide.

### What is the potential for reducing energy use in commercial kitchens?

Energy reduction must begin by understanding the foodservice environment requirements, starting with menu, trade levels, operating style, as well as operational aspects, including delivery, production, service methods, skill levels and maintenance intent. It is from this point the foodservice design takes shape, with layering on of building constraints, access flows and fuel types.

Extraneous equipment shouldn't be included, but future considerations are important to enable a unit to flex and adapt to changing markets. Trends in equipment, new shiny items or reinvention must be deliberated on in respect of requirement. Overall reductions in fuel, water and waste depend on the starting point. Refurbishments, along with new foodservice units, benefit from fresh thinking, challenge and equipment, which delivers what is marketed. Recovering heat, reusing waste water, fats, oils and grease (FOG) treatment, cyclical 'intelligent' parts within equipment and connectivity should be integral to optimise reductions.

### Why should an experienced foodservice consultant be used?

Interpretation is critical to enabling operation and energy efficiency. It is great to be energy efficient, but if the overall foodservice unit is not viable, this would be a waste of resource and energy. An experienced foodservice consultant will be able to interrogate the project requirements at appropriate points and sift through

information to provide the responsible and applicable design and specification for this unit. It is not a one size fits all, and each and every aspect needs to be considered to enable knowledge and decisions to be agreed upon.

Reading the guide can increase understanding, but an experienced consultant is invaluable for ensuring aspects work together and not against one another.

### Does the culture in the kitchen need to change to minimise energy use?

The human aspect of operation plays a large part in wasted energy. Understanding and making the onsite team's life simpler will have an effect on the energy plan. For example, equipment that is efficient but also easy to use, simple to clean and easy to maintain will enable chefs.

Communication of what and why, followed by how, should be shared with the team and documented to ensure initial team members – and those that follow – know what is intended. On a wider scale, knowing the energy consumption of the kitchen – and then being aware if this alters significantly – enables diligent proactive teams to question why things have changed and respond accordingly.

### What are the biggest risks to low-energy aspirations not being realised?

A holistic approach ensures project areas are not considered in isolation; the areas work together, and the team can work collectively to achieve energy goals. Budgeted capital costs can be greater with efficient equipment and associated aspects; however, utility savings should be realised. Again, the big picture should be considered.

The human aspect is a significant factor too. Adapting and changing the onsite team behaviour is vital to realise low-energy use – intelligent equipment can only go so far.

### How do you ensure users operate kitchens efficiently after handover?

I ensure appropriate equipment of a suitable specification for the purpose and for skill levels is included. Also, that the areas are designed so they can be accessed for cleaning and maintenance. A suitably proficient company providing the correct installation, followed with commissioning to set up equipment correctly and initial training, provides a platform for success. Refresher training, and ensuring the equipment is used correctly and only when needed to meet customers' demands, must be part of the overall, ongoing operational management.

# EVENTS



## TECHNICAL SYMPOSIUM

13-14 July

This year's event, which will be held virtually, is titled: Engineering the built environment for a new 'normal' - delivering safe, healthy and versatile buildings. The annual event encourages the participation of both young and experienced industry practitioners, researchers and building users to share experiences and develop networks.

For more information and to register, visit [www.cibse.org/symposium](http://www.cibse.org/symposium)

## CIBSE REGIONS AND GROUP EVENTS

For up-to-date information on Regions and Groups meetings, webinars and podcasts, visit [www.cibse.org/events](http://www.cibse.org/events)

### SLL and Home Counties North West: Webinar - Bats: why dark skies matter

6 July

Webinar looking at the impact of artificial lighting on UK bat populations, standards for protecting the night-time environment and

developments from the All-Party Parliamentary Group on Dark Skies.

### Home Counties North West: Seminar on Leading teams remotely

8 July

Presentation by Will Sambrook, business psychologist and leadership specialist, discussing the challenges and benefits of leading remotely.

### Australia and New Zealand: Annual cocktail function and awards

22 July

Evening of celebration and presentation of the ANZ Student, Graduate and Young Engineer of the Year awards. For those unable to travel, the event will also be streamed online.

### East Midlands: Student research presentation

3 August

Gain insight into the latest research topics carried out by postgraduate students in the built environment, with postgraduates from Loughborough University presenting their work.

### Home Counties North West: Seminar on



## CIBSE JOURNAL WEBINARS

CIBSE Journal hosts regular, sponsored webinars covering a wide range of building services related topics. The two Journal webinars held in June are now available to watch on demand at: [www.cibsejournal.com/cpd/webinars](http://www.cibsejournal.com/cpd/webinars)

### managing mental health in the workplace

9 September

Workshop to help give you the tools to manage your day-to-day roles and positive steps that will give you coping mechanisms to recognise where small changes can be made.

## NEW LIVE ONLINE TRAINING COURSES

Courses have been reformatted to work online, with a live trainer, meaning you can expect the same interaction and participation as you would in a classroom setting. For details and the full programme, visit [www.cibse.org/training](http://www.cibse.org/training)

### Low carbon consultant building operations

6-9 July

### Energy Savings Opportunity Scheme

7 July

### Avoiding overheating

7 July

### Energy surveys

8 July

### Fire safety building regs Part B

13 July

### Electrical services overview

13 July

### Air conditioning and cooling systems

14 July

### Building services explained

20-22 July

### Low carbon design

20-22 July

### Low carbon consultant

21-22 July

### Above ground drainage

21 July

### Mechanical services explained

3-5 August

### Fire alarm detection and codes BS 5839-1: 2017

6 September

### Heat networks code of practice (CPI)

6-7 September

### Low carbon consultant design

7-9 September

### Below ground building drainage

7 September

### Overview of current fire legislation and guidance

9 September

### Earthing and bonding systems

13 September

### Emergency lighting to comply with fire safety

14 September

### Above ground building drainage

16 September

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

17 September

### Energy savings opportunity scheme

20 September

### Mechanical services explained

21-23 September

### Heat networks (CPI) half-day update

23 September

## ONLINE LEARNING

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

## WEBINARS

### #Growyourknowledge

CIBSE's free webinar series continues. Taking place every two weeks on Thursday at 11am, the webinars are designed to support the CIBSE community in maintaining their CPD remotely. All previous webinars are also available to view on demand.

[www.cibse.org/growyourknowledge](http://www.cibse.org/growyourknowledge)

# CIBSE Membership

CIBSE Membership is hosting free webinars to support members with applications for the Associate and Member grades and registration with the Engineering Council at Incorporated Engineer and Chartered Engineer levels.

The two-part webinar series includes: session 1 covering routes to membership, and session 2 focusing on how to write the Engineering Practice Report.

### Upcoming webinars:

- 13 and 20 July
- 17 and 24 August
- 14 and 21 September



To register for the webinars, visit [www.cibse.org/webinars](http://www.cibse.org/webinars)



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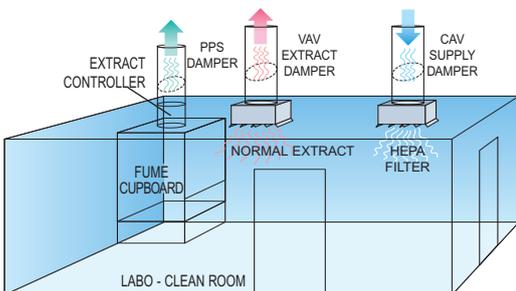


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