



CIBSE **JOURNAL**

#Build2Perform

April 2020

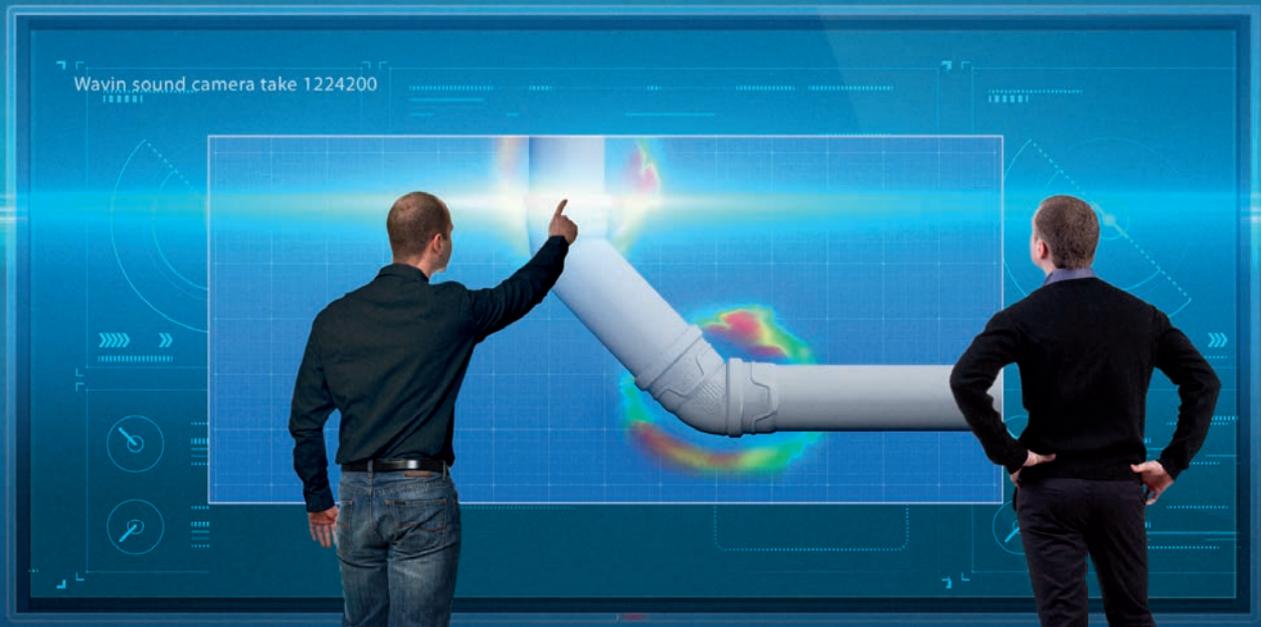
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PREVENTION AND CONTROL

Ensuring buildings minimise the risk of infection from Covid-19

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A test for us all



For many of us, coronavirus Covid-19 felt like a distant threat – a dark cloud on the horizon that did not appear to be getting any closer. Now, the virus that emerged from Wuhan, China, three months ago has spread through global airline routes to the rest of the world.

As we go to press, Italy has overtaken China as the country with the most fatalities caused by the coronavirus. The rest of Europe, downstream of the contagion, hope their social-lockdown strategies will spare them a similar scale of loss.

Every sector of society has been affected. For any industry, these are worrying and uncertain times.

A recent survey of 600 engineering services firms

found that 93% of respondents were worried about the fallout from Covid-19.

The survey, by the ECA, BESA and Select, also revealed that 53% had already experienced delays and disruptions to current projects.

Many of the firms in our sector will be in the midst of the battle to contain the virus, including facilities managers and those working in the healthcare sector.

The Department of Health and Social Care has published its guidance for the UK healthcare sector. This focused on the transmission of the virus through droplets (coughs and sneezes) and surface contact (hand-to-hand and hand-to-surface).

It said Covid-19 could survive for up to five days on some surfaces, highlighting the importance of regular cleaning.

Researchers are studying the early cases of Covid-19 to try to understand how the virus is being transmitted, and how we can prevent the virus from being spread in buildings. Last month, REHVA published a Guidance Document based on an ongoing Dutch literature review by Dr Francesco Franchimon. The papers included research dating back to 2013/14 and the outbreak of the SARS coronavirus, which is similar to Covid-19 and so offers clues to how today's pandemic might be spread.

Like the British government's guidance, REHVA found that the dominant transmission routes were large droplets and surface contact, but it also said airborne transmission was possible when the droplets evaporated to form small particles.

Though it found no direct evidence from the current pandemic, it advises that building owners ensure their buildings are well ventilated (page 26).

As we go to press, the CIBSE Healthcare Group is writing guidance, which will be available at www.cibse.org/coronavirus The Australian Institute of Refrigeration, Air conditioning and Heating (AIRAH) has also issued guidance, which is available at www.airah.org.au For all the latest announcements affecting buildings services, visit www.cibse.org and follow @CIBSE on Twitter.

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Hywel Davies

It may be hard to look beyond Covid-19, but industry needs to move forward with the Hackitt agenda



Liza Young

How one manufacturer is trialling combustion from hydrogen for continuous-flow water heaters



Bill Bahnfleth

ASHRAE past-president digests the latest advice from REHVA on the Covid-19 coronavirus



Tim Dwyer

This month's CPD looks at the prevention of backflow in wholesome water systems

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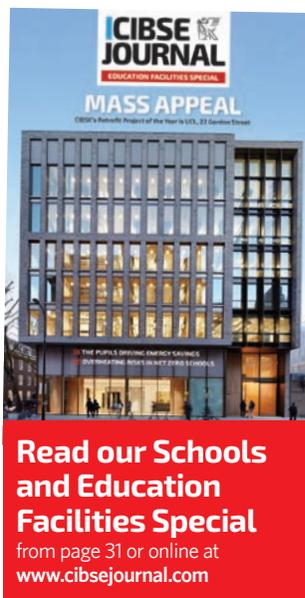
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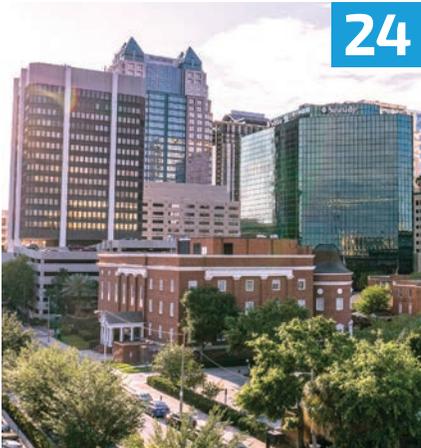
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IN BRIEF

Late pay creates mental health epidemic

Almost four in 10 SMEs across all industry sectors are seeing mental health issues among staff because of unfair payment practices, according to a new YouGov poll.

The survey, commissioned by engineering services bodies ECA and BESA, identified stress (suffered by staff in 29% of firms), depression (14%), extreme anger (9%) and suicidal feelings (3%), directly resulting from late or unfair payment.

The survey of more than 2,000 business owners found that 22% had been forced to cut their own salaries or stopped taking a salary for a period of time.

Calls for renewed focus on diversity

The Building Engineering Services Association marked International Women's Day by renewing calls for a national strategy to diversify the workforce in engineering sectors.

It urged the government to develop a comprehensive plan to encourage young people, women, career changers and people from black, Asian and minority ethnic (BAME) backgrounds to take up careers in industries such as construction and engineering. This would not only reflect the diversity of wider society, but also help address skilled labour shortages.

Just one in every 100 people on construction sites is female, and only 12% of British engineers are women, compared with 18% in Spain, 20% in Italy and 26% in Sweden.

Nine in 10 engineers fear business impact of Covid-19

Businesses encountering delays, access issues and cancellations, survey shows

Nine in 10 engineering services businesses are concerned or very concerned about the impact of coronavirus on their business over the next six months, according to an industry survey.

The ECA, BESA and Select engineering services survey - which, at the time of going to press, had had 600 responses, including nearly 180 from larger businesses - reveals

that 93% of firms are worried about the fallout from Covid-19. More than 60% of respondents said they were 'very concerned', while 1% of respondents suggested they were 'unconcerned'.

Half (51%) of the engineering services respondents said they have already encountered 'delays and disruptions to current projects', with 61% of larger businesses reporting current disruption. Around half of respondents reported 'delays and disruption to future work', while more than half (53%) said they were 'preparing business contingency plans' - a figure that rose to 71% in larger businesses. The most commonly cited response to coronavirus was 'reducing business travel' and 'asking or allowing staff to work from home', followed by 'business contingency planning'. Around 10% of businesses said they had 'shut down at certain premises or sites', and more than 10% said they were 'updating their contracts' and 'looking into alternative suppliers'.

As *CIBSE Journal* was going to press, the Treasury and Bank of England were coordinating efforts to support firms, and construction companies were anxiously waiting to hear the details behind the £330bn assigned to help businesses hit by the coronavirus crisis. (See panel, 'Treasury creates support fund'.)

ECA CEO Steve Bratt said: 'Coronavirus is already having a significant impact across our industry and wider society. We are working with industry bodies and government to represent the concerns and interests of the industry.'

BESA director of legal and commercial Debbie Petford added: 'The sheer scale of the disruption is alarming. We will be working around the clock to provide as much guidance as possible to our members, and calling on the government to keep providing additional stimulus and support.'



Industry task force established

An industry taskforce has been set up to work with the department for business, energy and industrial strategy (BEIS) and government to 'protect the current and future of the construction industry' amid the ongoing coronavirus crisis.

The CLC Industry Task Force, which includes CEOs from a small number of organisations, including the Construction Industry Council, will respond to a remit provided by the Construction Leadership Council (CLC). It will meet on a virtual basis with full-time resource.

The taskforce has been asked to report daily to the construction minister and the chair of the CLC for guidance and to provide updates, and it is expected to have a communications sub-group to keep the industry and media updated.

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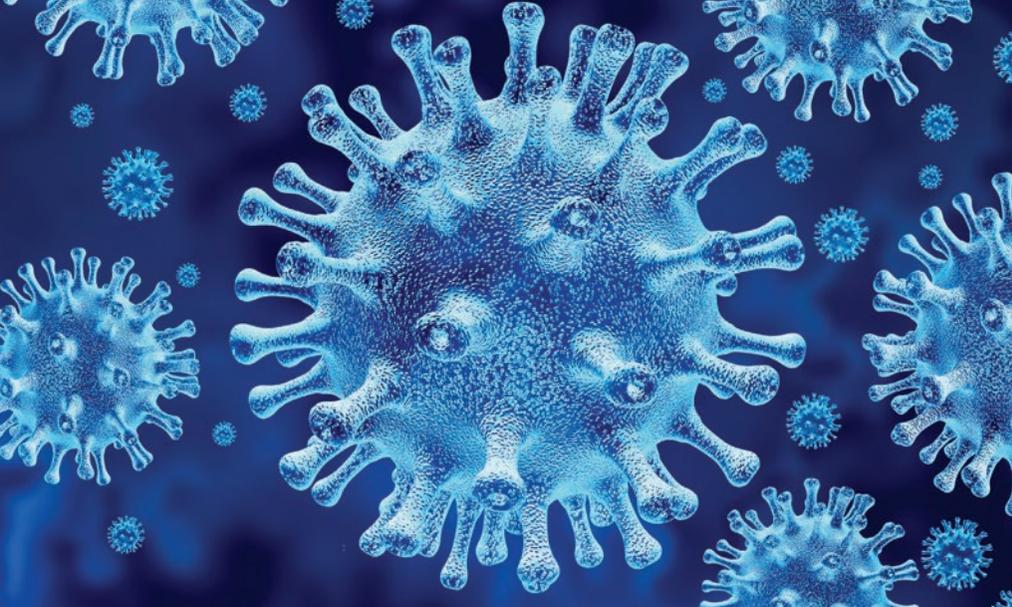
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REHVA guide mitigates airborne risk of virus

Draft guidance document warns of faecal-oral transmission risk

Building managers should avoid recirculation, switch off thermal wheels, and maintain negative pressures in washrooms, if they are to minimise the risk of Covid-19 transmission.

This is the advice in a new draft Guidance Document aimed at preventing Covid-19 from being transmitted through HVAC systems. Published by the Federation of European Heating Ventilation and Air Conditioning Associations (REHVA), it comes after a review of academic papers on the transmission of infectious diseases.

While the predominant means of transmission is through respiratory droplets of more than 10 microns, the document says, the virus can also be transmitted through the air when small particles (less than 5 microns) form from the evaporation of droplets. It adds that there is not yet direct evidence of airborne transmission of Covid-19, but based on research of the similar SARS coronavirus outbreak in 2003-04, the guidance says infection could be airborne.

It recommends supplying as much air to buildings as possible, by opening windows and expanding operation times of HVAC. Exhaust ventilation systems of toilets should be left on, and negative pressure must be maintained in toilets to avoid faecal-oral transmission.

In heat-recovery systems, the guidance recommends turning off thermal wheels during Covid-19 episodes because of the possibility of particles being resuspended.

It also says that humidification has no practical impact on the virus; Covid-19 is resistant to environmental changes and is susceptible only for a very high relative humidity (RH) above 80% and a temperature above 30°C.

This is contrary to experts such as Dr Stephanie Taylor, who are advocating a 40-60% RH range.

The guidance recommends avoiding central recirculation and advises that decentralised systems – such as fan coil units using local circulation – should be turned off, or cleaned regularly, to avoid resuspension of particles. See page 26 for more.

Aircon ‘scaremongering’ unhelpful

Industry figures have refuted reports that air conditioning systems are responsible for the spread of the coronavirus. Research from Singapore suggested that ‘traces of the virus’ had been found in an air duct connected to the room of a patient who had tested positive for the virus. This led reporters to assume the virus was being transferred via the air flowing through the duct.

‘Not only is this unscientific, because it does not consider the distinct probability that someone has touched the outlet grille and left the trace amount there, but the scaremongering this creates is unhelpful to those trying to get to grips with what is really going on,’ said Graeme Fox, head of the UK’s F-Gas register, Refcom.

REHVA’s guidance said that there had been ‘overreactive’ statements recommending the cleaning of ventilation ducts to avoid transmission of Covid-19 via ventilation systems. It said the ventilation system is not a contamination source if guidance on heat-recovery systems and recirculation is followed (see story above).

ASHRAE updates resources on Covid-19

ASHRAE has published guidance about the role of HVAC systems in helping to contain the coronavirus outbreak.

Its Covid-19 Preparedness Resources webpage, [ashrae.org/COVID19](https://www.ashrae.org/COVID19), provides resources for building industry professionals, including the association’s position document on airborne infectious diseases.

ASHRAE president Darryl Boyce said: ‘Preparedness Resources are available as guidance to building owners, operators and engineers on how to best protect occupants from exposure to the virus, in particular in relation to airborne particles that might be circulated by HVAC systems.’

ASHRAE recommends dilution ventilation, laminar and other in-room flow regimes, differential room pressurisation, personalised ventilation, source-capture ventilation, filtration, and UVGI (upper room, in-room, and in the airstream).

CIBSE Healthcare Group was preparing its own guidance as *CIBSE Journal* was going to press. See [cibse.org/coronavirus](https://www.cibse.org/coronavirus)

Government issues healthcare guidance

The government has published Covid-19 official guidance for the UK healthcare sector. *Guidance for infection prevention and control in healthcare settings* states that the main means of transmission are via droplet and contact, but it says precautions against airborne transmission should be taken when performing aerosol-generating procedures, such as surgery using high-speed devices.

It also says Covid-19 can survive on inanimate objects and remain viable for up to five days at temperatures of 22-25°C and relative humidity of 40-50%.

To clear aerosols, there should be a minimum of six air changes per hour (ACH) in general wards and 12 ACH in negative-pressure isolation rooms. One air change is calculated to remove 63% of airborne contaminants. See bit.ly/CJApr20News1

AIRAH answers Covid-19 FAQs

The Australian Institute of Refrigeration, Air conditioning and Heating (AIRAH) has created a frequently asked questions page on its website to address common queries surrounding Covid-19 and air conditioning, refrigeration and other HVAC&R systems.

The page, which is regularly updated as more information becomes available, addresses some of the concerns people have related to the spread of coronavirus and whether such systems could play a role.

The page answers questions such as: Can Covid-19 be transmitted through air conditioning systems, and should special filters be installed in offices to help control its spread? Visit bit.ly/CJApr20airah

Energy efficiency could save £6bn

Companies should take advantage of the launch of the new Streamlined Energy and Carbon Reporting (SECR) regulations to cut their energy use by up to 20%, according to the government.

From 1 April, firms will be obliged to submit data on their energy use and emissions alongside their annual financial reports. This is likely to affect around 12,000 large or listed companies, and the total savings could reach £6bn a year, according to Minister for Energy and Clean Growth Kwasi Kwarteng.

Companies will now be required to explain what measures they are taking to reduce energy consumption, and should include data on their supply chain's energy use and emissions as part of their submission. This is in line with the 2017 Clean Growth Strategy, which aims to reduce corporate energy use by 20% by 2030.

Carbon emissions fall to 19th-century levels

The UK's carbon emissions fell by 2.9% last year, according to data published by Carbon Brief. This brings the total reduction to 29% over the past decade, reaching their lowest level since 1888.

The driving force behind the decline was a further 29% drop in the use of coal. Emissions from coal have fallen by 80% over the past decade, while those from gas are down 20% and oil by just 6%.

Coal accounted for only 2% of UK electricity production last year – below solar power. Collectively, fossil fuels accounted for a low of 43%, while 54% of electricity generation is now from low-carbon sources, including 37% from renewables – 20% from wind alone.



James Warne

Companies trial heat-as-a-service with eye towards zero carbon

Baxi Heating UK and Bristol Energy test pay-as-you-go heat plans

Two British firms have trialled selling heat as a service in a move that experts believe will pave the way for the low carbon retrofit revolution.

As part of the Energy Systems Catapult innovation trials, 100 homes – in Newcastle, Manchester, the West Midlands, Gloucestershire, and Bridgend, Wales – have been fitted with smart heating systems that give room-by-room temperature control and a wealth of data on consumer behaviour and the thermal performance of the home.

The heat plan allows consumers to buy hours of warmth in their home – called 'Warm Hours' – instead of units of energy (kWh). These plans have been trialled by Baxi Heating UK, which sold one that bundled a new heating system, servicing, maintenance and energy for a fixed monthly price.

Bristol Energy became the first energy supplier in the UK to trial heat-as-a-service, selling fixed-price and pay-as-you-go heat plans to domestic customers.

Energy Systems Catapult also tested the performance of hybrid heating systems that combine gas boilers with an electric heat pump.

Dr Matt Lipson, consumer insight business lead at Energy Systems Catapult, said: 'If people have the peace of mind that heat-as-a-service will deliver the comfort they want at a price they can afford, they will be more confident of switching to a low carbon heating system, such as a heat pump, district heat network or hydrogen boiler. The work we are doing with Bristol Energy and Baxi is taking a leap forward, piloting commercial offers that could pave the way for a low carbon retrofit revolution.'

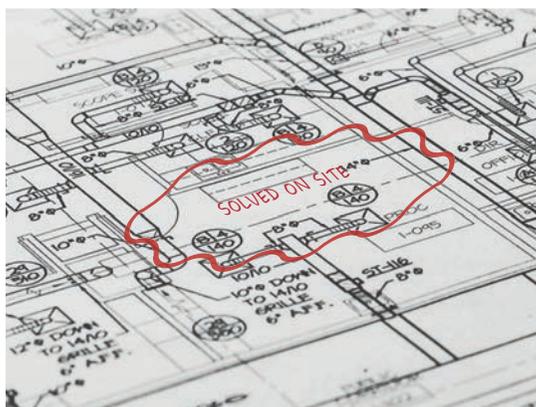


Boom for business as firms merge

WME and Boom Collective have joined forces to create WMEboom, the UK-based arm of WME Global's engineering consultancy.

As well as MEP services and sustainability within the UK, the firm's offer includes structural and civil engineering, and expertise in AV, IT and security. The firm has also created a specialist building performance team with skills in Breeam assessments, energy performance, whole-life analysis, materials selection, and assessments of occupant comfort and wellbeing.

The team has the talent required to improve the as-built performance of new and refurbished buildings, including Soft Landings support, adoption of modern methods of construction, design for manufacture and assembly, and post-occupancy evaluation.



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Chancellor Rishi Sunak has pledged an extra £6bn for the NHS



Chancellor backs 'cleaner electricity' and green heat

Sunak pledges £800m for research into carbon capture and £100m for heat-pump and biomass boilers markets

Chancellor Rishi Sunak recognised the importance of accelerating the uptake of low carbon heating systems, and the need for further investment in heat networks in his first Budget last month.

Sunak's headline announcement was a pledge to spend £600m on infrastructure investment.

He is planning to triple the average net investment made over the last 40 years into rail and road, affordable housing, broadband and research

Plans were announced to freeze the Climate Change Levy (CCL) on electricity, but raise it on gas from April 2022. He also revealed a Green Gas Levy to encourage the development of more 'environmentally friendly ways of heating homes and other buildings'.

Sunak also extended the Domestic Renewable Heat Incentive (RHI) until 31 March 2022 and will introduce 'flexible tariff guarantees' to the Non-Domestic RHI in March next year. He also unveiled plans for a £100m Low Carbon Heat Support Scheme, to bolster the market for heat pumps and biomass boilers.

The Heat Networks Investment Project was extended to March 2022, and given an extra £270m so that new and existing heat networks could adopt low carbon heat sources.

Sunak said this package of environmental measures would achieve the government's promise to 'deliver green growth and protect the environment'.

Some in the industry said the Chancellor should have gone further.

ECA director of CSR Paul Reeve said: 'The measures proposed for carbon emission reductions simply do not go far enough or move fast enough. For instance, there is no strong commitment to energy efficiency retrofitting and the proposed £100 million heat pumps

grant scheme from 2022 is nowhere close to the level of funding required to roll this technology out across the country.'

Mark Wilkins, head of training and external affairs at Vaillant Group UK, said: 'With an estimated four million non-condensing boilers still in use across the UK, further incentives are needed to encourage the widespread adoption of renewable heating technologies – for example, through a scrappage scheme.'

The Chancellor told the House of Commons: 'There can be no lasting prosperity for our people if we do not protect our planet.' He pledged to reveal the Treasury's Net Zero Review shortly, saying this would 'set out the government's strategic choices ahead of COP26 later this year'.

Also outlined in the Budget was £800m for further research into carbon capture and storage (CCS) through a new CCS Infrastructure Fund, which the Chancellor said would create 6,000 new low carbon jobs.

A number of critical announcements required to drive down emissions in line with the government's commitment to become a net-zero economy by 2050 are still pending, including its pivotal Infrastructure Strategy and long-awaited announcements on energy efficiency improvements – including how the government intends to spend its manifesto commitment of £9.2bn in this area.

The Budget at a glance

- £800m for two or more carbon capture and storage 'clusters' by 2030, creating 6,000 high-skilled jobs
- The affordable homes programme to receive £12bn, with allocations of nearly £1.1bn from the housing infrastructure fund to build almost 70,000 homes; £650m will be used to help homeless people find permanent accommodation
- The NHS will receive an extra £6bn over the course of parliament, to pay for 50,000 more nurses and 40 new hospitals.

IN BRIEF

Intelligent building tie-up for global growth

Intelligent building system provider Tyrrell Building Technologies has acquired the Dutch software company Simaxx, which specialises in collecting data from building management and sensor systems, smart meters and IoT solutions.

'The team at Simaxx will strengthen our presence in Europe and allow us to grow globally,' said Tyrrell founder and CEO Ged Tyrrell.

'We welcome our new owner,' said Simaxx CEO Dick Fens. 'This acquisition is a strong strategic fit, boosting innovation and growth. Our customers will benefit from the extensive know-how and experience in building management solutions from Tyrrell.'

New technical director at Hoare Lea

Sam Shooter has been appointed as project and technical director at Hoare Lea, based in Wales.

Shooter began his professional career in 2002. While mainly based in Wales, he has also worked in Hong Kong, Amsterdam, Dublin, Dubai and the US in the past 10 years, delivering large-scale schemes. He is joining Hoare Lea's Cardiff office to take an active role in the healthcare team, as well as become a member of senior management.

Shooter championed technical excellence in his previous position as mechanical engineering skills leader, using his expertise to craft learning requirements and training courses alongside digital and research strategies.

BACnet creator dies

Mike Newman, founder of the BACnet building control protocol (ANSI/ASHRAE Standard 135-1995), has died at home in the US.

He became interested in creating a system to allow building automation systems to communicate with each other in the 1970s, when he took over the operation of an energy management system at Cornell University. 'That's when the real trouble began,' he wrote at the time. 'All the building automation companies started offering DDC equipment, and none of them could communicate with each other.'

The protocol ANSI 135 has been a trademark BACnet since 1992 and the worldwide ISO standard 16484-5 since 2004.

IN BRIEF

'Greta effect' could boost Stem careers

Almost a quarter of young people say they are considering a career in combating climate change because of what has been dubbed 'the Greta effect', according to research.

A survey by the Royal Society of Chemistry (RSC) found that more than half of respondents aged 15-18 said climate change was the biggest problem the world was facing, and they were inspired by Greta Thunberg's 'listen to the science' message. More than a quarter of the 1,000 teenagers surveyed said scientists had the biggest role to play in addressing climate change.

The RSC said educators should make the most of the opportunity to encourage more students to opt for Stem careers.

BCIA announces Sharp new president

Terry Sharp is the new president of the Building Controls Industry Association (BCIA), taking over from Jon Belfield, who held the role for two years.

The associate at NDA Consulting has worked in the sector for more than 35 years, and was appointed BCIA vice-president in January 2019. His experience includes UK and European leadership roles at Johnson Controls, Sontay, and Satchwell Control Systems.

'I look forward to continuing from where Jon left off', Sharp said, 'using my knowledge and experience to help form closer relationships between manufacturers and installers, and ensure the building management systems industry plays a prominent part in 21st-century building design and management.'

Europe aims for climate-neutral first

A European Commission 'climate law' will commit Europe to becoming the first net-zero emission continent by 2050.

The European Climate Law, which still needs to be approved, will be supported by a new 2030 target for cuts in greenhouse gas emissions.

The regulation proposes that, by September 2023, and then at five-year intervals, the European Union will assess the consistency of national commitments and international measures with the long-term goal in mind.

Fire Safety Bill holds building owners to account

The bill empowers fire and rescue services to take enforcement action

The government has introduced a new Fire Safety Bill that places a legal requirement on owners of multi-occupancy residential buildings to inspect cladding and fire doors.

The bill states that fire and rescue services would be empowered to take enforcement action and 'hold building owners to account' if they are not compliant.

It amends the Fire Safety Order 2005, to clarify that the responsible person or duty-holder for multi-occupied, residential buildings must manage and reduce the risk of fire for the structure and external walls of the building - including cladding, balconies and windows - and entrance doors to individual flats that open into common parts.

The bill will also provide a foundation

for secondary legislation to take forward recommendations from the Grenfell Tower Inquiry Phase One report, which stated that building owners and managers of high-rise and multi-occupied residential buildings should be responsible for a number of areas. These include: lift inspections and reporting; reviewing and updating evacuation plans; ensuring residents are provided with safety instructions; and ensuring flat entrance doors in buildings that have unsafe cladding comply with current standards.

The ongoing Phase 2 of the Grenfell Tower Inquiry has been suspended because of the Covid-19 outbreak. Inquiry chair Sir Martin Moore-Bick said: 'We shall be giving careful consideration to whether it is possible to resume hearings using electronic means, but even if that is not possible - the work of the inquiry will continue.'

Before the suspension, the lead architect behind the Grenfell Tower refurbishment admitted he did not read the relevant sections of the Building Regulations covering fire safety in tall buildings. Studio E associate and project lead Bruce Sounes told the inquiry he had not been aware of the specific guidance in Approved Document B for buildings taller than 18m, and did not know that aluminium panels could melt.

Some expert witnesses have stated that it was clear proposals for the refurbishment would make the tower less safe than it was before and the architect admitted he was not familiar with the details in the guidance on external fire spread or the compliance route for the external envelope.



Energy for heating more than two times higher in non-Passivhaus homes

The energy used for space heating is 2.4 times higher in non-Passivhaus dwellings, a Building Performance Network review has found. Launched at Futurebuild 2020, *State of the Nation review: performance evaluation of housing* found that the energy performance gap in non-Passivhaus (NPH) dwellings was nearly twice that of Passivhaus (PH) dwellings.

The study looked at 91 housing-performance evaluation studies of new housing, covering 826 dwellings, of which 105 were PH and 721 NPH. It found that PH dwellings used 62% less energy than NPH homes, with a mean energy consumption of 73kWh-m⁻² per year, compared with 117kWh-m⁻² per year for NPH dwellings.

Despite the differences in energy use, indoor temperature profiles in the heating and non-heating season were similar in PH and NPH dwellings, with mean indoor temperature ranging from 20.1-24.6°C. However, consistently higher mean monthly CO₂ concentrations were observed in NPH dwellings than in PH dwellings, with the difference being more significant in bedrooms.

Resident comfort and satisfaction with indoor temperature were found to be higher in winter than in summer across PH and NPH dwellings, with indoor temperatures perceived to be hot.



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IN BRIEF

Support sought for YEN National Ball

Only a few tables are left for the CIBSE Young Engineers Network's National Ball. The black-tie event takes place on 16 October, at Hallé St Peter's Church, in Ancoats, Manchester. It will comprise an audience of industry-leading suppliers and young engineers from around the UK.

The theme of the evening is 'Cirque du CIBSE', and there will be an array of entertainment, such as firebreathers, stilt walkers and candyfloss machines. For further details of sponsor packages and to support the event, please contact JLenahan@cwcon.co.uk

Don't lose your membership

CIBSE membership fees for 2020 were due on 1 January. If you haven't yet paid your subscription, you can do so by visiting cibse.org/renew, to ensure you don't lose your membership benefits, such as the *CIBSE Journal*. If you need any help, or would like to speak to the membership team, please contact membership@cibse.org

Log in to My CIBSE to make sure your details are correct – and check your email preferences, so you don't miss out on news and updates from CIBSE, the *CIBSE Journal* or *CIBSE Journal* partners.

CIBSE AGM

The CIBSE AGM will be taking place on 5 May. Details to be confirmed. The AGM will be followed by an address by incoming president Stuart MacPherson. For details visit www.cibse.org/agm

CIBSE Undergraduate Award opens for entries

Winner will receive a £500 cheque presented by the CIBSE President

Whether you are a studying building services engineering, just starting out in your career, or working for a building services company that is delivering outstanding projects or products, CIBSE offers a number of ways for you and your team to be recognised for

your achievements and celebrate success.

The CIBSE Undergraduate Award is now inviting entries. It is open to all CIBSE student members in their final year of a BSc, BEng or MEng course accredited by CIBSE, and is designed to encourage students to develop their potential and aim for excellence.

Entrants must submit a 2,000-word synopsis of their final-year project, together with a completed application form. A judging panel will be looking for evidence of excellent understanding and knowledge in building services engineering, science and design, as well as originality and high-quality visual information.

The winner will receive a £500 cheque and trophy, which will be presented at the President's Award dinner in October.

Two runners-up will each receive £100. For more information and to enter visit cibse.org/awards Entries must be received by Friday 10 July.



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. If you know someone suitable, let us know why they would make a good candidate and what they would bring to the role.

For full details – including candidate eligibility requirements and nomination forms – visit cibse.org/nominations

Nominations should be received by 1 June.

New members, fellows and associates

FELLOWS

Steel, Cameron Grant
Horsham, United Kingdom

MEMBER

Vangodan Veettil, Faseesh
Doha, Qatar

Baron, Jonathan
Darwen, United Kingdom

Edwards, Lewis
Uxbridge, United Kingdom

Chu, Chi Pan Benny
Kowloon, Hong Kong

Lee, Pok Keung
NT, Hong Kong

Haggart, William
Dubai, United Arab Emirates

Lam, Chi Ming
NT, Hong Kong

Leonard, Darren
Manchester, United Kingdom

Lau, Hing Cheong
Tseung Kwan, Hong Kong

Koo, Wai Kit
Tsing Yi, Hong Kong

Bahnan Sadek, Michael Louis
Doha, Qatar

Suwar, Elmahadi
London, United Kingdom

Marshall, Steven John
Bathgate, United Kingdom

Piontas, Katarzyna
Liverpool, United Kingdom

Lee, Nga In
Tsuen Wan, Hong Kong

Cheung, Yun Kei
To Kwa Wan, Hong Kong

Lam, Tai Kit Ken
Aberdeen, Hong Kong

Massey, James
Cheadle, United Kingdom

Falcon Bonilla, Alejandro
Abu Dhabi, United Arab Emirates

Pasala Noor Mohamed, Thawfeek Ahamed
Dubai, United Arab Emirates

Barbosa Fernandes, Carolina Raquel
Cardiff, United Kingdom

Leisegang, Jacques
Dubai, United Arab Emirates

Ng, Yik Shan
Tin Shui Wai, Hong Kong

Leung, Lun Cheung
Yuen Long, Hong Kong

ASSOCIATE

Lenahan, Jake
Manchester, United Kingdom

LICENTIATE

Hynes, Joseph
Manchester, United Kingdom

Noquet, Joseph
Nottingham, United Kingdom

Aston, Daniel
Birmingham, United Kingdom

Evans, Chris
Newport, United Kingdom

Watson, Jack
Newcastle upon Tyne, United Kingdom

Wythe, Sean
Rickmansworth, United Kingdom

Lancini, Jake
Sheffield, United Kingdom

Bennett, Ryan
Solihull, United Kingdom

Konstantinidou, Antonia
Woodstock, United Kingdom

Davies, Ashleigh
Cardiff, United Kingdom

The built environment accounts for 40% of energy-related CO₂ emissions



Industry-wide pledge to tackle climate change

CIBSE is one of 28 bodies pledging urgent coordinated action on environment

CIBSE has joined 27 other built environment professional bodies to pledge to work together to help tackle climate change.

Their joint statement recognises that the breakdown in global climate and biodiversity is the most serious issue of our time, and that the built environment is a major contributor. The 28 signatories, which includes 25 built environment professional bodies in the Construction Industry Council, plus the UK Green Building Council, the Edge and the University College of Estate Management, acknowledge that the built environment accounts for almost 40% of energy-related carbon dioxide emissions, while having a significant impact on our natural habitats.

The statement signals 'an urgent need for coordinated action to address and mitigate the impact of the built environment on the climate change and biodiversity

"emergencies"', with the signatories establishing a Climate Change Panel to aid collaboration and shared endeavour between the professional bodies. The panel, formed of leaders from within each profession and convened by CIC, aims to:

- Drive a net-zero carbon emissions pathway
- Identify and promote examples of best practice carbon reduction, climate resilience, biodiversity protection and improvement
- Encourage thought leadership and innovation to bring about change
- Share best practice on education accreditation, membership qualification and CPD development
- Give advice and guidance on matters relating to the mitigation of the climate change and biodiversity 'emergencies' and the appropriate adaptation of the built and natural environment.
- To read the statement and pledge in full, visit [cibse.org/news](https://www.cibse.org/news)

Book your place to get the most out of Build2Perform 2020

Taking place at London Olympia on 24-25 November 2020, Build2Perform is the UK's premier event for built environment solutions. Last November, the 2019 event welcomed more than 1,700 attendees representing all parts of the building services sector.

An array of exhibition options are available to book, and will provide your company with a truly unique marketplace, where manufacturers, distributors and service providers meet face to face with decision-makers, clients and specifiers.

- Find out more and register for your free place at [cibse.org/build2perform](https://www.cibse.org/build2perform)



IN BRIEF

Inclusivity Panel is recruiting

CIBSE believes that an inclusive culture brings resilience, creativity and innovation – qualities that deliver better buildings and a stronger building services engineering community.

We're looking for people who want to make our profession more welcoming to all, to join the CIBSE Inclusivity Panel.

This is a fantastic opportunity for those who are passionate about inclusivity to contribute their ideas and enthusiasm. There are a number of vacancies, including a position to lead on the refresh of Women in Building Services Engineering (WiBSE).

For further information, visit [cibse.org/inclusivity](https://www.cibse.org/inclusivity)

May day for SoPHE Northern Dinner

The 10th SoPHE Northern Dinner is due to take place on 1 May (note the change of date, because of the alteration to the bank holiday), at the Midland Hotel, Manchester – starting with a drink's reception.

The guest speaker is comedian Lucy Porter, who has appeared on various TV and radio programmes over the years.

All tables are sponsored by the various SoPHE Industrial Associate members, for which the membership is very grateful.

To attend, and for further details, contact the regional secretary, Malcolm Atherton, at m.atherton@cundall.com

CIBSE Technical Symposium delayed

Following the recent developments regarding coronavirus (Covid-19) in the UK, the decision has been made to postpone the CIBSE ASHRAE Technical Symposium. It will now be held on 14-15 September, at the same venue – the University of Strathclyde.

For any questions, email symposium@cibse.org

MISSION EARTH

CIBSE's new Vision, Mission and Values statements recognise members' work in tackling the climate emergency and delivering safe, comfortable and sustainable buildings for future generations

To support and champion our members as they face the increasing challenges as a result of our changing climate, we have published new statements covering CIBSE's Vision, Mission and Values. These highlight the expertise, knowledge and passion that CIBSE's members bring to improving the performance, safety, health and sustainability of the built environment.

We feel it is more important than ever to shout loudly about the work that CIBSE's incredibly talented members are doing in relation to climate change. 'We lead, we empower, we champion, we inspire' are the values that drive and motivate our staff and membership.

We sought input from our Young Engineers Network, which made it clear that they wanted CIBSE to have a stronger voice, and to be more outspoken in communicating its achievements and knowledge.

Through these new values, CIBSE supports, nurtures and champions its members, while raising the profile of its knowledge pool and skills. The Institution believes that the passion with which it works to improve buildings for all is now better reflected through these values.

We lead

CIBSE is leading the conversation on equipping the built environment for a changing climate.

Building services are key to keeping building users as safe and comfortable as possible, promoting occupant health and wellbeing,

minimising impact on the environment during construction and in use, and driving improved performance and productivity. CIBSE promotes improvement in the performance of buildings to the benefit of users, developers and owners; we are informed by the expertise that members deploy on a day-to-day basis.

Our involvement in government-level discussions and consultations makes us a strong champion for better standards and enforcement, driving buildings that are safe and fit for purpose.

We empower

CIBSE empowers its members and wider building community through the sharing and dissemination of knowledge and training. We enable people to access the skills and knowledge they require to fulfil their potential and serve society.

Knowledge sharing is one of CIBSE's primary roles in the sector. Working with the industry and its clients, CIBSE serves

OUR VISION, MISSION AND VALUES



OUR VISION

Better-performing buildings for society and the environment



OUR MISSION

To advance and promote the art, science and practice of building services engineering, to invest in education and research, and to support our community of built environment professionals in their pursuit of excellence

OUR VALUES



WE LEAD

We are a trusted authority on the present and future challenges facing the built environment; we use our collective expertise and influence to champion the best and most innovative solutions with rigour and integrity



WE EMPOWER

We give people knowledge, training and networking, and a pathway to professional registration so their work will have a meaningful impact



WE CHAMPION

We are vocal and visible in our drive to improve the performance, safety, health and sustainability of the built environment, and we support and celebrate the talented people who make it happen



WE INSPIRE

We are passionate about the quality of the built environment, and we encourage committed people, from every background, to join our community

“CIBSE promotes improvement in the performance of buildings to the benefit of users, developers and owners; we are informed by the expertise that members deploy on a day-to-day basis”

wider society by developing and publishing internationally recognised guidance and codes. The knowledge provides authoritative guidance for the design, installation and operation, and maintenance of engineering services in buildings. It enables engineers to keep up to date with best practice in technology and standards, and supports the implementation of policies to improve safety, comfort and productivity of buildings, and to reduce their carbon emissions.

In an industry in which technology is increasingly complex and ever evolving, CIBSE enables building services engineers to keep abreast of the changes, and empowers them to deliver the best outcomes for clients and end users. By improving their skills and knowledge, they can help everyone live and work in safer, healthier and more comfortable spaces.

We champion

CIBSE supports and champions the diversity, breadth and strength of its membership. Membership acknowledges and accredits expertise so those who are competent can be recognised widely and reliably.

We celebrate the skills and experience of our members, raising their profile and giving prominence to the best engineers who value good building performance.

Members generate knowledge in a variety of specialisms for industry and public benefit across many areas of the world. The diversity of the Institution's membership is central to achieving these goals. CIBSE delivers the greatest benefit to society when our knowledge is drawn from the full spectrum of people and professions that form its membership.

We inspire

We inspire our community and wider society to strive for better and safer building performance.

Our monthly *CIBSE Journal*, the annual Building Performance Awards, the Technical Symposium, and Build2Perform Live all serve to raise wider public awareness of what we do and the importance of building services engineering to society. They maximise the impact of the work being done by CIBSE – and building services engineering generally – to a highly diverse audience.

Raising awareness helps people appreciate the benefits of supporting building services engineers in their careers and the work they do to improve building performance.

Demonstrating the importance of building performance, and the link with good building services engineering, reinforces the message that the success of the built environment is crucial to many areas of public life.

Our Building Performance Awards and Young Engineers Awards demonstrate what can be achieved by our expert members across the industry. The events encourage innovation and inspire others to tap into their own creativity.

Inspiring others to join our community and choose engineering as a career are essential if we are to meet our environmental targets, and we encourage committed people from every background. Through the work of our Inclusivity Panel and our commitment to diversity, we hope to attract as broad a range of new engineers as possible. **C**

Flaktgroup has completed its restructure

FlaktGroup UK has been restructuring behind the scenes to deliver a streamlined, customer-focused business that integrates an all-in-one approach to site services, sales and customer excellence – restructuring from three channels to two to simplify the business

Since the merger of DencoHappel and FlaktWoods the company has had a big vision of becoming the UK's leader in HVAC, not just financially, but as technical leaders, product innovators and the most energy-efficient HVAC company in the market. The restructure and will enable us to achieve those goals while prioritising our customers.

Sharpening our customer excellence

We have opened a technical centre of excellence, adopted an all-in-one service method, and are offering a life cycle approach to your HVAC building requirements, from integrated controls to commissioning, via our restructured Applied Systems sales team.

In the past year we have reduced our delivery times, cut our commissioning waiting times, and boosted our communication efforts to inform you of new products and changes to products. We have also given you full access to your documents via our website. In addition, we have a full selection of CIBSE- and RIBA-approved CPDs, have increased the number of engineers we have and boosted training for our staff, and introduced a 'one vision' policy to increase our customer focus.

Adding the detail to strong foundations

Strong foundations have been laid for FlaktGroup, giving us one of the most complete and innovative ranges of products in the industry. No-one on the market can match us for all-in-one capability. We offer air handling units, close control systems, fan coil units, fans, chillers, carpark fans, axial fans, heat recovery units... the list goes on. These products are all supported by our site services team. By offering this all-in-one solution, we make your project simple... one contact point, one solution, one FlaktGroup.

Words from the senior management team

Aidan Flannery: 'FlaktGroup has an enviable reputation and history within the industry. I remember working with the Woods Selection Catalogues & Fan Curves during my M&E contracting and college days. Later, I had the opportunity to work alongside an installer on the installation of Denco close control units (CCUs/CRACs) as part of my learning and development in the industry. These memories and experiences,

along with an inherent respect for the companies concerned, made my decision to join the FlaktGroup at the beginning of 2019 an easy one.

'We appreciate the regular customers who have worked closely with us over the years, and thank them for their understanding and patience during the recent period of remodelling our business. We now have a new and stable structure. The changes we made during 2019 have been rewarded within our global business, with the UK being recognised as the outstanding performer in 2019 by FlaktGroup.'

Clive MacKinnon: This year, our goal is to grow our Site Services business through the expansion of specialist services to new and existing customers. Our engineers will be developed through a continual learning and development programme. They are a key part of the business, and we will continue to offer them all the support they need to ensure better customer service and relationships – ultimately, providing a better experience for customers of FlaktGroup Site Services.'

Rob Erwood: For me, FlaktGroup UK must make this the year of the customer. We will go out of our way to ensure we fully adopt the cradle-to-grave approach from the sales orders that we secure. The changes we have made to our newly renamed Applied Systems team will ensure this. Our data centre cooling performance in 2019 has been beyond outstanding. It contributed to our success in 2019 and will continue to be a major contributor to our success and growth in 2020.'

NEW CONTACT DETAILS

- **Site Services director**
Clive MacKinnon – integrates from Commercial Operations director to Site Services
- **Head of Site Service Support, previously central helpdesk (CHD)**
Rachel Beeching
- **Head of Technical Centre of Excellence**
Alan Weston
Will have a team of multidisciplinary engineers providing internal and external support for our broad product range and services
- **Applied Systems director**
Rob Erwood – continues to be director of the products sales business
- **Contacts:**
Email:
appliedsystems.uk@flaktgroup.com
Phone: 0845 608 4446
- **Site Services contact:**
Email: siteservices.uk@flaktgroup.com
Phone: 0845 608 4449

- For more information on FlaktGroup visit www.flaktgroup.com

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Look to the future

We are all focused on the immediate and unprecedented impact of the coronavirus emergency – but we need to look forward, too. Hywel Davies considers what might lie beyond

Construction faces a huge challenge. It is a critical element of the UK economy. Approximately 3.3 million people work in it, and it accounts for 12-14% of GDP. And our industry has a vital role to play in the delivery of any recovery from the impact of coronavirus. It is a key vehicle for delivering the new homes we need, and for building low or zero carbon homes. It is essential to any levelling up in the UK. Construction is also a vital growth multiplier; every pound spent on construction and infrastructure generates nearly three pounds in economic activity.

Construction and infrastructure face many difficulties right now, but it is essential for keeping the UK economy resilient in the face of this complex, challenging, fast-moving and totally unprecedented set of circumstances. Construction operations must remain open if possible: whether they are construction sites or produce materials and equipment needed to keep Britain building.

The sector is particularly vulnerable to the reduced workload that enforced closure of sites and projects will cause. Around 40% of those working in the sector are self-employed, and more than 200,000 construction businesses are SMEs; all are vulnerable to cash-flow problems.

Complex projects have complex supply and delivery chains that need to be kept intact. It is vital that the cash is kept flowing in the sector to pay workers and suppliers, avoid job losses and closure of SMEs and prevent cost increases on projects. The health sector may also yet need additional infrastructure in a hurry before this emergency is over.

The public sector has a huge responsibility to pay contractors and suppliers promptly; and to do all it can to drive that behaviour throughout the supply chain. Private firms must also play their part, however. Chancellor Rishi Sunak has announced many welcome measures to support business, but deferring VAT and PAYE payments may also be needed to keep the wheels turning now.

Construction must embrace fundamental change, not only in the aftermath of the Grenfell tragedy and in response to the new Building Safety Regulator and regime, but also to deliver improved productivity, more offsite manufacturing, and much greater uptake of digital technologies.

The fragile position of many firms clearly demonstrates



“The current circumstances should spur us on to use the break to imagine what construction should look like in future”

that the typical business model is a long way from healthy. Far from being a reason to pause any reform initiatives, however, the current circumstances should spur us on to use the break from normal working practice to imagine what construction should look like in future.

There is a feeling that too many in the industry see Dame Judith Hackitt’s review as yet another in a long list of reports – from Banwell in the 1960s through Latham, Egan and Wolstenholme – to be quietly stalled and parked. There is no evidence that this government will allow that to happen. Legislation is promised and almost certainly being drawn up now. The Health and Safety Executive (HSE) is developing its plans for the new regulatory body and the gateway processes that will challenge the design and construction teams to deliver the approved design in reality – and to identify clearly where the as-built differs, why, and how that change was managed, in order to demonstrate the building will still be safe. BSI and the Engineering Council are working with the professional engineering bodies and others to develop the competence framework for the buildings in the scope of the new regime. Whatever damage it does, Covid-19 will not stop building safety reform.

Then there is the digital revolution. The current situation has got many of us working online fast. We do have the technology, and CIBSE will be looking to use it to continue to support our members and share our knowledge more widely. This technology can also enable the development of building designs online, however, and the standards for digital design and information exchange are available to support the creation of digital-asset models. If anything, the current situation is more likely to drive that process than hinder it. The BS EN ISO 19650 series of standards and the UK BIM Framework provide the tools, guidance and support industry needs, and the UK BIM Alliance is developing the guidance and the framework to learn from the experiences of its early adopters.

This all ties into the Hackitt reforms through the ‘golden thread’ of building safety information. Better digital design, construction and information-exchange tools and digital-asset models feed into eliminating the performance gap and delivering zero carbon buildings. The current emergency offers significant opportunity, as well as huge challenges.

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AN OPEN BOOK

Brian Ford's *The Architecture of Natural Cooling* gives guidance on implementing a collaborative approach to design, and explains the creative application of building physics. London South Bank University's **Andy Ford** reviews the contents

It's funny, but whatever I do, there is always a bit of prejudice in my head that needs adjusting before I can see things. That was certainly the case as I began reading this book.

I have known the main author, Brian Ford, emeritus professor of architecture at the University of Nottingham, for many years – and, indeed, worked with him on occasion. So I am aware of his 'rigorous' architectural approach to 'natural' ventilation and consummate dislike of fans and ductwork, and was wondering how his book would go down in a building services journal. As I read, however, it grew on me. This might be fairly described as an 'important book' for both architects and engineers. Specifically, it addresses those wishing to learn how to approach low energy and low carbon building design in a hot world creatively.

The title does not cover fully what is at the heart of the book, and why it has importance. Although it is about an approach to cooling, it is more than that. With a foreword by Professor Dean Hawkes, *The Architecture of Natural Cooling* steps through the design process, from empty

sheet to the analysis in the case studies. These inspire and warn with their 'problems encountered and opportunities for improvement' sections. This is an exemplar of clarity, explaining how environmental engineers and architects can extract exciting architecture from the engineering of comfort – and how to do it with a lightness of touch.

Throughout, there are little blue boxes highlighting key points. If building services and architectural students only read, absorb and implement these, I would be happy.

This discusses different climates where cooling might be needed. The authors explain how to approach a design process that begins before a building form exists to deliver an architecture that is comfortable in hot conditions. Particularly key is the identification of simple formulae and climate mapping that enable robust early strategic decisions to be made. It is at this very early stage that engineers appear to struggle most to input creatively to design team meetings – but this is also where the most impact can be made with fewest words. If clear, simple, quantitative advice can be well delivered by the engineer, it will help tune an architect's design intuition. Then, a joint project ambition can be formed that is strong and thoroughly understood by all parties to be carried through the construction of a completed building.

But what is 'natural cooling', and is it relevant to the built environment today? As the authors explain, it is 'the exploitation of natural heat sinks, which include external air, the night sky, the ground and the evaporation of water'. This certainly has wide relevance. There are opportunities to understand these concepts and engineer them at scale.

"Key is the identification of the simple formulae and climate mapping that enable robust early strategic decisions to be made"

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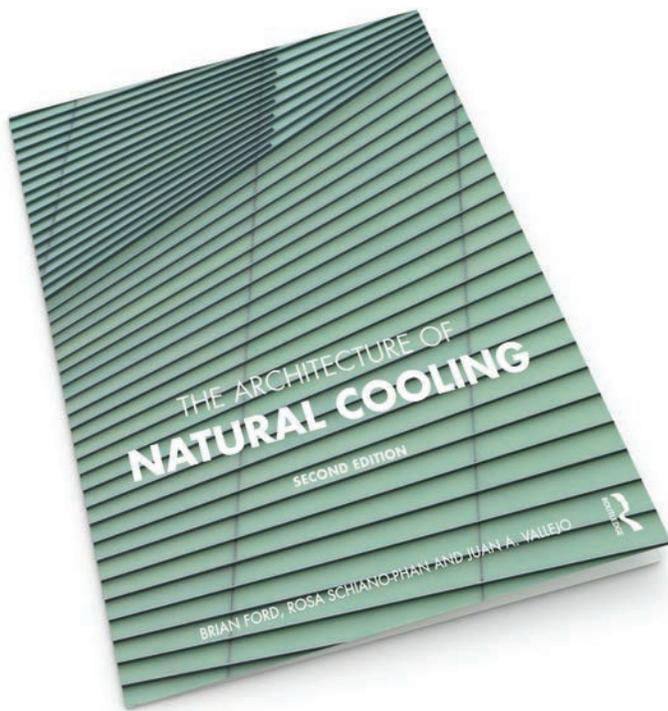
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Brian Ford's book can 'return pleasure to engineering design'

The authors give examples from around the world. Much of the greatest building cooling challenges are in climates other than our own, and many of us will be lucky enough to design in these. With air conditioning use growing rapidly in Asia and Africa, it is vital that we understand the opportunities to develop climate-specific, naturally cooled architectures for these rapidly developing countries.

I am encouraged that a book written by architects introduces climate mapping on a psychometric chart as a point of initial discussion with an engineer when considering a brief. This is to be celebrated. Together with the concept of applicability, mapping to focus the mind quickly on the available opportunities is the way to give us engineers a voice at the pre-design table. We need to grasp this. The other side of the coin is that engineers need to understand enough about architecture and the way architects think to become truly integrated designers.

CIBSE should work with architects on guidance that will enable us jointly to deliver buildings that work, without the unmanageable complexity we seem to introduce. Rather than focusing on ductwork and air handling units to move air, perhaps we should develop better ways to use occupied spaces and the naturally occurring pressure differences, and then know where and how to enhance them. This book opens a door on a world where building structures can be the heat absorber and falling water the heat dissipater; where environmental engineers are welcomed at the design team table before a built form exists.

If you want to understand the possibilities of natural heat sinks, this book is an excellent introduction. The mathematical complexity is carefully limited to just what is required, and no more. It delivers clear guidance on how a collaborative approach to design can be implemented – an approach that, I believe, can return pleasure to engineering design. This is a book about the creative application of building physics and how – done well – it can result in buildings that will be loved and become the built heritage of the future, rather than demolished in 20 years. The future just got brighter for a change. Thank you, guys.

■ **ANDY FORD** is professor of building systems engineering at London South Bank University

Achieving the right aesthetic

Swegon's Josh Emerson believes we can build beautiful, with quality

In last month's *CIBSE Journal*, we read that Housing Minister Robert Jenrick was considering a fast-track planning process for 'beautiful buildings and spaces'. He was inspired by the final report of the Building Better, Building Beautiful Commission, chaired by the late visionary architect Sir Roger Scruton.

Well-designed, high-quality buildings in attractive, tree-lined environments should be the 'norm, not the exception', according to the commission. This inspired the Minister to suggest the planning process should reward those who put in the extra effort to create proposals that look good, perform well, use high-quality materials and take account of their local settings.

The concept of 'beauty' rarely comes up in design and planning meetings. Building services engineers are a pragmatic bunch, who tend to leave the aesthetics to the architects. However, there is a deeper philosophy behind the commission's proposals than simply delivering attractive finished products. The function of a building often takes its lead from the form – and the concept of beauty can go well beyond appearance. If the client has a vision and the design team puts its weight behind it, the finished product will not only look good, but deliver on a range of performance parameters, including comfort, health and energy efficiency. For beauty in this context read 'quality'. The commission presented a vision of buildings that support communities by enhancing quality of life. The industry needs to respond by helping our clients meet this standard and qualify for fast-track approval.

This also chimes with the vision of Dame Judith Hackitt in her advice to government on reforming our building 'culture'. Her condemnation of the 'broken process' that undermines too many well-intentioned projects was primarily aimed at safety and compliance – but, by the same token, if the project team is encouraged to raise its game and aim higher, the life-critical boxes will be ticked along the way.

This, however, depends on our sector working together. Products should be considered as components of complete systems, to ensure they stay true to the original vision at all stages of the project. Only then will we, as an industry, be able to deliver consistently what Scruton called 'beautiful' and what Dame Judith would simply describe as 'safe, compliant and fit for purpose'.

● **Josh Emerson** works on building efficiency and occupant wellbeing at Swegon UK&I. www.swegon.com/uk



Swegon
Air Management

IDEAL GROWING CONDITIONS

The ASHRAE Winter Conference in Orlando featured more than 300 presentations to nearly 2,800 delegates. **Tim Dwyer** gives a taste of the engineering zeitgeist, including seminars on growing cannabis and the latest BACnet software to secure controls



ASHRAE celebrated its 125-year anniversary at its Winter Conference at the Hilton Orlando, Florida, USA. ASHRAE executive vice-president Jeff Littleton reminded the audience of the oratory of founding President Edward Bates at the inaugural meeting in 1895, when he told ASHRAE's first members that the success of the society was on their shoulders.

In language typical of the age, he said: 'I now charge you... as you love the cause in which you so recently embarked... to look well to your applications for members, as the growth and perpetuity of this Society rest upon this.'

ASHRAE has since matured into an organisation of 57,000 members, with 195 chapters and 433 student branches across 130 countries. A key focus for Littleton in his address was the society's new headquarters – a deep retrofit of a 42-year-old 6,200m² building, targeting net zero energy-ready performance. He said that the demolition was complete for the largest capital project in the society's history, and said the intent was to move in by October 2020.

Building operational performance was the focus of ASHRAE president Darryl Boyce's presentation. He revealed that a guide providing 'concrete steps' needed to design buildings that meet occupants' requirements would be published later this year.

Alongside the conference was the AHR Expo, held at the Orange County Convention

Center, attracting more than 32,000 visitors to 1,988 exhibitors in the 47,000m² space.

The technical programme included more than 300 presentations across four days, with a wide and diverse range of topics and speakers delivering technical discussions to excite interest and debate.

The summaries below give a feel for the breadth of the conference. A full set of recordings can be viewed (for a fee) through the ASHRAE virtual conference.

Growing cannabis

There was a packed seminar room, with standing room only, for *Cannabis Grow Facilities: Challenges for HVAC Design, Equipment Selection and Operation*. The legalisation of cannabis in many US states and Canada has provided opportunities and challenges for the HVAC industry. In her presentation, *HVAC Load Calculations for Cannabis Grow Facilities*, Nadia Sabeh – founder of Dr Greenhouse – noted the need for unique and dynamic environments to grow and develop cannabis plants.

She gave a summary of the plant life-cycle, highlighting the importance of 'vapour pressure deficit' – the difference between the saturation vapour pressure at the plant temperature and the vapour pressure in the surrounding air – as this will affect the health of the plant by impacting evapotranspiration.

She illustrated the three phases required to grow cannabis needing distinct controlled setpoints for lighting, humidity and



ASHRAE president Darryl Boyce

Orlando was the location for the 2020 Ashrae Winter Conference



“The technical programme included more than 300 presentations across four days”

temperature, and noted that the majority of the sensible gains typically came from lighting requirements. In association with this, there are extremely high latent loads from the evapotranspiration.

Interestingly, she said evapotranspiration will provide evaporative cooling, so offsetting some of the sensible lighting load. However, this creates a relatively low ‘sensible to total heat ratio’ (SHR) that requires careful consideration of cooling system requirements.

She concluded that there were currently a lack of appropriate standards and guidelines, and – worse still – ill-informed rules and regulations that, for example, mandated maximum lighting power without due consideration of the impact on other operational requirements.

The associated presentation by Quest Dehumidifiers sales engineer Daniel Dettmers – *HVAC Equipment Selection for Cannabis Grow Facilities* – provided more detailed analysis of the highly variable SHR.

Throughout the cannabis plant life-cycle,

the relative sensible and latent heat load will vary as the lighting levels, the dry bulb temperature and the RH are manipulated to optimise the final harvest.

He gave an overview of the pros and cons of a number of common systems to provide environmental control, and concluded that ‘latent load matters’, as it will dominate the cooling requirements, and selection and operation of appropriate HVAC equipment.

Transcritical CO₂ cycles

Since the reintroduction of CO₂ as refrigerant R744 in the mid-1990s, there have been significant efforts to develop transcritical CO₂ cycles. In her presentation *How to Design and Apply a CO₂ Transcritical System in North America*, Shitong Za explained that a basic two-stage CO₂ transcritical booster system can operate in cold and mild climates with similar or improved efficiency, compared with a traditional HFC DX system.

By using a two-stage arrangement, the very high pressures (circa 130bar) required for effective transcritical operation is only required for a relatively limited section that provides the medium temperature heat rejection. The remainder of the pipework will operate at the (relatively) low pressure of 45bar in the cooling section of the circuit.

Za continued to highlight the comparative benefits of CO₂ as one of the most promising natural refrigerants, not least because of the smaller displacement needs (hence smaller compressors and lower installation costs, as pipes are smaller).

She outlined a number of refined systems that she asserted had low additional cost, employing arrangements of parallel compressors and vapour ejectors in the medium temperature section of the circuits that reduced energy use by up to a third.

Making BACnet secure

Michael Osborne of Reliable Controls Corporation, and chair of the ASHRAE BACnet committee, presented on the new secure implementation of the Building Automation Controls Network (BACnet) protocol. BACnet is a low-cost, ASHRAE-led protocol for multiple devices to communicate across building automation systems.

BACnet internet protocol has been widely deployed since it was added to the BACnet standard in 1999, but it has struggled in an increasingly competitive network environment. The new BACnet secure connect (BACnet/SC) provides built-in encryption of

messages and device authentication protocols – WebSockets and TLS 1.3 in particular. TLS is widely used for secure communication between web browsers and web servers (the technology used in HTTPS websites – the secure version of HTTP).

A BACnet/SC network will typically have one or two BACnet/SC hubs whose function is to forward both broadcast and unicast messages between BACnet/SC devices (that have the appropriate security) for a particular BACnet/SC network.

All the new devices must be able to connect to the hub, so the new standard has also implemented the concept of a ‘failover hub’ that could be located in the building, on a campus or in the cloud.

Although a hub is required, the protocol enables direct secure workstation-to-device connections, so reducing the load on the hub. Osborne continued with some examples of how the new protocol may be used to communicate securely with, for example, the plethora of ‘smart’ thermostat controllers that exist in multi-resident buildings.

He envisaged a near future where BACnet will readily link almost any Internet of Things device, adding depth to the rich datasets on building operational performance. **CJ**



One of the delegate activities at the Winter Conference



The conference featured more than 300 presentations



PREVENTING COVID-19 SPREADING IN BUILDINGS

In response to the coronavirus pandemic, REHVA experts have published a guidance document on how to operate and use building services to minimise the spread of Covid-19. **Alex Smith** provides a summary of their findings

REHVA, the Federation of European Heating, Ventilation and Air Conditioning Associations, has produced interim guidance on the operation and use of building services in areas with a coronavirus disease (Covid-19) outbreak.

Based on a survey of recent academic literature, the guidance aims to prevent the spread of coronavirus through HVAC or plumbing systems, and is targeted primarily at HVAC professionals and facility managers. Its scope is limited to commercial and public buildings, such as offices, schools, shopping areas and sports premises, where only occasional occupancy by infected people is expected. Information and research on the disease and virus responsible for it (SARS-CoV-2) is very limited, so REHVA says best-practice recommendations have been made based on evidence from SARS-CoV-1, which occurred in 2003-04. The document will be updated with more information and evidence when it becomes available.

Transmission routes

The guidance document states that there are two dominant transmission routes: via large droplets (droplets/particles emitted when sneezing, coughing or talking); and via surface contact (hand-to-hand, hand-to-surface, and so on). However, it says the World Health Organization (WHO) also recognises a faecal-oral transmission route for SARS-CoV-2. In a technical briefing on 2 March, WHO recommended closing toilet lids when flushing, and avoiding dried-out drains in floors and other sanitary devices by regularly adding water (every three weeks, depending

on climate). In the SARS 2003-04 outbreak, open connections with sewage systems appeared to represent the primary transmission route in the Amoy Gardens apartment building in Hong Kong. Transmission was probably because of a dried-out floor drain and airborne dissemination by the toilet exhaust fan and winds.

Professor Catherine Noakes, professor of environmental engineering for buildings at Leeds University, says aerosolisation from water systems may be important. 'The REHVA guidance recommends checking floor-drain traps, but drain traps in high-rise buildings can be susceptible to being blown out by wind pressure. So even traps in drains that are used more regularly are important to watch, too.'

Air transmission

There are two exposure mechanisms, which the guidance document describes as follows:

Large droplets (> 10 microns)

Airborne transmission through large droplets that are released and fall to surfaces no further than 1-2 metres from the infected person. Droplets are formed from coughing and sneezing (the latter typically forms more particles). Most of these fall on surfaces such as desks and tables. People could catch the infection by touching contaminated

surfaces and objects and then their eyes, nose or mouth. People standing 1-2 metres from an infected person could catch it directly in droplets sneezed or coughed out.

Noakes believes that drops greater than 10 microns can travel further than two metres. 'Some of those very big droplets will fly ballistically, but even particles up to 20 microns can be carried further than we might expect because of airflows in the room,' she says. 'It doesn't necessarily mean there's huge additional risk, because there's probably a small concentration of virus, but we should be aware of where surfaces might be contaminated.'

Small particles (< 5 microns)

These may stay airborne for hours and can be transported long distances. They are generated through coughing, sneezing or talking. Small particles (droplet nuclei or residue) form from droplets that evaporate (usually within milliseconds) and desiccate.

The coronavirus particle is 80-160 nanometres (1 micron = 1,000 nanometres) and remains active in common indoor air conditions for up to three hours and two to three days on room surfaces. These small particles can stay airborne and travel long distances by airflows in the room or via air ducts of ventilation systems.

REHVA says there is no evidence yet for Covid-19 infection via this route, but it noted that there were no studies that ruled it out. It also referred to a case where coronavirus SARS-CoV-2 was isolated from swabs taken from exhaust vents in rooms occupied by infected patients. This implies that keeping 1-2 metre from an infected person might not be enough, concluded REHVA, and that increases in ventilation may be useful, as it would remove more particles. It recommends taking a series of measures that help control the airborne route in buildings as follows:

Increase air supply and exhaust ventilation

The general advice is to supply as much outside air as possible. Expanded operation times are recommended for buildings with mechanical ventilation. Consider keeping the ventilation on 24/7 with lower ventilation rates when people are absent. If employee numbers reduce, do not place remaining staff in smaller areas. Exhaust ventilation systems of toilets should always be left on 24/7, and relatively negative pressure must be maintained in the room air to help avoid faecal-oral transmission.

Use more window-driven natural ventilation

In buildings without mechanical ventilation, the use of openable windows is recommended, even if this causes thermal discomfort. Even in buildings with mechanical ventilation, open windows can be used to boost ventilation.

Open windows in toilets with passive stack or mechanical exhaust systems may cause contaminated airflow from the toilet to other rooms so, in these circumstances, it is recommended that toilet windows remain shut. If there is no adequate exhaust ventilation from toilets, and window airflow cannot be avoided, keep windows open in other spaces to achieve crossflows through buildings.

Humidification has no practical effect

Covid-19 is resistant to environmental changes and is

susceptible only to a very high relative humidity (RH) above 80% and a temperature above 30°C, which is not acceptable for reasons of thermal comfort. The reason humidification is suggested in winter (up to a level of 30%) is because nasal systems and mucous membranes are more susceptible to infections at very low RH of 10-20%. However, from March, climatic conditions will see RH higher than 30% in all European climates, without humidification.

Safe use of heat-recovery devices

Virus particles in extract air can re-enter the building. Heat-recovery devices may carry over the virus attached to particles from the exhaust airside to the supply airside via leaks. In rotary heat exchangers (including enthalpy wheels) particles deposit on the return airside of the heat exchanger surface, after which they might be resuspended when the heat exchanger turns to the supply airside.

Based on current evidence, REHVA recommends turning off rotary heat exchangers temporarily during SARS-CoV-2 episodes. Its document goes on to state: if leaks are suspected in the heat-recovery sections, pressure adjustment or bypassing can be an option to avoid a situation where higher pressure on the extract side causes air leakages to the supply side. Transmission via heat-recovery devices is not an issue when a HVAC system is equipped with a twin-coil ('run around' coil) or other heat-recovery device that guarantees air separation between return and supply side.

No use of recirculation

The guidance document says virus particles in return ducts can re-enter a building if centralised air handling units have recirculation. It recommends avoiding central recirculation during SARS-CoV-2 episodes and closing the recirculation dampers, even if there are return air filters, as the guidance says these don't normally filter out viruses. It also advises that decentralised systems, such as fan coil units that use local circulation, should be turned off to avoid resuspension of particles at room level. If they can't be turned off, they should be cleaned regularly.

Duct cleaning has no practical effect

Virus particles will not deposit easily in ventilation ducts and will normally be carried away by the airflow, says REHVA. No changes are needed to normal duct cleaning and maintenance procedures. Increasing the fresh-air supply and avoiding recirculation are more important.

Change of outdoor air filters not necessary

In rare cases of virus-contaminated outdoor air, fine outdoor air filters provide reasonable protection for a low concentration, but occasionally spread viruses from outdoor air, according to the guidance. Clogged filters are not a contamination source, but should continue to be changed as part of any good-practice maintenance regime.

Room-air cleaners can be useful

Particles can be removed from the air, but air cleaners must have at least HEPA filter efficiency. 'Attractively priced' room-air cleaners are not effective enough, says REHVA. As the airflow through air cleaners is limited, the floor area they can serve is normally quite small, typically less than 10m². If used, they should be placed close to the 'breathing zone'.

Special UV cleaning equipment for supply-air or room-air treatment is effective at killing bacteria and viruses, but the guidance document says this is normally only suitable for healthcare facilities.

The guidance is a live document. REHVA invites specialists to respond at info@rehva.eu. A bibliography is at www.rehva.eu/activities/covid-19-guidance. See CIBSE's guidance at www.cibse.org/coronavirus  

Don't discount UV and high-efficiency filters

Professor William Bahnfleth comments on REHVA's Covid-19 guidance document and compares it with ASHRAE recommendations



PROFESSOR WILLIAM BAHNFLETH
Professor of architectural engineering at Penn State University

I'm glad to see the possibility of airborne transmission acknowledged clearly in REHVA's guidance document on Covid-19. However, I think there would be debate about what it says about humidity. The document says humidification and air conditioning have no practical effect, and concludes that there would have to be an unacceptably high humidity to have an effect on the virus. That conclusion is similar to what you will find in the section on temperature and humidity in the ASHRAE Position Document on Airborne Infectious Diseases, which declines to make any 'broad' recommendations about humidity. However, it does cite a number of studies that have found viral infection rates to be higher at lower humidity and suggests that practitioners may choose to take that into consideration on a case-by-case basis.

On the other hand, experts such as Dr Stephanie Taylor advocates the 40-60% RH range,¹ partly because

of the other consideration that dry mucosa may be more vulnerable to infection and that, at low humidity levels, respiratory droplets evaporate more quickly to particle sizes capable of remaining airborne for extended periods.

There are many factors to consider when evaluating the advice on recirculation. Certainly, closing it off will reduce transfer of airborne pathogen containing aerosols from one space to another. It will also, assuming supply airflow rates don't change, greatly increase the amount of outdoor air being brought in to reduce exposure by dilution.

Forcing the system into 100% outside-air mode without any recirculation may result in the need to condition a large quantity of cold, very dry air in the winter or hot, very moist air in the summer. This may have consequences for comfort, microbial growth, and occupant susceptibility.

The guidance dismisses filtration on the grounds that the filters typically found in such systems are not of

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sufficiently high efficiency to have a significant positive impact (see page 27). That may be true, but I believe most systems can handle higher efficiency filters that may have a significant impact. In addition, ultraviolet germicidal irradiation (UVGI) can be installed in a recirculating system that has a negligible effect on pressure drop and can be designed for high, single-pass efficiencies.

ASHRAE's Standard 170-2017 *Ventilation of Health Care Facilities* allows recirculation to most space types and specifies filtration requirements that are mostly below HEPA level. HEPA filters are mandatory only for protective environment rooms. For example, in ASHRAE Standard 170, the minimum filter efficiency requirement for an operating room is MERV 14 with a lower-efficiency MERV 7 prefilter. A MERV 14 filter must have an efficiency of more than 75% for 0.3-1.0 micron particles, a range into which many virus-bearing airborne droplet residues will fall. It is not rated for smaller, virus-sized particles, but will still collect a high percentage in that range.

[The UK government guidance on filters in healthcare facilities is stated in *Guidance for infection prevention and control in healthcare settings* bit.ly/CJApr20News1].

A MERV 16 filter must be greater than 95% efficient in this range. UVGI that is 80-90% efficient on single pass under worst-case conditions, plus a filter that is of comparable efficiency for small particles, could be a good combination that removes or inactivates a large fraction of airborne pathogens even when there is recirculation.

I consider going to full outside air a reasonable emergency measure, but one that may be unacceptable based on outdoor conditions at the time, unless the system is designed for it.

If a recirculating system is selected for a building, I would recommend a relatively high-efficiency filtration and UVGI (or other air cleaners shown to work). A system could put in 100% outside air when occupied and then recirculate when unoccupied, to allow filtration and UVGI to remove/inactivate pathogens at lower energy cost.

I disagree that UV is only suitable for healthcare. UVGI is used in all types of buildings – residential, commercial, and healthcare – although healthcare is the niche in which it has the most obvious value. A major US manufacturer I contacted estimates that the current market for UVGI is only about 10% healthcare by number of systems. Upper-room UVGI can be combined with 100% outside air, which may be the best of both worlds – no recirculation and enhanced, low-energy microbial control.

Studies of the effectiveness of upper-room systems have suggested they may be equivalent to as much as 10 air changes per hour of outside air in their ability to inactivate airborne pathogens in a space. Systems that irradiate surfaces when unoccupied can reduce the likelihood of fomite transfer, which is important given the potential infectivity of virus deposited on surfaces for several days.

Reference:

1 Dr Stephanie Taylor, Using the indoor environment to contain the coronavirus, *Engineered Systems*, 16 March 2020, bit.ly/2UeU1tm



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MASS APPEAL

CIBSE's Retrofit Project of the Year is UCL, 22 Gordon Street



36 THE PUPILS DRIVING ENERGY SAVINGS
40 OVERHEATING RISKS IN NET ZERO SCHOOLS



Core principles

The CIBSE award-winning retrofit of 22 Gordon Street has saved University College London £110,000 in annual bills. **Andy Pearson** looks at how BuroHappold Engineering used thermal mass in the original structure to minimise energy use and how researchers helped identify comfort issues

When engineer BuroHappold Engineering and architect Hawkins\Brown were first involved in the refurbishment of the former Wates House, home of the Bartlett School of Architecture at University College London (UCL), their brief was to improve the thermal performance of the building's 1970s single-glazed, brick façade. The original building's façade thermal performance was so poor that the cramped interior of the seven-storey building was too hot in summer, too cold in winter and expensive to run.

It was soon apparent, however, that the expense and effort required to improve the performance of the façade would enhance occupants' thermal comfort, but it would do nothing to resolve the issue of the building's cramped interior.

As an alternative, Hawkins\Brown proposed a deep retrofit, which – in addition to replacing the poor-performing façade – would extend the floor plates and reconfigure the interior, to help address the outdated learning environment while delivering better long-term value.

The proposal was to: retain the building's reinforced concrete structure; reconfigure its layout, including the addition of a new centrepiece staircase; extend the existing floor plates outwards; build a new, full-height extension on a small area of infill land adjacent to the building; and re-clad the entire building. The additions doubled the space for teaching and research, in addition to helping tackle the building's poor energy performance.

The deep retrofit also meant stripping out the building's ageing mechanical, electrical and plumbing (MEP) systems, and replacing them with new, more energy efficient systems that would enable the building to achieve Breeam 'Excellent'. At the same time, these systems would help maintain a comfortable environment for increased numbers of students.

'The school's plan was to expand; it was apparent that façade replacement alone would be expensive and the school would gain nothing in terms of increased floorspace without the new additions,' says Kenichi Hamada, an associate at BuroHappold, the project's MEP engineers.

In contrast to its sleek newly clad brick-and-glass-exterior, the architect wanted the interior of the £22m refurbishment to provide 'a robust canvas for the creativity within' – which, in engineering speak, meant it wanted the rawness of the original concrete structure to remain on view for all to see. 'We estimate that retaining the original concrete frame not only saved money and build-time, but it also saved 400 tonnes of CO₂,' says Hamada.

The exposed thermal mass of the concrete structure and soffits provide additional thermal inertia to help guard against large daily temperature swings. The architect's vision for a robust canvas also included the building services, which it wanted to remain exposed to complement the unadorned concrete structure and utilitarian timber-joinery aesthetic it had planned for the interior.

For BuroHappold, this meant working closely with the architect, client,



PROJECT TEAM

Acoustics, building services engineering, fire engineering, lighting design:

BuroHappold Engineering

Architect: Hawkins\Brown

students and teaching staff to develop a solution to coordinate with the building's exposed structure. 'The building is evolving all the time, so not having a ceiling will give it additional flexibility,' Hamada explains.

BuroHappold's solution was a mixed-mode ventilation scheme based on active multi-service chilled beams that would provide heating or cooling as required. In addition to a heating/cooling coil, the multi-service chilled beams simplified the solution, incorporating presence and smoke detectors, a speaker, and low-energy LED lighting.



The multi-service chilled beams incorporate low-energy LED lighting

To save energy, the system is designed so that students can open windows in spring and autumn to ventilate the learning and teaching spaces naturally. A wall-mounted traffic-light system indicates when external conditions are suitable for operating the building with the windows open, and a window interlock turns off the heating, cooling and fresh air supply to the chilled beams. This ensures energy is not wasted by opening the windows.

In summer, the multi-service chilled beams provide cooling. A roof-mounted air-cooled chiller supplies the chilled beam circuit with chilled water at an elevated temperature of 14°C flow/18°C return. The raised temperature maximises the potential for the chillers to run in free-cooling mode and minimises the likelihood of condensation occurring on the chilled beams.

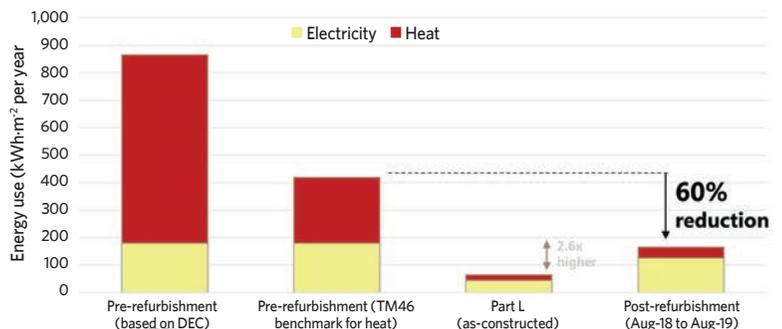
'Allowing for the provision of cooling in the retrofit ensures a robust solution, where comfort levels can still be achieved when external temperatures rise as the result of climate change, without the need to retrofit inefficient cooling systems,' says Hamada. 'Currently, the low-energy chillers are used to maintain comfort levels only during peak summer temperatures.'

A second, roof-mounted air-cooled chiller supplies lower-temperature chilled water at 6°C flow/12°C return to the fan coil units (FCUs) serving the basement workshop spaces, ground floor exhibition spaces and the entrance lobby. The chiller also supplies low-temperature chilled water to the cooling coil in the air handling unit (AHU) that supplies fresh air to the chilled beams.

AHUs provide fresh air only with heat recovery and the fresh air supply rates are demand-controlled. The lower chilled water temperature to the cooling coil helps dehumidify the fresh air to maintain its dew point below the surface temperature of the chilled beams, to avoid condensation forming and dripping into the space.



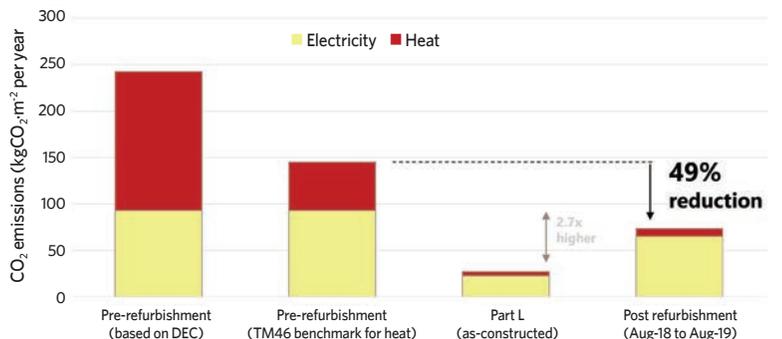
Energy reduction per m²



Includes the 179kWh·m⁻² per year for electricity (verified) and the TM46 typical benchmark for a university building at 240kWh·m⁻² per year

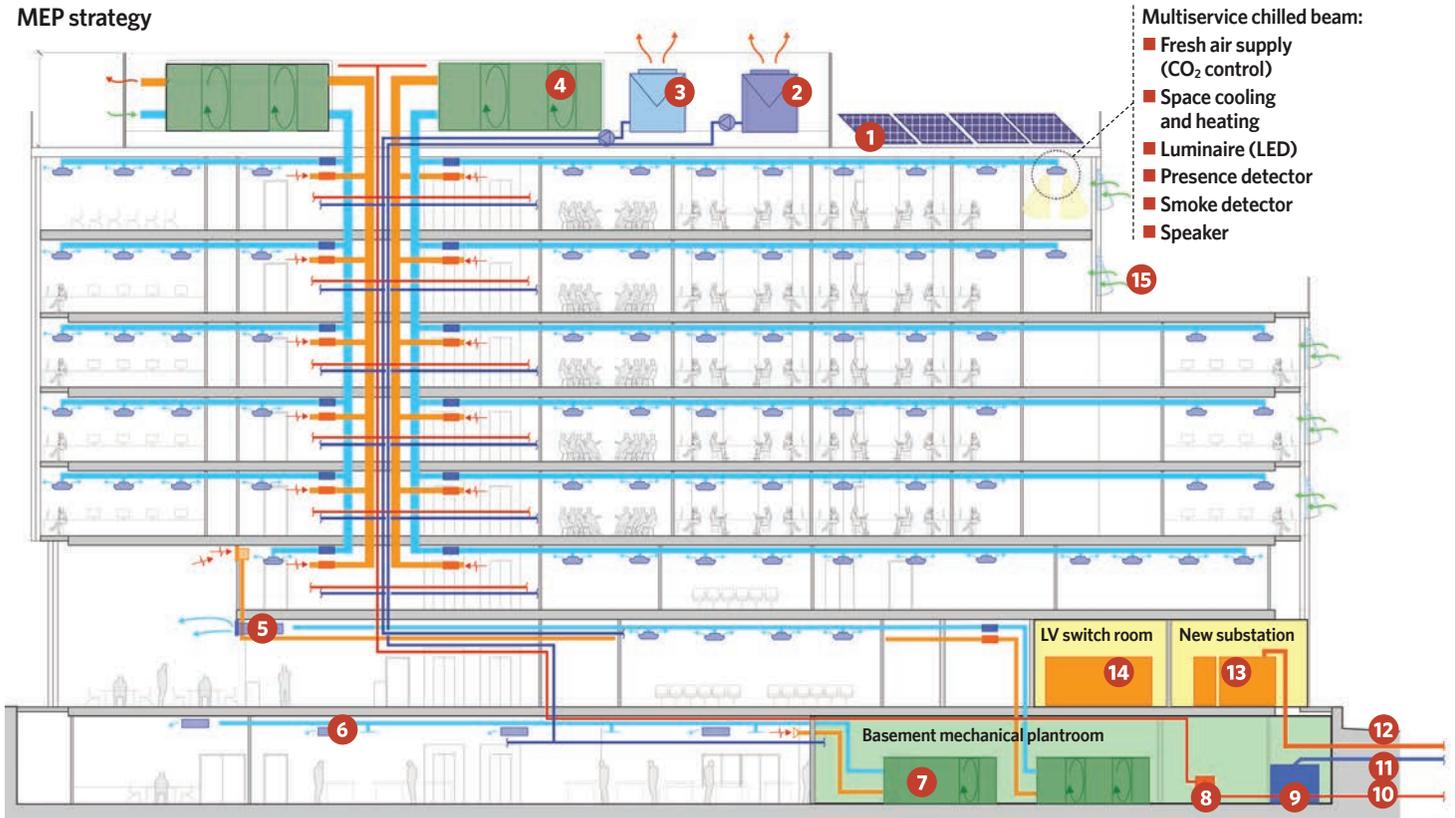
The graph below shows the energy use for 22 Gordon Street vs various benchmark figures. As shown, a 60% reduction in energy use per m² is calculated

CO₂ reduction per m²



CO₂ reduction m² is estimated as 49%. This is baseline on applying carbon factors of 0.216kgCO₂·kWh⁻¹ for gas and 0.519kgCO₂·kWh⁻¹ for electricity (UCL district heat network figure from Ben Stubbs 6 April 2018. Electricity based on UCL carbon-appraisal tool)

MEP strategy



1 Approximately 400m² PV panels on roof 2 Air-cooled chiller (CHW circuit for AHU and FCU cooling coils - 6-12°C 3 Raised CHW circuit for chilled beams - 14/18°C 4 Air handling units (energy recovery by twin wheels) 5 Fan coil unit - serving ground-floor exhibition space and entrance lobby 6 Fan coil unit - serving workshops 7 Air handling unit (heat recovery) 8 LTHW plate heat exchangers 9 Domestic cold water break tank 10 Incoming UCL district heating 11 Incoming mains water 12 Incoming HV power 13 Ring main unit and transformer 14 LV switch panel 15 Openable windows in office: natural ventilation in mid-season



The building's original concrete structure has been left exposed...



...and the interior designed to provide flexible teaching spaces

» Stale air is extracted adjacent to the lift core on each floor, where the service risers are located. The air is ducted to a roof-mounted AHU. This incorporates twin thermal wheels to allow humidity to be transferred from the fresh air to the exhaust air while enabling energy recovered from the exhaust air to be transferred to the supply air. 'The thermal wheels ensure increased heat recovery in winter and free re-heat of the supply air after it has been dehumidified in the summer,' explains Hamada.

Heat for the building's space heating and domestic hot water comes from UCL's district heat network via a LTHW plate heat exchanger in the basement plantroom. 'Our team developed a building services design that offers a flexible, low-energy and comfortable environment for the occupants, which - when coupled with good levels of daylight and healthy material choices - provides healthy and productive teaching spaces,' says Hamada.

Heating and cooling loads are kept to a minimum by the building's new façade. Its design is based on what Hamada terms a 'passive first' approach because of its thermally efficient glazing and the high levels of insulation. This enables it to exceed Part L 2013 U-values, even though the scheme was certified under Part L 2010. The building achieved an onsite airtightness of 8m³·h⁻¹·m⁻²@50Pa and an as-constructed EPC rating of B(41), equivalent to a 30% reduction over Part L 2010.

The building was occupied in January 2017. Seasonal commissioning was carried out in winter, mid-season and during peak summer conditions. One of the issues identified during commissioning was condensation forming on the chilled beams at a random time of day. Investigation showed that this was down to a fault on the chiller's control software, which meant the chilled water flow temperature reset to default low temperature. The chiller was subsequently reprogrammed and is now operating at predicted design flow and return temperatures.

A Building Use Survey (BUS) was carried out among staff and students in April 2018, more than a year after the building was first occupied. This identified two aspects of the building performance where user comfort needed to be

improved: air quality in the basement workshops, and thermal comfort on the upper floors. BuroHappold was able to involve the students, using the building to investigate the findings further. It supervised two MSc students from the Bartlett to undertake user surveys and POE monitoring studies. (See panel, 'Investigating comfort issues').

Aside from these minor operational issues, the building is performing well in terms of operational energy. The Bartlett's new home, renamed 22 Gordon Street, uses 60% less energy per square metre than did the old Wates House. This is equivalent to a 33% reduction in absolute energy use, despite floor area increasing from 5,260m² to 8,887m². The provision of far greater environmental control throughout the building is key.

The improvement is best demonstrated when comparing expenditure on energy: in the case of the old Wates House building, UCL was spending around £136,000 on energy each year. After its refurbishment, energy costs are now around £26,000, saving the university approximately £110,000 per year.

BuroHappold's approach to the refurbishment impressed the judges at this year's CIBSE Building Performance Awards, where 22 Gordon Street won the Project of the Year - Retrofit category. The judges said the scheme showed

'genuine ambition' and they were impressed that the consultancy had 'involved students from UCL Bartlett in the post-occupancy studies' and with the culture of 'performance, feedback and learning' the team had created.

During the project's lessons learned workshop, David Stevens, assistant director of the UCL Estates Project Mobilisation and Transition team, hailed it as 'a real success' and said it had 'set a standard'. 'This has all the hallmarks of good project - how to go about delivering a project and how post-occupancy can deliver lessons'. **CJ**

INVESTIGATING COMFORT ISSUES

UCL researchers looked at two areas of concern highlighted by a BUS survey - poor air quality in the basement and thermal comfort issues on the upper floors.

They found that the problems with thermal comfort on the upper floors were down to large numbers of students using the building at weekends - particularly when coursework submissions are due - when the chilled beams in the main building were programmed to be off.

The air quality issue in the basement was also found to be because the workshops were being used outside of normal hours, which meant the extraction systems were not always switched on.

The findings were presented to the building's facilities management (FM) team. As a result, an interlock was fitted to the extraction system, so power to workshop equipment can only be turned on when the extraction system is activated.

Similarly, it was agreed that the HVAC time controls would be adjusted periodically throughout the year to align with periods when coursework submissions are due and the building is expected to be in use for extended hours.





Key influencers

Students at Parrs Wood High have responded to the climate emergency by making energy savings in their school buildings. Science teacher **Chris Baker** explains how other schools could replicate the model, which has cut annual carbon emissions by 543 tonnes and energy bills by £106,000

Parrs Wood High is a thriving, state-maintained comprehensive school in Manchester, with an extraordinary story to tell. Over the past eight years, successive members of the student sustainability team have worked tirelessly to cut annual carbon emissions by 543tCO₂e, resulting in annual savings of £106,000 and an improvement of two Display Energy Certificate (DEC) bands for each of the three main buildings.

In that time, they have identified areas for improvement, calculated payback periods, selected contractors, secured funding, and project-managed the majority of the work. As well as cutting energy use, the students have achieved 100% recycling rates and introduced water-saving measures (their key achievements are shown in Table 1).

Recently, students completed a full appraisal and costing for an LED lighting upgrade in preparation for a Salix funding bid later this year. They are currently working to eradicate single-use plastic bottles in school, with a potential reduction of 100,000 bottles per year.

The school is used by Salix Finance and the Department for Education (DfE) as a national role model, and the students have given advice to the DfE, finance officers, site managers and students from other schools.

Parrs Wood High has a mix of buildings, ranging in origin from the 18th to the 20th centuries, as well as a small amount of new build. The majority of schools in the UK have a similar mix of building stock. Work to upgrade and retrofit

equipment at the school has been achieved with limited funding and limited technical knowledge at the outset.

How Parrs Wood delivered

The huge reductions in carbon have been achieved by a group of sixth-form students – the CO₂ team – who meet at least twice a week and employ the help of younger students. They draw on the knowledge gained in lessons and through their relationships with staff.

One of Parrs Wood's strengths is its extremely diverse mix of students, and this is reflected in the CO₂ team; its members' broad range of backgrounds and interests means they approach tasks from a variety of perspectives.

Each year, the CO₂ team tackles at least one large sustainability issue. For each issue, they apply 10 key principles. Projects must be applied to real-world problems and the



10 STEPS TO SUCCESS

The following underlying principles have helped make each year's team highly effective:

1. The work is applied to real school issues, to develop the ability to find solutions that are viable and rooted in the real world.
2. A simple model is used: identify issues/opportunities; assess the scale of the issue and potential savings/cost; shortlist alternative solutions; brief school management; secure funding; implement change; assess the impact.
3. Quantify, so you are able to make informed decisions. While not all members of the team will be studying mathematical-based subjects, the group as a whole should be quantifying issues and developing this skill.
4. Assess impacts: our experience shows that measures don't always work as expected and initial snags need to be ironed out. A failure to monitor impact can result in unintended increases in energy consumption.
5. Clear milestones: at the end of each of the above steps, a student presentation/report is produced. This gives a clear time-limited target and forms the starting point for the next stage.
6. Keep it simple: while the initial assessment and solution may be complex, the implementation must be straightforward in operation or it will fail to deliver desired results. The best way to encourage a desired behaviour is to make it the easiest option.¹
7. Be realistic about behaviour change and what it can achieve: in large, busy shared spaces, a sign reading 'please turn off the lights' will have little impact, and a technological solution may be required.
8. Openness: students should have access to relevant accounts to assess the financial impacts of measures.
9. The site team is an invaluable source of information and our greatest ally for implementing effective change.
10. We don't pay for advice: why pay for a carbon-literacy course when universities, businesses and other experts are keen to help for free as part of their outreach programmes.

model must be simple. The projects must be costed and quantified, and monitored afterwards to ensure any issues are rectified. Implementation has to be simple and we consider how real-life behaviour will affect the likelihood of success.

Students have access to financial accounts so they can see the consequences of their actions. We never pay for advice - outside organisations are willing to share knowledge and carry out surveys for free. (See panel, 'Ten steps to success').

How it started

The work was started in response to student demand. As young people become increasingly aware of the need to protect the environment, they not only want their schools to be more sustainable, but also want to be involved in making this happen.

The work gives students the opportunity to apply the knowledge and skills learned in their academic studies to the real world, and develops their ability to quantify issues to make informed decisions. Importantly, it makes them appreciate that, in the real world, with limited resources, finding solutions is often not clear-cut and involves difficult decisions between competing priorities.

As we have seen recently, protesting can be a valuable way of raising public awareness around environmental issues.

"Why pay for a carbon-literacy course when universities and businesses are keen to help for free, as part of their outreach programmes, and contractors are keen to give free surveys and quotes"

Table 1: Pre-handover testing schedule

Efficiency measure	tCO ₂ eq pa	Annual school savings (£)
Successfully made seven bids for Salix funding (totalling £250k) across 10 technologies, with an average payback time of 3.9 years. All but one of these loans has now been paid off.	320	61,000
Collaborated with Manchester council to secure our 250kW peak solar PV array in 2015 (at the time, the largest array on a school in the country); value £280,000.	60	14,000
Developed and promoted our award-winning recycling scheme (0% to 100% diversion from landfill in 12 months) for which the team also received a Student Leadership award from the Speaker of the House of Commons.	130	320
Monitored and improved control of distributed HVAC equipment, reducing its energy consumption by 400%	31	9,000
Uncovered overcharging on our water contract, resulting in an annual reduction in costs and a rebate of £50,000. We have also implemented water-saving measures.		12,500
Centrally adjusted printer settings, to avoid accidental printing, resulting in a 10% reduction across the school	2.1	10,000
Total savings	543	£106,820

» As well as cutting energy use, students have achieved 100% recycling rates and implemented water-saving measures

» However, it does not begin to find solutions to the problems. To make a real difference, large numbers of people need to be engaged in making achievable and permanent changes. Schools, and in particular their students, are ideally positioned to spread this practice beyond school, to their homes and future work environments. Ultimately, it's about encouraging people to take responsibility for solving their problems, and not rely on someone else to do it for them.

Next steps

Having become experienced in tackling a range of sustainability issues, the school is now keen to share this knowledge.

As well as publishing articles, the students have been briefing relevant organisations on their work and how it can be better supported. The team is currently working with Greater Manchester Combined Authority (GMCA) to develop a package to encourage student leaders and staff in other schools.

A lack of time, technical knowledge and confidence that students and staff can tackle more complex issues involving technological solutions were all identified as barriers by other schools.

The CO₂ team will be producing online resources this year, which will give clear technical guidance for other schools. It will have activities for students, and include links to the curriculum, as well as financial advice to enable them to access Salix and other funding. Above all, we want to convince students and teachers in other schools that they can initiate significant change, and that it's not something that has to be left entirely to 'experts'.

Finally, one thing other schools should definitely be made aware of is just how addictive this work is. While people often complain about getting out-of-hours emails, I get them from a diverse and motivated team of students telling me about their latest research and possible solutions to problems – which, for me, makes this the best job going. **CJ**

■ **CHRIS BAKER** is a science teacher and coordinator of the student CO₂ sustainability team.

■ For further information, please contact c.baker@parrswood.manchester.sch.uk

■ The school is extremely grateful to Salix, the local authority, and other organisations for their willingness to engage with its students.

References:

- 1 *Behaviour change and energy use*, The Behavioural Insights Team. (2011). London: Cabinet Office. bit.ly/CJApr20CS1

Efficiency measures have saved £106,820 a year at Parrs Wood High



“We want to convince students and teachers that they can initiate change, and that it's not something that has to be left entirely to ‘experts’”

WHAT THE STUDENTS SAY

Why did you get involved?

Attending climate-change protests raised my awareness of the issue, but I wanted the opportunity to do something about it. The project sounded interesting because it had a purpose, and was focused on actually doing something.

What have you learned from the project?

Trying to bring about even simple change is always more complicated than you expect. If these things were easy to fix, someone would have done it already. We've learned how complex it is to juggle the priority of the environment with all the other issues the school management and local authority have to consider. This is good to appreciate; don't just leave it to someone else to fix – we all need to chip in.

What advice would you give to other students wanting to get involved?

Actions taken to benefit the environment need to be guided by scientific understanding; it's not always obvious what the actual impact may be. Make sure all options are fully explored, as there might be some complications you've missed. Working as a team, you get a lot more done, and making an improvement across the whole school makes a bigger impact than you'd expect. Also, you will be listened to by the school and local authority if you undertake serious research.

Will you continue this work after college?

Yes, in the choices we make on a daily basis, and by looking for opportunities to volunteer at university or at work.

Do you think this work will be relevant to your future careers?

One in 13 of us is considering a career in environmental science, and one wants to study philosophy and is interested in policy-making and the ethics of individuals' choices and collective responsibility. The rest of the group, while not planning related careers, think sustainability in energy consumption and waste management will be relevant in their vocation.



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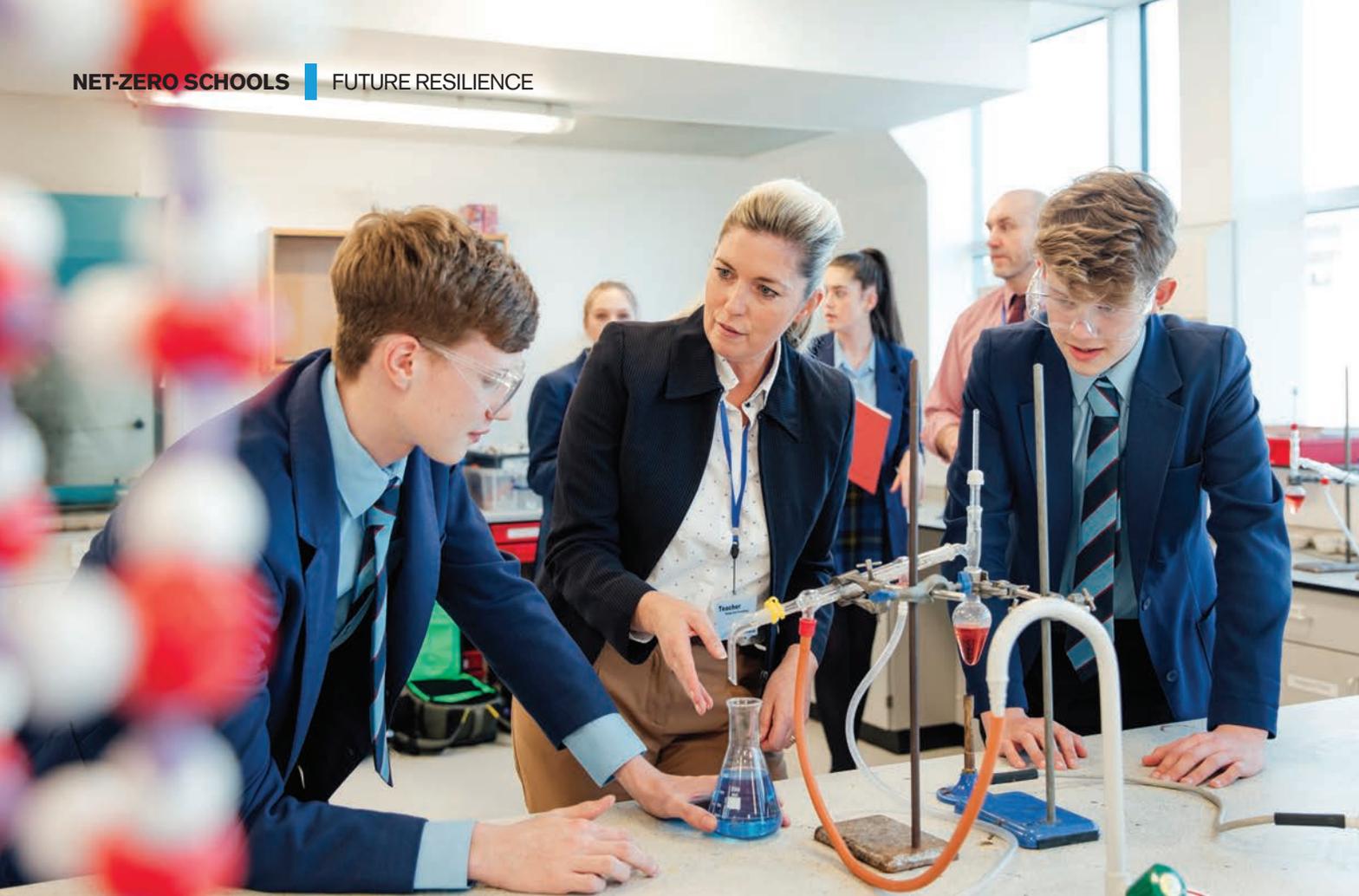
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Building resilience into net-zero schools

Schools designed today must withstand future climate change. **Tim Taylor, Joe Jack Williams** and **Paula Morgenstern**, from the CIBSE School Design Group, look at the likelihood of them overheating

A month after the UK government announced its net-zero target, we had the hottest day in the UK since records began. As the urgency of cutting carbon emissions rises up the industry agenda, so too should our response to the risks of hotter summers, wetter winters and extreme weather. What impact will net-zero and climate change have on schools across the country – and how can the sector best respond to these multiple challenges, as well as related environmental objectives, such as net biodiversity gain?

The CIBSE Schools Design Group on climate change adaptation was formed to share knowledge and promote good practice in adapting school buildings to future climate, with an initial focus on the risks of higher summer temperatures.

In April 2019, a kick-off workshop – involving industry, academia and policy-makers – was held to develop a joint view on the actions to be taken. Among the key issues highlighted were the need:

- For a collective understanding of how schools currently perform
- To build confidence in predicting performance under future climate scenarios
- For more guidance on current overheating risk assessments to achieve greater consistency and transparency when assessing thermal performance of schools
- To recognise that the existing school estate represents the biggest challenge for climate change mitigation and adaptation. However, strategies developed

for new schools should lead the way. From the workshop, two workstreams were established – one focused on modelling to test the performance of recent school designs under future climate scenarios, and the other on monitoring to gather data on how school buildings are performing.

Under the modelling workstream, a range of schools, delivered to meet current thermal comfort design standards – for example, the Building Bulletin 101 (BB101) overheating risk assessment methodology – were tested against two future climate scenarios.

With the support of CIBSE and the Met Office, weather files were selected that aimed to represent scenarios of 2°C and 4°C global warming above pre-industrial levels. These two scenarios align with how climate risks to the UK are assessed in the Climate Change Risk Assessment.¹ This, in turn, informs wider UK

government policy, as detailed in the National Adaptation Programme.²

Research cited in UKCP18 (the latest climate change projections for the UK³) cautioned that a global mean warming level of 2°C could be reached as early as the late 2020s without mitigation of climate change, with a risk that this level of warming could occur from around the late 2030s onwards, even under a low-emissions trajectory.

The modelling results highlight the potential risks of thermal discomfort in a changing climate. A summary of the overheating test results for the range of schools is presented in Figure 1. This shows the proportion of classrooms that do not achieve target comfort criteria under the 2°C and 4°C global warming scenarios. With 2°C of global warming, the overall number of classrooms not achieving current standards for thermal comfort is low. However, there are schools with substantial numbers of classrooms that do not meet the standards.

The classrooms most at risk were found to be those with an increased exposure to solar gains – for example, south-facing, top-floor classrooms. Risks were higher in London and the south-east of England, with dense urban areas also representing an increased risk because of the urban heat island effect. Conversely, there was some evidence that schools with higher standards of insulation and increased potential for ventilation in classrooms performed better. With 4°C global warming, the majority of classrooms do not achieve target comfort criteria.

Beyond modelling, post-occupancy data collection and monitoring of completed schools is essential to validate and improve modelling tools, and close possible performance gaps. Monitoring also lays robust foundations for any fine-tuning of controls, to ensure comfortable and low carbon buildings for users.

For energy, differences between modelling and actual outcomes – as well as their main causes – are by now well documented, notably through CarbonBuzz. Now evidence is emerging that there are also gaps between design expectations and actual outcomes for daylighting, summertime thermal comfort and some aspects of functionality.

Despite some progress on post-occupancy monitoring in recent years, we urgently need evidence on the real performance of schools. Within the working group, everyone recognised the importance of sharing data, but few were able to hand over data, even in an anonymised format. It was clear that there is nervousness about releasing data, and, particularly, about acknowledging that some aspects may not perform as well as intended. More work is clearly required on how to reduce the perceived legal implications of sharing these studies.

Department for Education (DfE) contractors are required to carry out aftercare, with fine-tuning of services in the first year of operation (see case study on page 42). Comprehensive seasonal commissioning is a key part of this, based on interrogations of BMS trends for system efficiencies, as well as meter readings.

With ambitions for new schools to move towards zero carbon, it is increasingly urgent that actual performance outcomes are tracked and each building is optimised to its potential. Findings need to inform new projects. Recent monitoring in schools using the cloud-based reporting platform K²n and iSERV methodology, and in those monitored by BAM, have shown that actual hot-water

“Post-occupancy data collection and monitoring of completed schools is essential to improve modelling tools and close performance gaps”

demand is lower than current benchmarks. This finding is being considered by the Part L review and is significant, particularly given increasing opportunities for heat pumps, which are more efficient with lower hot-water loads. Monitoring in recent schools by BAM also suggests that designs may overestimate heating requirements in internal corridor spaces for buildings that achieve good levels of fabric performance.

Closing the performance gap through effective building management and commissioning is an important first step towards future-proofing our schools



North Somerset Enterprise and Technology College, Weston-Super-Mare

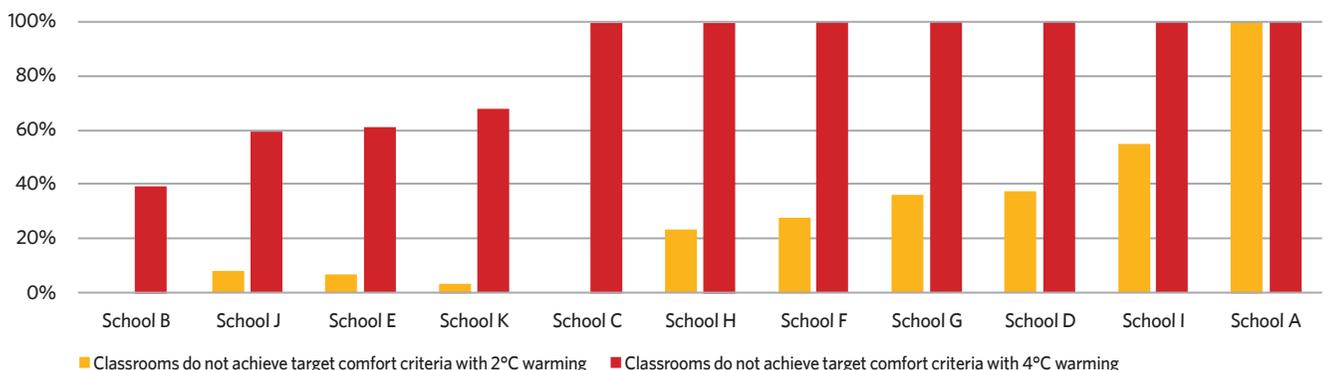


Figure 1: Results of schools tested using BB101 methodology against 2°C and 4°C global warming

» against a changing climate. Other potential low- or no-cost measures include passive improvements to the building and its microclimate – for example, tree planting to increase shade – and changing user behaviours (flexible dress codes or school hours). These are the first steps in the ‘cooling hierarchy’ – further guidance is given in Annex 2F of the Output Specification.⁴

The CIBSE schools working group will continue building the evidence base to inform industry guidance for climate change adaptation. Its next steps include further research into the risks of extreme weather and the life-cycle costs and benefits of climate resilience for UK school buildings. **C**

■ **TIM TAYLOR, JOE JACK WILLIAMS** and **PAULA MORGENSTERN** are from CIBSE School Design Group

References:

- 1 UK Climate Change Risk Assessment 2017 Evidence Report **CJApr20TT2**
- 2 Climate change: second national adaptation programme (2018-23), July 2018, Defra **CJApr20TT3**
- 3 UK Climate Projections (UKCP), **CJApr20TT4**
- 4 Output specification: generic design brief and technical annexes, June 2019, DfE, **CJApr20TT5**

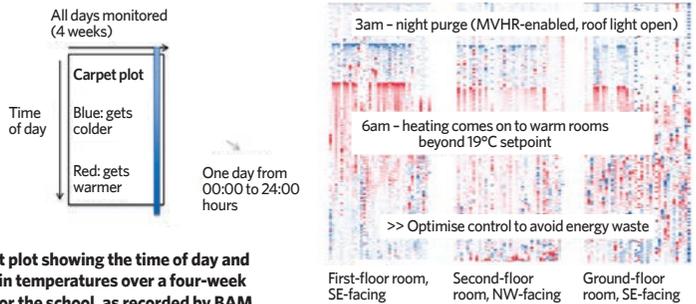
TWEAKING THE NIGHT-PURGE CONTROL STRATEGY

Schools are a core market for contractor **BAM**, so a consistent understanding of the in-use performance of completed buildings is a real opportunity to identify efficiencies and improve the next generation of projects.

‘Night purging’ is a core part of low carbon strategies to prevent summer overheating. North Somerset Enterprise and Technology College, in Weston-super-Mare, is a superblock with hybrid cross-ventilation in classrooms and a night-purge strategy through high-level secure vents in the atrium.

Temperature monitoring was undertaken by **BAM** during the school’s first summer as part of seasonal commissioning. Data confirmed that the night cooling was effective, reducing classroom temperatures across the building from 3am (under BMS control).

However, the monitoring revealed that the heating was coming on at 6am to heat rooms to the 19°C setpoint, thereby wasting energy and money, and undoing any free-cooling benefits. The case study highlights the value of seasonal commissioning to ensure good performance across the seasons, and shows the importance of integrating different systems in the controls strategy.



A carpet plot showing the time of day and change in temperatures over a four-week period for the school, as recorded by **BAM**

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RINNAI CPD

PROVISION OF LOW TEMPERATURE DOMESTIC HOT WATER DELIVERY SYSTEMS

Danny Madagwa, MSc

It is a prime aim of the UK and all other developed and developing nations to quickly and effectively reduce energy consumption and carbon emissions and still maintain performance levels. With the UK's publicly stated aim of almost net-zero carbon by 2050, along with many other countries proposing their own legislation, big and bigger steps are required in providing as close as possible to an environment-neutral impact of products and systems.

This will need to be rigorously implemented across several industries involving carbon-dioxide releasing processes, and the building services sector is no exception. While there are a number of ways to increase energy efficiency and reduce emissions in a building, changes to how domestic, and commercial, hot water is supplied will play a significant role in achieving these goals.

A major factor will be closer attention to DHW design and ensuing analysis of any given current system in order to facilitate the shift to low temperature domestic hot water (DHW). This has the potential to make an enormous contribution to overall energy reduction.

The term "low temperature DHW" will sound and read like a contradictory term but it must be taken in the context of the current era, with energy and emissions under such scrutiny and concerns regarding scalding,

especially for those more vulnerable. It can be seen as a pragmatic response that ticks a lot of boxes. There are, however, a few concerns particularly related to health and safety that must be considered first.

Methods of DHW supply

This CPD considers two major modes of supplying DHW:

For more info on Rinnai CPD, contact info@rinnaiuk.com

- continuous flow (instantaneous) water heaters.
- storage water heaters

Both of these modes have their pros and cons, with the main differences are outlined below.

Storage water heaters:

- Have a limited store of water
- When store depletion takes time to reheat before use
- Require more plant room space

• Heavy and cumbersome

Continuous flow heaters:

- Hot water is only heated and provided upon demand.
- Endless supply of hot water.
- Lighter and require less space.
- Advanced models can supply temperature accurate hot water.

Table 1 shows a comparative analysis between a continuous flow and storage water heater. As you can see from the data, the storage option tends to be less efficient and consume more energy. It is clear that a continuous flow heater is the more cost and energy efficient option.

Continuous flow heaters are therefore generally better for reducing the carbon



footprint, but with the correct measures in place it can be taken a step further.

Scalding

When discussing temperature control of DHW, the risk of scalding must always be considered, especially in the health and social care sector. This is an area that often provides care for individuals who may be more vulnerable to risks from hot water such as children, elderly people, those with less physical or mental ability or a sensory issue. According to the Health and Safety Executive (HSE), temperatures over 44°C can create a scalding risk and as such water temperatures discharged from outlets accessible to those vulnerable or where there is the potential for full body immersion must not exceed this temperature. Engineering controls should be put in place in order to ensure this. These include thermostatic mixing valves (TMV's) which should be placed as close to the outlet as possible.

Legionella & ACOP L8

National guidance underpins safety at work, and specific guidance for the control of L pneumophila in water systems is provided in the Health and Safety Executive Approved Code of Practice (ACOP L8) and its associated regulations, HSG274 Part 2. ACOP L8 governs the control of Legionella in water systems. Legionella – full name Legionella pneumophila – is a bacteria that causes, amongst other less serious conditions, Legionnaires disease, a potentially fatal form of pneumonia. Legionella bacteria are common in natural water sources but the conditions are rarely conducive to people catching the disease. This usually occurs in

Table 1	Continuous flow	Storage w/h
Max Heat Input (kW)	58.3	79
Max heat output (kW)	56	65
Efficiency (Gross)	96%	82%
1st hour flow rate @ 50°C rise (l/hr)	960	1411
Storage/Cylinder (L)	0	300
Continuous flow rate (l/hr)	960	1111
Peak usage periods (hr)	1	1
Number of peak usage periods	3	3
Heating consumption (kW)	58.3	79
Storage recovery time (mins)	0.0	16.2
Storage recovery (kW)	0.0	21.3
Storage loss (kWh)	0	9.29
Secondary return system heat loss per hour (kW)	10	10
Efficiency (efficiency curve of appliance)	93%	82%
Appliance input for secondary system (kW)	10.8	12.2
Secondary system operating time (hr)	21	21
Reheat of secondary return (kWh/day)	225.8	256.1
Consumption per peak period (kWh)	58.3	79
Total consumption per day (kWh)	400.7	566.4
Consumption per week (kWh)	2804.9	3964.7
Annual consumption (kWh)	146257.9	206730.1
Annual CO ₂ carbon emissions (kgCO ₂ e)	26,889.5	38,007.3



purpose built water systems and the risk of being exposed to legionella increases in warm, stagnant water, passed to humans via breathing in miniscule, aerosol-like droplets of water.

Certain conditions support the growth of bacteria, such as a temperature range of 25°C - 45°C as well as the presence of certain deposits such as lime-scale, rust, sludge and organic matter can also increase this risk. This is why it is important to control the risk of exposure and do all you can to minimise it by introducing measures that restrict the growth of bacteria and reduce exposure. Traditionally this is done via temperature control, keeping stored water at least at 60°C and ensuring distributed water is supplied with 50°C water (55°C for healthcare) at outlets within 1 minute.

Table 2: Analysis of continuous flow heater at 16l/min and 33°C temperature rise

According to the ACOP L8 guidelines, continuous flow direct to outlet systems are seen as low risk for Legionella, due to it allowing for a full turn-over of water volume, no stored water and accurate temperature control. However, this can be further reduced by implementing more preventative measures which include:

- **Good system design.**
- Avoiding dead legs (capped ends).
- Keeping pipework as short and direct as possible, ensuring they are adequately insulated.
- Maintaining cleanliness of system – hard water areas should be treated – so scale is reduced.
- Ensuring cold water comes from wholesome mains.

Low Temperature DHW in practise

Due to their modulating nature, continuous flow heaters only provide an output in response to the water flow and temperature demand. This means that depending on what is required, the kW rating can range anywhere from a given maximum output to a minimum.

For example, if a heater has a maximum output of 58.3kW and a 13:1 turn down ratio, it can potentially modulate down to a minimum of 4.4kW. This is a massive difference, resulting in a significant reduction in energy consumption and therefore emissions. A storage water heater, however, does not have the same ability as regardless of the capabilities of the heater, the water stored in the tank must be kept at a temperature of at least 60°C, requiring constant heating.

Table 2 shows the output, consumption and running cost based on the same continuous flow water heater from earlier in the report when it has modulated down based on a temperature rise of 33°C and a flow rate of 16l/min. The annual savings shown in consumption and running costs are over 20,000 kWh. This saving amounts to almost 4 tonnes of CO₂ emissions. This can be taken further if the required flow rate is lowered to 10 l/min at 43°C (33°C rise).

Conclusion

Striking a balance between providing low enough temperature water to reduce scalding risk and decreased consumption and emissions but high enough to minimise exposure to legionella is the aim. A control routine

Table 2	Condensing c/f
Max Heat Input (kW)	38.9
Max heat output (kW)	37.4
Efficiency (Gross)	96%
1st hour flow rate @ 33°C rise (l/hr)	960
Storage/Cylinder (L)	0
Continuous flow rate (l/hr)	960
Peak usage periods (hr)	1
Number of peak usage periods	3
Heating consumption (kW)	38.9
Secondary return system heat loss per hour (kW)	10
Efficiency (efficiency curve of appliance)	93%
Appliance input for secondary system (kW)	10.8
Secondary system operating time (hr)	21
Reheat of secondary return (kWh/day)	225.8
Consumption per peak period (kWh)	38.9
Total consumption per day (kWh)	342.5
Consumption per week (kWh)	2397.5
Annual consumption (kWh)	125014.9
Annual CO ₂ carbon emissions (kgCO ₂ e)	22,984.0

reliant on water treatment could also permit a low temperature system. A 2019 paper published by The American Journal of Infection Control entitled “Controlling Legionella pneumophila in water systems at reduced hot water temperatures with copper and silver ionization” studied the effectiveness of copper and silver ionization to control L pneumophila. The Great Ormond Street hospital building in question has effectively removed TMV’s from the system design by opting to supply water consistently at 43°C, instead relying on the copper-silver water treatment protection. They concluded that using this setup, not only had they saved money due to the associated costs of installed TMV’s but energy savings and reduction of carbon emissions were calculated to amount to “33% and 24% respectively compared to an equivalent temperature-controlled system”. In over 6 years, there have been no cases of legionella counts being detected. (Cloutman-Green, *et al.*, 2019).

As highlighted, a continuous water heating solution with accurate temperature control and a modulating burner system incorporated into a high turnover rate hot water system would be a possible solution for lower onsite carbon and energy. ■

Table 3	Storage w/h	Condensing c/f	Condensing c/f	Condensing c/f
	50°C rise		33°C rise	
Max Heat Input (kW)	79	58.3	38.9	23.92
Max heat output (kW)	65	56	37.4	23
Efficiency (Gross)	82%	96%	96%	96%
1st hour flow rate (l/hr)	1411	960	960	60
Storage/Cylinder (L)	300	0	0	0
Continuous flow rate (l/hr)	111	960	960	960
Peak usage periods (hr)	1	1	1	1
Number of peak usage periods	3	3	3	3
Heating consumption (kW)	79	58.3	38.9	23.92
Storage recovery time (mins)	16.2	0	0	0
Storage recovery (kW)	21.3	0	0	0
Storage loss (kWh)	9,29	0	0	0
Secondary return system heat loss per hour (kW)	10	10	10	10
Efficiency (efficiency curve of appliance)	82%	93%	92%	93%
Appliance input for secondary system (kW)	12.2	10.8	10.8	10.8
Secondary system operating time (hr)	21	21	21	21
Reheat of secondary return (kWh/day)	256.1	225.8	225.8	225.8
Consumption per peak period (kWh)	79	58.3	38.9	23.92
Total consumption per day (kWh)	566.4	400.7	342.5	297.6
Consumption per week (kWh)	3964.7	2804.9	2397.5	2083.0
Annual consumption (kWh)	206730.1	146257.9	125014.9	108611.8
Annual CO ₂ carbon emissions (kgCO ₂ e)	38,007.3	26,889.5	22,984.0	19,968.3

References

Carbon Footprint. (n.d.). Retrieved from <https://calculator.carbonfootprint.com/calculator.aspx?lang=en-GB&tab=3>
Cloutman-Green, E., Barbosa, V. L., Jimenez, D., Wong, D., Dunn, H., Needham, B., . . . Hartley, J. C. (2019).

Controlling Legionella pneumophila in water systems at reduced hot water temperatures with copper and silver ionization. American Journal of Infection Control.

Water Treatment Services. (n.d.). Retrieved from Water Treatment Services:

HSE clarifies risk guidance on instantaneous water heaters

Note applies to instantaneous water via plate heat exchangers

The HSE has clarified guidance on low-risk instantaneous water heaters.

The statement, in HSG 274 (Part 2, 2014) and ACOP L8 (2013), that 'instantaneous water heaters are low risk' applies to instantaneously supplied domestic hot water via plate heat exchangers (for example, heat interface units), according to the HSE – provided the volume of water is small, such as in homes connected to communal heat systems.

The requirement for $\geq 50^{\circ}\text{C}$ delivery at outlets in M1 minute is applicable to systems incorporating hot-water storage, and does not necessarily apply for instantaneous water heaters. This means that the HSE has no fundamental objection to the reduction in temperature at outlets from HIUs.

It clarified that, if $\geq 50^{\circ}\text{C}$ is not achieved within one minute at the



outlets, this would need to be risk assessed to confirm suitability for the application for the particular low-risk system, and the likely susceptibility of the service users.

Please note, this does not apply to all plate heat exchangers within domestic hot-water systems, just those operating as low-volume instantaneous domestic hot-water systems.

PRODUCT NEWS

Hamworthy launches two new direct-fired water heaters

The Dorchester DR-LL is an atmospheric low- NO_x water heater, that can be used on old systems with existing flues, although the draught diverter will need changing. If the existing system is a flue cascade, the appliances and draught diverter will need replacing to comply with BS6644 and IGEM UP10, says Hamworthy.

The water heater's integral stainless steel burner produces low NO_x emissions ($34\text{--}45\text{ mg}\cdot\text{kWh}^{-1}$) and has an automatic gas/air premix burning system for increased efficiency. It is available in three models with continuous outputs (50°C delta T) of 850 to 1,600 litres per hour, recovery rates from 12 to 23 minutes, and a working pressure of up to 8bar, to help meet the continuous demands of bigger (taller) buildings.

An optional unvented supply kit (up to 3.5bar working pressure) enables direct connection to the water hot supply and reduces the risks associated with cold-water storage tanks.

The Dorchester DR-XP is a condensing water heater, with grade 444 stainless steel tank, available in two models (38-50kW input) of 184 litres. With an ErP efficiency of 91%-93% and NO_x emissions of $53\text{mg}\cdot\text{kWh}^{-1}$ or below, it is compliant with the ErP regulations. With an operation temperature of up to 85°C , stored hot water stretches up to 15% further thanks to mixing.

It can be sited in small compartmental areas, and flexible flue options mean the water heater can be installed almost anywhere.



DHW energy efficiency consultation to take place this month

The CIBSE DHW working group is writing its first briefing note, *The optimisation of DHW delivery temperatures and times in low-volume, instantaneous domestic hot-water systems served by communal heat sources*.

The note will be circulated for consultation in April, with a view to gaining support from across the industry before publication as formal guidance.

The aim of the working group is to look at ways of optimising the energy consumption of DHW systems – and, in particular, the opportunities for reducing temperature in heat pump-led DHW.

Becci Taylor, chair of the working group, said: 'As far as the government policy writers are concerned, the big issue is about reducing space heat loss. They haven't moved on to understand that new buildings have much lower space heating than domestic hot-water load.'

To find out more, please contact:

hotwatergroup@cibse.org

To read more on the work of the group see 'Taking the temperature', *CIBSE Journal*, February 2020 at www.cibsejournal.com



Taylor: 'New buildings have much lower space heating than DHW load'

Global water heater demand to rise rapidly

New research by Global Market Insights is predicting that the water heater market will grow 72%, from \$18.04bn (£14.68bn) to \$31.12bn (£25.33bn), by 2023.

The report said that rapid urbanisation, a rise in disposable incomes, and affordability would drive growth in the forecast period. It added that stringent government standards were resulting in manufacturers producing increasingly energy-efficient products.

The reports analysed the markets for solar, electric, gas/propane and geothermal water heaters.

Heater's remote monitor cuts hotel energy use by 17%

Whitbread to replace non-condensing water heaters at all Premier Inns

A Premier Inn in Oxford has achieved a 16.7% reduction in energy use since installing a new water heater with remote monitoring.

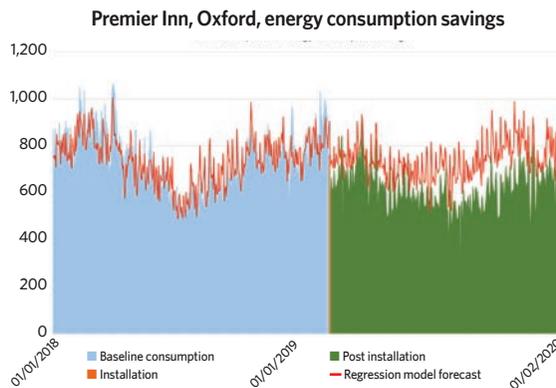
It replaced an 11-year old water heater, running at 74% efficiency, with a MAXXflo Evo model with remote monitoring.

Whitbread, which owns Premier Inn, is in the process of replacing all of the non-condensing water heaters across its Premier Inn estate.

The new water heater was installed before the existing unit reached the end of its life, contractors at Spie Heating replacing it in a six-hour window.

The water heater is designed to be low NO_x, with emissions of 39mg.kWh⁻¹ and below, meaning it is suitable for larger commercial premises in areas with stringent air-quality policies.

The diagnostic emails and alerts provided through connectivity with the BMS enables site managers to gain real-time information.



The new water heater has saved 28,658kWh of energy

During the field trial, the service engineer could check the water heater's performance at any time - including monitoring running hours, gas consumption and fault codes. Automatic fault alerts mean that any problems with hot water are now spotted by building managers rather than guests.

The new water heater is running at 98% efficiency and has made savings of 28,658kWh, which is the equivalent of more than £1,300.

Data centre moves into Nato mountain base

A Nato ammunition storage facility in Norway has been converted into a data centre by site owner Green Mountain.

The ex-military base in the mountains of Stavanger was selected because of the cold climate and the abundance of nearby hydroelectric power.

Water for cooling is extracted from a nearby fjord at a constant temperature of 8°C.

Manufacturer of mechanical pipe joining systems Victaulic, and installation contractor Sig Halvorsen, delivered the piping system, which cooled the server racks of the 22km² facility.



How to specify PDUs in data centres

Rittal's product manager for IT power distribution outlines his principles for selecting power distribution units

Energy efficiency in data centres can be improved by optimising internal power distribution systems via the PDU.

1 Does it do the job? Consider:

- The overall consumption required from the PDU, which is the aggregated power consumption of all IT devices connected to it, is measured in amps - for example, 3.16 or 32amps. The rating of the PDU should at least meet this aggregated figure
- The use of single- or three-phase power. This depends on the total demand of the IT devices. You may need a three-phase PDU where demand exceeds 8kW per rack
- The number of sockets. The socket type is typically determined by the device using it
- The advantages offered by intelligent PDUs, such as remote monitoring and the ability to switch off sockets remotely

2 Efficiency rating

To lower power consumption, monitor usage at the incoming supply to the PDU, to check the total power being drawn from the whole PDU. Alternatively, you can focus on an individual device's demands from a socket.

PDU electronics consume power at levels that can be significant - especially in a large data centre. This can range from 6 to 60 watts. If intelligent PDUs are installed in a 200-rack data centre, using dual PDUs in the rack, then the power consumption could be as little as 2.4kW or as much as 24kW.

The switching function allows users to shutdown individual sockets remotely and 'hard boot' any device connected to it. It is worth investigating what type of switch device (or relay) the PDU uses - monostable or bi-stable.

Monostable needs a permanent supply of power to change state and stay there; bringing it back means removing the power. Bi-stable needs to be pulsed with electricity to change state and pulsed again to come back, so it uses less power than monostable.

3 Reliability

Bi-stable relays have a higher mean time between failure (MTBF) than the lower-cost monostable option - in excess of 80,000 hours. Most PDUs operate at the back of the rack where ambient temperatures can exceed 40°C. Metering enables users to check how close the system is getting to tripping circuit breakers as loads become too high.

4 Ease of integration

Larger PDUs should not extend into the 19in space to avoid conflicting with 19in mountable equipment. You can mount PDU positions to sit in parallel with the 19in angles and this should be possible even in 600-wide racks if the PDU profile is slim. Most intelligent PDUs use SNMP protocol to communicate, so simple integration into a DCIM or NMS is easily achieved.

5 Life expectancy

Users should provide additional sockets within the PDU and ensure there is spare capacity. Modular PDUs allow for additional sockets.

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Improvement measures

The refurbishment of school buildings offers an excellent opportunity to improve the efficiency of hot-water and space-heating provision, says Baxi Heating's Tom Murray

For many schools with old or inefficient plant for space heating and hot water, retrofit is one of the most cost-effective ways of eliminating energy waste.

In a traditional heating system, condensing boilers will often be specified to deliver well-regulated space heating and a reliable supply of hot water. However, a boiler coupled with a calorifier may not be the most appropriate option in buildings with a high demand for hot water. Sizing boilers to meet peak demand in the colder months could lead to oversizing during the months when space heating is not required. Aside from energy waste, this can also affect the efficiency of the boiler because of short cycling, low firing rates or an inability to operate in full condensing mode.

Separating hot-water and space-heating generation, with dedicated plant for each, allows the equipment to be sized more accurately.

As a water heater heats from a low mains temperature, enabling high levels of condensing to be achieved, this also maximises the overall efficiency savings.

A case in point is Archbishop Ilsley School, a large secondary school and sixth-form college in Acocks Green, Birmingham, dating from the 1950s. The sports hall, gymnasium, swimming pool, changing rooms and shower facilities were served by old, non-condensing boilers and an ageing hot-water cylinder. After an accurate assessment of the space-heating demand at the school, it was decided to install boilers on a cascade system, which met the requirement for higher efficiencies, maximum turndown ratio, in-built redundancy, and ease of maintenance.

A correct understanding of the hot-water demand is also critical, because undersizing the water heater could lead to an inadequate supply that fails to satisfy demand. Oversizing the unit

may result in excess financial costs – both in terms of the upfront investment in the cylinder and the higher longer-term operating costs because too much hot water is being heated.

At the school, an Andrews Water Heaters ECOflo fully condensing, direct-fired water heater – with a storage capacity of 380 litres, an output of 79.1kW and a recovery rate of 1,400L·hr⁻¹ – satisfies the demand for hot water at the school's sports centre. It also has a low-NO_x pre-mix power burner and a gross efficiency of up to 98%, to keep running costs to a minimum.

Good manufacturers offer sizing-calculation tools. An additional 2% heat-efficiency credit is given when using a sizing tool to assess the expected performance of water heaters for compliance with Approved Document L.

TOM MURRAY is specification manager for Baxi Heating

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Chris Goggin



Hydrogen ready?

Rinnai UK is trialling combustion from hydrogen for its commercial continuous-flow water heaters. Liza Young speaks to the firm's operations director about the challenges

To assist the energy trilemma of security, sustainability and affordability, Rinnai UK has been trialling combustion controls with hydrogen for its water heaters. We speak to Chris Goggin, operations director at Rinnai, about the opportunities and challenges of hydrogen appliances.

How are the trials going, and what is involved?

We have been trialling water heaters and hydrogen for the past three years in different guises, from the full development spectrum. When you put a new product into research and development (R&D), you have to go through a stage-gate process, which should include feasibility, testing and modelling, through to combustion testing and manufacturing. We are at the stage of having manufacturing capability.

One of the other things we are preparing for is advanced controls, which have the potential to communicate with other Internet of Things-enabled devices and, potentially, smart meters and grids. If a smart grid is running at 50% hydrogen, for example, then appliances of the future will have to be intelligent enough to know what combustion setting is required – and that is something we're working on.

Organisations are coming out with a boiler that can run off hydrogen, but the challenges are widespread; what percentage is the hydrogen? Will we have to change controls for different gas blends – and can we talk to the grid? Rinnai is considering this not only from a combustion and control perspective, but also from a digital and telemetry perspective, which is intriguing and challenging.

We're at a stage where we can produce controls that can combust on 100% hydrogen – we are testing within facilities around the world on different blends of gas. We'll be able to share information with bodies such as [risk management and quality assurance body] DNV GL, which is working on the hydrogen specification for the UK. This is where our advanced capability and facilities can be deployed to the wider hydrogen debate.

What is your biggest challenge in converting to hydrogen?

What the government is going to do, and whether the industry is prepared for it. Are we going to have a 5% hydrogen and natural gas mix, a 20% mix, or 100% hydrogen straight away? That's one of the arguments that's going to rage between industry and the government over the coming years – what is practical?

The biggest challenge for us has been specification of the gas. If we are changing the specification from natural gas to hydrogen, that's going to change the combustion control. So the challenge for us is having a sound industry energy-decarbonisation

pathway based around hydrogen. Once we have this, it will make the technological challenge a lot more straightforward.

I feel that there is a big industry debate pending, whereby there will be an argument around the specification of the gas. Do manufacturers develop appliances that burn on methane and a per cent of hydrogen and then, later, convert to 100% hydrogen, or do they wait until a hydrogen grid is running?

Having a mix is a scenario that is heavily publicised. But this causes problems, potentially, for industry – water heaters and boilers, anything that combusts off gas – because you have to prepare your appliance for a different mixture, creating additional remedial works. And that mixture isn't the end goal, it's only one step towards that end goal of 100% hydrogen.

Manufacturers need a clear decarbonisation pathway towards 100% hydrogen. Without that, it's a real challenge.

What do you need to do to convert water heaters?

If we have the right combustion control – a specific range of gas – then, potentially, we would simply have to change the digital element. This is the brain of the appliance that sets the gas injection and air mix to be relevant to that combustion specification. If we know the specification of the gas, the process of preparing appliances for it becomes a lot more straightforward.

Have you got solar/electric heaters?

Electrification is an important energy mix for the UK, particularly around London, where there are high-rises – so we could well see the introduction of electrical appliances from Rinnai in the future. The Rinnai appliance is a good product to use with boosted hot water. If you were to take solar energy into a thermal store, the unit can modulate its burner and apply the right amount of gas to bring that water up to temperature, therefore applying only the required fossil fuel for boosting the water temperature which harnesses renewable gains. From a technical perspective, the appliance delivers its best performance, from an energy perspective, in a pre-heated renewables environment.

What else is Rinnai working on?

This year, we launched a stainless-steel water heater – a first for the UK market. It has a fully stainless-steel heat exchanger with a zero-governor gas control. It also has a very easy gas-orifice conversion; this would take about 10 minutes, and combust from natural gas to LPG, or anything else on the horizon – for example, hydrogen or other gases.

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New developments in lithium-ion battery technology are promising more energy efficient solutions for data centre UPS battery backups, as Phil Lattimore finds out

POWER SAVING

The energy efficiency and carbon impact of running data centres are growing issues with firms seeking to meet energy-performance targets, but ensuring their continuous operation remains a critical part of business infrastructure planning.

Unexpected outages can have a big impact on consumer experience, hit the bottom line and inflict reputational damage on organisations – as companies, such as British Airways in 2017, have found out. So the reliability and performance of uninterruptible power supplies (UPS), and the battery systems these employ, are essential for maintaining a consistent, high-quality power supply to keep servers running in the event of a mains power failure or drop in power quality ('spikes').

Saft claims that battery systems based on a proprietary lithium-ion (Li-ion) known as super lithium iron phosphate (SLFP) – offer a solution to some of the challenges facing data centres. Benefits include maximised availability, lower total cost of ownership (TCO), and safety and energy efficiency.

Switching

Until recently, valve-regulated lead-acid (VRLA) batteries were used as standard for backup UPS systems in data centres. Li-ion systems, however, have been gaining an increasing share of the UPS battery market (North America has been an early adopter); they currently account for around 15%, and this is expected to grow to 30-40% by 2025, according to Bloomberg New Energy Finance.

François Danet, global business development manager – data center at Saft, explains the main benefits of Li-ion technology over VRLA. 'It offers higher power density, which means more power within less footprint (up to three times) and lower weight (up to six times). It has a 20-year lifetime, and requires very low maintenance to replace batteries. By bringing accurate monitoring inside, the battery enables data collection for critical equipment, to implement conditional maintenance, and provides

big-data analysis for system improvement.' Danet says it offers faster charging rates, too. He claims 75 minutes with a Salt Flex'ion battery, compared with eight-12 hours for VRLA.'

Using Li-ion can also have an impact on data centre energy use and carbon emissions by reducing HVAC loads and/or system size according to Danet, who says VRLA batteries need to be maintained at stable temperatures of around 22°C to optimise performance and battery life, requiring temperature-control measures with correlated warranty Ts&Cs.

'Li-ion battery technology – and especially phosphate-based batteries – offers a higher operating-temperature capability and long lifetime,' he says. The company claims its system 'can operate full time at 30°C with full performance for up to 15 years, and at higher temperatures], so it offers data centre operators the opportunity for potential HVAC reduction and/or downsizing.

'Li-ion is much better suited to uncontrolled temperature environments,' says Danet. 'With no need for VRLA-type cooling, every 1°C operating increase correlates to a 4% energy cost reduction from the HVAC. This will have a corresponding impact on reducing carbon emissions in areas of the building where backup batteries are deployed,' he adds.

Standards

Li-ion battery technologies have different battery chemistries that combine diverse characteristics of energy density, power density, calendar life, cycle life, and safety, suitable for different types of application. For its Flex'ion system, Saft concluded that its SLFP was the optimum solution for data centres. The system is fully certified by the International Electrotechnical Commission, UL and UN to meet the high safety standards for UPS data requirements.

The system has self-powered monitoring and can interface with a data centre's building management system, such as connecting to smart UPS communication systems to enable monitoring of the battery's performance. As a modular system, it can be scaled up for voltage (from 87V up to 750V), power (10kW to 2.3MW) and energy (1kWh to 500kWh), and optimised for each application. Components can be integrated with standard racks and are hot swappable at rack level.

The higher power density of Li-ion batteries offers another cost benefit, as less building space and associated infrastructure is required to accommodate them, claims Danet. The capital cost of the system is higher than a VRLA alternative, but Danet says whole-life TCO – including initial purchase and installation costs, plus operating, maintenance, end-of-life, recycling and replacement costs – should be part of the equation. **CJ**

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The application of non-mechanical arrangements to prevent backflow in wholesome water systems

This module considers what causes backflow and how non-mechanical means can be used to prevent it

When considering the supply of wholesome water, the term ‘backflow’ is used to describe a ‘flow upstream, that is in a direction contrary to the intended normal direction of flow, within or from a water fitting’, as defined by section 2 of the England and Wales Water Supply (Water Fittings) Regulations 1999. The prevention of backflow is to protect the consumer and the wider water supply from contaminated fluids entering the water distribution network.

This CPD will consider what causes backflow and the circumstances where non-mechanical means may be used to prevent such backflow.

For backflow to occur, there needs to be a cross-connection and a pressure difference between wholesome water (formerly typically known as ‘potable water’), and potentially contaminated water. This connection may be direct or indirect.

Direct connections are where a pipe (or device) is connected directly to another pipe, or a ‘receptacle’ – for example, a cistern, vessel, fitting or appliance⁵ – and so provides a clear route for potential contamination. A commonly seen example is where flexible filling loops, used to fill heating systems, are inadvertently left connected to the main service water pipe after completion of commissioning.

Indirect, or submerged, connections are where the supply point – such as tap or hose outlet – is inappropriately immersed in water. A hose outlet that is left to rest submerged in water is a common case – as might be seen, for example, in a sink or bucket in a wash-up area; a flexible shower head in a bath or toilet; or a garden hose in a filled bucket, drain or paddling pool. In the recent flooding in the UK, there were many wholesome water outlets that, although not normally a backflow risk, would have become submerged, providing opportunity for backflow that added to the miseries of the unfortunate building occupiers and water service providers.

Providing there is a cross-connection, water will flow from a point of high pressure to that of lower pressure. In normal operation, the water outlet, or supply point, would be at a higher pressure than the point of delivery. For a tap outlet, the point of delivery would typically be at atmospheric pressure. In the UK, the

statutory¹ service standard of mains water pressure to consumers is 0.7bar (70kPa), although it is commonly higher than this. So, any inadvertent cross-connection from a consumer-side water service that is operating at a pressure higher than 0.7bar could cause backflow. This equates to a water head of about 7m – so if, say, the consumer system included a connected water tank (cistern) higher than 7m above the water-service pipe (or the consumer’s system was pressurised above 0.7bar), there would be opportunity for backflow to the mains supply because of the back pressure.

The mains water pressure may drop significantly below 0.7bar if there is a break in the water main, a failure in pumping, or an unusually large demand on the system – for example, when a fire hydrant or an inappropriately connected irrigation system is in use. As the pressure in the mains supply drops below that of the consumer system, the opportunity for back siphonage of water from the consumer side into the mains water service will increase. After a break to the mains supply, or maintenance, the water supply authority would ensure that the restored water supply is wholesome. >>

» However, where the pressure reduction in the mains supply is caused by transient excessive demand, this can potentially cause undetected backflow and so contaminate the water supply. Recorded incidents of backflow^{2,3} indicate that it occurs mainly as a result of cross-connections that contravene the water byelaws or have been inappropriately operated/installed. However, hoses that are left with the outlet submerged, and ‘temporary’ connections that are inappropriately left in place, were also identified as causes of backflow due to back siphonage. To reduce the risks from hoses, it has been illegal since 1999 for commercial organisations to connect a hosepipe directly to a tap to wash down machinery or a vehicle – this requires appropriate backflow protection.

Pressure fluctuations and backflow may occur within the confines of the pipework in a building that – particularly where the piping layout is not properly installed, or where there is a fault – can cause contamination of the supply to outlets within that building. A particularly obvious manifestation is where taps have been seen to pass blue water – caused by a malfunctioning toilet-cistern float valve on an upper floor – that, when the pressure drops in the pipework system, ‘back siphons’ water, stained blue with a toilet disinfectant block, from the cistern into the supply pipework.

Preventing backflow

There are a number of publications that provide guidance on the recommendations and standards to avoid backflow, including the specific backflow prevention standard BS EN 1717:2000⁴; and the local/regional water regulations such as, in the UK, the Water Supply Regulations, 1999⁵ and Part G⁶ of the Building Regulations. The Water Regulations Advisory Scheme (WRAS – see www.wras.co.uk) produces excellent documentation that incorporates current guidance and the relevant UK information from the other publications – the *Water Regulations Guide*⁷ being one of its most comprehensive, as well as being superbly illustrated.

These documents provide details of the type of protection method – if any – required to prevent backflow contamination of wholesome water related to the potential hazard to human health, broken into five categories of flowing liquids. The higher the potential danger, the higher the category number. The need for protection, or type of protection device required, is determined by the liquid’s category number, as shown in Table 1. Category 1

Category 1	Wholesome water supplied by the undertaker and complying with the requirements made under the current water regulations.
Category 2	Water in fluid category 1, the aesthetic quality of which is impaired because of a change in its temperature, or the presence of substances or organisms causing a change in its taste, odour or appearance, including water in hot-water distribution systems.
Category 3	Fluid that represents a slight health hazard because of the concentration of substances of low toxicity, including any fluid that contains ethylene glycol, copper sulphate solution or similar chemical additives, or sodium hypochlorite (chlorox and common disinfectants).
Category 4	Fluid that represents a significant health hazard because of the concentration of toxic substances, including any fluid that contains chemical, carcinogenic substances or pesticides (including insecticides and herbicides), or environmental organisms of potential health significance.
Category 5	Fluid that represents a serious health hazard because of the concentration of pathogenic organisms, radioactive or very toxic substances, including any fluid that contains: faecal material or other human waste; butchery or other animal waste; or pathogens from any other source.

Table 1: Categories applied to assess backflow risk

represents drinking-quality water, while fluid category 5 is the most contaminated. The categories take account of the context of the particular application. So, for example, in private domestic dwellings, dishwashers and washing machines are rated as fluid category 3, but in commercial premises, the higher backflow risk is rated as fluid category 4 – and, if healthcare is provided in the premises, as fluid category 5. The backflow prevention specification then equates each fluid category to a range of suitable backflow-prevention methods for both back pressure and back siphonage. However, it is noted that in cases where insignificant concentrations, or substantial amounts, of substances are present in the fluids, it may be appropriate to redefine the backflow safety regime.

The arrangement that is deemed most appropriate in meeting standards will depend on the application and the requirements of the local regulations. Where an appliance is used, care needs to be taken to identify the backflow-protection requirements, and to ensure that the appliance has the appropriate protection incorporated within the machine, or has appropriate backflow protection installed upstream of the appliance. (Particular care should be exercised when using an appliance marketed as a domestic appliance in a more demanding commercial application.) Prevention measures include mechanical devices that are typically inline valve arrangements designed to prevent flow reversal and ensure that there are no sub-atmospheric pressures (‘anti-vacuum’) in the supply pipes. (These are not being discussed in this article – see *WRAS Water Regulations Guide*.)

The most fundamental mechanism to prevent backflow is the ‘air gap’, known as a ‘non-mechanical backflow prevention arrangement’. An air gap provides a physical separation between the supply end of a water-supply pipe and the receiving receptacle, and, if properly installed and maintained, is effective at preventing backflow. The air gap is measured vertically (to within 15°) from the lowest end of the supply outlet to the spillover level (see Figure 1) or highest

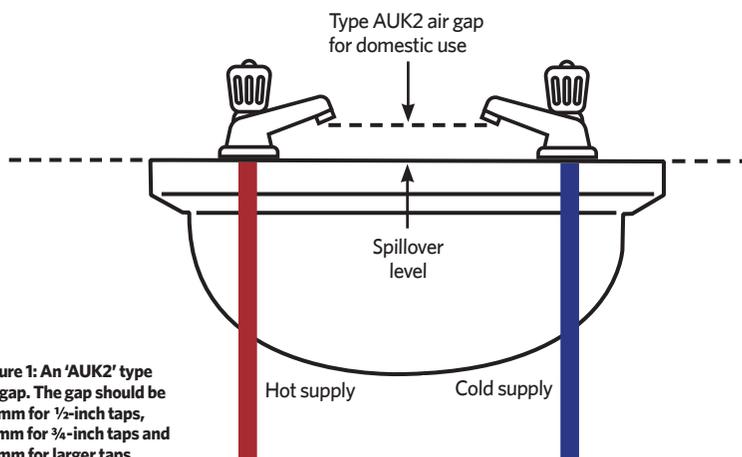


Figure 1: An ‘AUK2’ type air gap. The gap should be 20mm for ½-inch taps, 25mm for ¾-inch taps and 70mm for larger taps

possible water level of the receptacle into which it discharges. The separation provided by the air gap must be twice the supply-pipe inside diameter, and never less than 20mm. Although this non-mechanical arrangement provides a robust defence, it can be compromised – for example, with funnels or hoses – and the incoming water may be exposed to airborne contaminants. The air gap is shown, in its most common application, in Figure 1. This particular air gap is designated as ‘AUK2’ – ‘A’ for air and ‘UK2’ for the specific sub-type. This is suitable for protection against category 3 fluid back siphonage, and is not applicable to back pressure.

AUK3 is similar, but relates to higher-risk taps (such as in laboratories) for back siphonage = 5. AUK1 is the arrangement to provide an appropriate gap when a toilet cistern is used in series with a storage tank (back pressure = 3, back siphonage = 5). There are six other air-gap designations, AA to AG. Those illustrated in Table 2 are probably the most common types used in UK building applications.

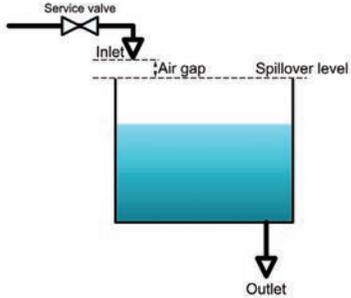
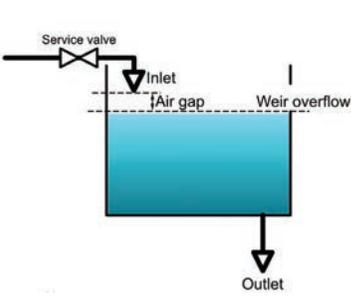
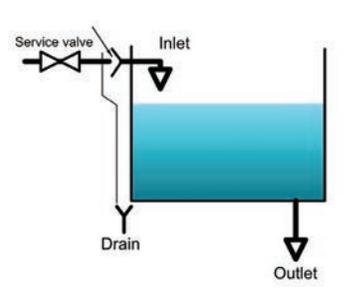
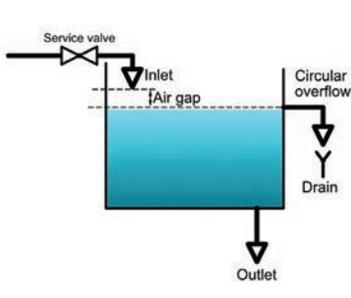
<p>AA back pressure = 5 back siphonage = 5</p>		<p>Air gap with unrestricted discharge. This could be a cistern without a lid, where water spills over when full – an overflow system would probably also be fitted below the top of the tank to prevent spillage in normal operation.</p>
<p>AB back pressure = 5 back siphonage = 5</p>		<p>Air gap with weir overflow. This typically includes a lid to maintain the water quality, and an insect/dust screen on the rectangular weir where water spills when full.</p>
<p>AD back pressure = 5 back siphonage = 5</p>		<p>Air gap with injector. This arrangement uses a nozzle to provide a jet across an air gap to offer protection from extreme fluids, such as those that might include bacteriological hazards.</p>
<p>AF back pressure = 4 back siphonage = 4</p>		<p>Air gap with circular overflow. A traditional arrangement common to many buildings.</p>

Table 2: Schematics of common non-mechanical backflow arrangements. Real applications would include a control mechanism to meter the incoming water, vents, overflow arrangements and insulation, and (possibly aside from AA) would typically include a lid



Figure 2: Example of a break tank with an AB air gap that can be used, for example, for refurbishment applications, as the smaller sizes in the range are made so that they fit through doors. The submerged pumps are almost silent in use; the integrated inverter control and pressure vessel is on top (Source: Dutypoint)

As any break-tank arrangements will lose any benefit from the mains supply water pressure for subsequent distribution (as the water will be at atmospheric pressure) systems are available to provide both backflow protection and pressurisation. So, for example, the 575-litre cistern in Figure 2 meets the requirements of the water supply regulations by incorporating an ‘AB’ air gap, and could be applied to serve commercial facilities to supply wash-down hoses. For simpler pressurisation applications – with no need for extensive storage and modulated flow – lower-cost systems, such as the 100-litre break tank and end suction booster pump illustrated in Figure 3, may be more appropriate, still maintaining an AB air gap.

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■ Turn to page 60 for references. >>



Figure 3: An example of a break tank and end suction booster pump set, featuring an electronic pressure controller and a type AB air gap that meet the requirements to prevent a category 5 backflow (Source: Dutypoint)

Module 160

April 2020

» **1. In the UK, what is the statutory service standard of mains water pressure to consumers?**

- A 0.1bar
- B 0.3bar
- C 0.5bar
- D 0.7bar
- E 0.9bar

2. Since what year has it been illegal for commercial organisations to connect a hosepipe directly to a tap to wash down machinery or a vehicle?

- A 1979
- B 1989
- C 1999
- D 2009
- E 2019

3. What category is water likely to be if it is taken from a wholesome water distribution system and has a modest change in colour?

- A Category 1
- B Category 2
- C Category 3
- D Category 4
- E Category 5

4. What minimum air gap would be suitable for a 3/4-inch tap above a kitchen sink?

- A Any gap that is above the spillover level
- B 15mm above the spillover level
- C 20mm above the spillover level
- D 25mm above the spillover level
- E 30mm above the spillover level

5. What type of air gap is typical of that used in a storage cistern with a circular overflow, as used in many historic UK systems?

- A AUK3
- B AA
- C AB
- D AD
- E AF

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References:

- 1 *The guaranteed standards scheme (GSS): summary of standards and conditions*, OfWat 2017.
- 2 Curtis, C, *Cross-connections and backflow prevention manual*, West Virginia Bureau for Public Health Office of Environmental Health Services, 2011.
- 3 *A study of backflow events in England, Wales and Scotland*, UK Department of the Environment, 1993.
- 4 BS EN 1717:2000 *Protection against pollution of potable water in water installations and general requirements of devices to prevent pollution by backflow*.
- 5 The Water Supply (Water Fittings) Regulations 1999.
- 6 *Approved Document G - Sanitation, hot water safety and water efficiency (2015 edition, with 2016 amendments)*.
- 7 *Water Regulations Guide*, 2nd Edition, WRAS, 2000.

PRODUCTS & SERVICES



Grundfos is creating the right oval-tures

BT Murrayfield Stadium, in the heart of Edinburgh and with the largest capacity in Scotland, is not just home to the Scottish Rugby Union, but also regularly hosts an array of other sporting and musical events.

Maintaining a high-profile, 67,114-seater stadium at its operational peak involves a team of dedicated experts with a wide range of knowledge and expertise. So when the M&E system underwent a review and upgrade recently, Grundfos Pumps worked with consultants RSP and installer Livingston Mechanical to deliver the best solution possible.

With a focus on energy saving, Grundfos TPE vertical in-line pumps were chosen. Supported by Grundfos pressurisation sets, these precision-engineered pumps are an energy-efficient solution for heating and cooling in commercial applications such as this.

The circulators bring an additional dimension to in-line pumping, via a plethora of improvements, including their in-built intelligence that simplifies installation and makes self-optimising operation a reality – meaning they can deliver increased system performance.

■ Visit www.grundfos.co.uk

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Rinnai, maker of units delivering limitless, on-demand supplies of hot water, are offering people an easy-to-choose facility via an online interface.

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■ Visit www.rinnaiuk.com



Hamworthy reshuffles London sales team >

Hamworthy Heating's newest recruit to its sales team, Vincent Ng, will cover central London, an area previously overseen by Gary Banham, who has been promoted to senior area sales manager. Hamworthy's specification manager for London, Paul Fox, retired last year, leading to a reshuffle of area responsibilities in the capital.

Ng has experience in specification and sales in the heating and construction industry. With expertise in heating controls, he will support Hamworthy's strategy to underline the importance of setting up boiler controls correctly to save energy.

■ Call 01202 662500, email sales@hamworthy-heating.com or visit www.hamworthy-heating.com



Thorn's Omega Pro 2 – a new approach to lighting control

The new Omega Pro 2 from Thorn Lighting offers a new approach to lighting control as it enables you to afford the functionality required for your project today or delay the expenditure of the materials until a later date and easily integrate your lighting control when you are ready.

Omega Pro 2, combined with the O-PEC optical range, provides consistency to any lighting installation as the one product family offers a variety of options that will allow for a creative lighting design.

■ Call 01388 420042, email uk.quotations@zumtobelgroup.com or visit www.thornlighting.co.uk



Myson's new strategy promises 'comfort delivered'

Myson has introduced a new, strong brand position aligned with meeting customer needs and tackling global challenges of changing climates, scarcer resources and growing populations. The strategy is based on delivering more sustainable and integrated heating solutions. Myson's promise to the market is 'comfort delivered', and it offers a range of products and solutions, using four focus areas to drive change:

- Improve efficiency by optimising the energy efficiency of solutions
- Better integration of solutions into innovative systems to boost performance
- Work smarter by supporting planners, wholesalers and installers with benefits to make every day easier, increase work efficiency and deliver better solutions
- Reduce footprint by limiting the use of resources, such as energy and water, and decreasing the impact of production processes on the planet.

Myson has the experience and capabilities to create sustainable indoor climate comfort for new commercial properties, private homes and renovation projects. Its strategy aims to help increase energy efficiency in buildings large and small.

■ Call 0845 402 34 34 or visit www.myson.co.uk

Bosch Commercial and Industrial employee takes the reins at the Combustion Engineering Association

Bosch Commercial and Industrial's contract manager for industrial boilers, Matthew Walton, is the new chairman of the Combustion Engineering Association (CEA), an educational charity that aims to improve understanding and development of the combustion industry.

Walton, who will serve a three-year term in the post, said: 'It is an absolute privilege to be selected as chairman of the Combustion Engineering Association. The reputation of the group goes back more than 80 years, promoting the science and best practice of industrial boiler combustion engineering. I'm excited to be part of that heritage.'

■ Visit www.bosch-industrial.co.uk or follow @BoschHeating_UK on Twitter



Fruit picks Fujitsu for club upgrade



Clubbers in Hull are being kept comfortable by an efficient, flexible variable refrigerant flow (VRF) air conditioning system from Fujitsu.

Original plans for the Fruit nightclub, in the Fruit Market and Humber Street area, centred on a heating-only proposal using gas boilers, but it was decided to install a modular Airstage V-III heat-pump solution. The system provides cooling, heating and ventilation through the air handling unit (AHU), with mixed return and fresh air.

Fujitsu equipment was chosen because of its simple integration with the third-party AHU and touchscreen control system, and its ability to use VRF condenser units on an AHU rated down to -5°C ambient conditions and 3°C air on coil. The AHU ventilation rate

is CO₂- and temperature-regulated, so with fewer people in the club, fresh air introduction is reduced and the AHU operates more air recirculation. The rooftop Fujitsu Airstage V-III heat pump, twinned with four Fujitsu DX EEV kits for AHU integration, can raise the temperature from -5°C in winter to 16°C, and provide cooling without pumping large quantities of cold air into the building when fully occupied.

■ Visit www.fujitsu-general.com/uk

AET's innovative underfloor air conditioning used in award-winning renovation of listed London landmark



An innovative underfloor air conditioning system has allowed key period features to be preserved in the renovation of Grade II-listed building 24 St James's Square. British company AET Flexible Space provided an underfloor air conditioning system that fits into the existing space beneath a raised-access floor.

One of the main challenges was to simultaneously preserve key architectural features while providing flexible, modern, premium office space that would suit the requirements of incoming tenants.

AET's pioneering UfAC CAM-V system was suited to this complex project because it eliminates the need for ceiling-based services and associated duct and pipework, while maximising floor-to-ceiling heights. The UfAC solution is designed to create minimal draughts and allow for individual control of temperature and fan speeds, creating comfortable and adaptable working environments.

The 24 St James's Square project has already won the Best Office Architecture London award at the 2019 International Property Awards, and the space is currently being let as Grade A office space by BNP Paribas Real Estate.

■ Visit www.flexiblespace.com



Draka welcomes NG Bailey as a technology partner

Draka - a brand of power and telecommunications cables and systems company Prysmian Group - has recognised NG Bailey's IT Services business as a Technology Partner. The partnership will strengthen the firms' collaboration on product application and development.

NG Bailey is already a Draka UC Connect Installation Partner, and is authorised to sell and install the Draka UC Connect structured wiring solution. The latest announcement was made during a visit by NG Bailey IT Services' managing director, Kelly Tedesco (above, with Llyr Roberts, Global VP of Draka Multi Media Solutions), to Prysmian's Bishopstoke manufacturing facility.

■ Visit www.prysmiangroup.com



New Condair sales manager

Humidity control and evaporative cooling specialist Condair has appointed Paul Kipp as area sales manager covering the north of England and Scotland. Kipp will take on responsibility for expanding sales of humidifiers and dehumidifiers across the region.

Kipp said: 'It's a great pleasure to join this global leader in humidity control. Condair has the most comprehensive range of technologies across both humidifiers and dehumidifiers available in the UK.'

Kipp joins Condair with many years' experience in the UK HVAC sector, having previously worked for Carel, Systemair, Daikin, Fläkt Woods and Fujitsu.

■ Visit www.condair.co.uk



^ **ATAG commercial unveils new range of high-efficiency boilers**

Boilers in ATAG Commercial's new QR Series boast a stainless steel heat exchanger, a new burner control unit with LCD display, built-in pump, and an integrated zone-management system for up to three central heating zones. They replace the existing Q Series range, and each has numerous flue options suitable for a wide range of applications. There are four models of system boiler in the new range, offering outputs of between 4.4kW and 60kW, and three combi boilers, with outputs of 6.1kW to 51kW. The non-return valve is now built in to every unit as standard.

■ Visit www.atagcommercial.co.uk

v **Daikin launches first R-32 air-to-water heat pump**



The UK's first air-to-water heat pump range using R-32 refrigerant has been launched by Daikin. Its models offer heating capacities from 80kW to 670kW and complete the Daikin 'Bluevolution' range of products - all of which are available with R-32 refrigerant in cooling-only and free-cooling modes.

Daikin Applied was the first company in the world to introduce R-32 into split air conditioners in 2012. The new Daikin R-32 heat pump series will be available in

two efficiency versions (Silver and Gold), which can be combined with three acoustic configurations (Standard, Low and Reduced), providing full customisation to meet project-specific requirements.

A key focus for the designers of the Bluevolution heat pump units was reducing running costs by achieving a coefficient of performance (COP) of up to 3.5 at nominal conditions, plus a seasonal energy efficiency rating (SEER) of up to 4.7 in cooling mode and 3.9 for heating.

■ Visit www.daikinapplied.uk

Kohler Power celebrates 100 years at the forefront of power protection innovation v

Kohler Power, a division of Kohler Co, celebrated its centenary in power products earlier this year.

On 16 February 1920, the 'Kohler Automatic' - the first modern-day generator - was introduced at the National Tractor Show in Kansas, USA. Since its launch, Kohler Power has continually developed best-in class products and services for power generation and protection.

Kohler Co acquired Kohler Uninterruptible Power (KUP), formerly UPS Ltd, in 2008. KUP pioneered modular uninterruptible power supply (UPS) and transformerless technology, and continues to innovate with products such as the PowerWAVE 9250DPA, the world's most efficient UPS in its class.

Kohler Power supplied five generators and engines to Admiral Byrd for two of his Antarctic voyages in 1929 and 1933, providing his expeditions with their sole source of heat, light and communication. In addition, Kohler Precision Controls were used in the Apollo spacecraft and moon suit, chosen for their reliability, zero rejection rate and expedient communication.

■ Visit www.kohlerpower.com



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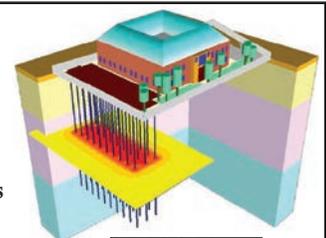
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Senior / Public Health Engineer London, £55k - £65k + bens

A high-profile design consultancy with a reputation for delivering award winning and innovative projects are looking to expand their London office with the recruitment of a Senior / Principal Public Health Design Engineer. With a very impressive portfolio of projects completed and a big order book of work they are well established as one of the top engineering companies in the UK with an expanding reach across Europe and Asia. Ref: 5866

Jun/Int Mechanical Design Engineer

London, £28k - £35k + bens

An established & growing Building Services & Sustainability Consultancy is looking to add a Junior/Intermediate Engineer to the Mechanical Building Services Design Team due to new projects & increasing repeat business from existing clients. You will join the design team, which includes BIM/REVIT. Projects are within Commercial, Residential & Mixed Use developments ranging from £10m-£200m. Full training, support and mentoring is a key part to this role. Ref: 5795

Public Health Engineer London, £42p/h

I have a requirement for a Public Health Engineer to work on a temporary contract in London. You will provide designs through to completion on a high-end mixed use development. The work is detailed design on above and below ground systems as well as fire suppression systems. This role is outside of IR35. Ref: 5737

Intermediate Electrical Engineer

London, £35k - £42k + bens

The successful candidate will possess an ability to contribute to projects collectively and offer engineering solutions beyond their own discipline; the use of the latest engineering software; internal standards; industry benchmarks; analysis tools along with working closely with internal and external teams will be the building blocks to deliver project design and information to budget and within agreed times frames. This is a cornerstone in the success and level of repeat business our client achieves with a number of signature architects. Ref: 5850

Senior Mechanical / Project Lead

London, £50k - £60k + bens

This is an opportunity to work for a global engineering consultancy who are passionate about providing solutions that improve value, reliability and efficiency. As Senior Mechanical / Project Lead you will be working on some of London's flagship projects ranging from £30 - £80 million construction value, with a specific focus on large scale mixed use projects. You will be acting as project lead on these projects, liaising directly with in house design teams and external stakeholders. Ref: 5719

Mechanical Engineer Berkshire/London, £40p/h

A multi-disciplinary consultancy has a need for a contract mechanical engineer on high-end mixed use (hotel/residential) development in London (office in Berks, site in London). Suitable engineers need to have experience using Hvacomp and Revit whilst being client facing. You will be split between the office and site, provide design, review, and comment on Contractor's working drawings. Ref: 5869

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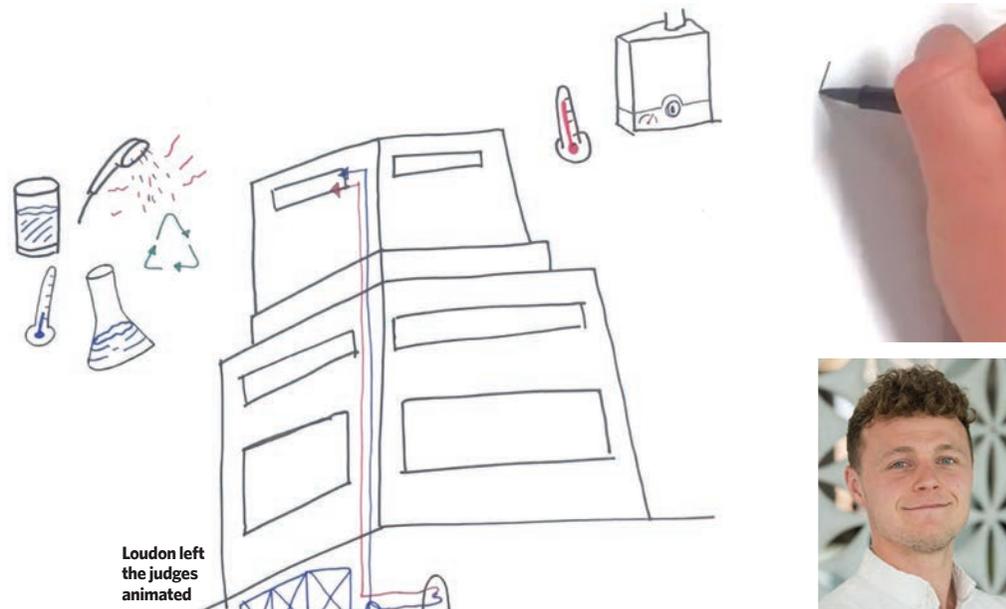
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– David Wood, Chair of the CIBSE Benevolent Fund Trust.

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Loudon left the judges animated



Keir Loudon

Hollywood star

After moving to Hoare Lea's LA office, SoPHE Young Engineer of the Year award-winner Keir Loudon explains the inspiration behind his entry

Arup's Keir Loudon was the winner of the Society of Public Health Engineers (SoPHE) Young Engineers Award 2019. The competition challenged applicants, aged 18-35, to produce a promotional video celebrating the work of public health engineers.

Loudon's entry provided an engaging insight into the problem-solving they undertake. In it, he sketches the type of work public health engineers undertake, while narrating the story.

In a timely coincidence, following his short film (see bit.ly/CJApr20KL), Loudon has now moved to Hollywood to join Arup's Los Angeles team, and hopes to develop his knowledge of American codes and engineering.

What gave you the idea for the video?

As soon as I read the brief, I knew I'd like to do something more than just be in front of the camera describing public health engineering. I wanted to find a way to communicate a lot of information and ideas in a short space of time in a way that was a bit different. YouTube has some great examples of creators finding new and interesting ways to portray content and I'm sure I picked up some inspiration there.

Your sketches are great. Did you enjoy drawing when you were young?

I've liked sketching and visual media as long as I can remember. I drew a lot when I was younger; my sister is an incredible graphic designer, so she was always there to point me in the right direction. One of the first artists she showed me that had a lasting impression was Bridget Riley; I find it fascinating how mathematic and technical the process behind her work is, especially given its 50-year chronology. I ultimately went down the engineering route, but still sketch ideas every day. Regardless of the discipline, it's the most effective way of communicating your ideas.

I'd never made anything like the video for the competition, but I really enjoyed the process, and the positive feedback from people has been great. I'd love to do something similar again, I think it could work well as a learning tool for specific aspects of engineering, for graduates or engineers who just need a refresher.

Do you think young people prefer communicating through video and audio?

There has been a massive growth in YouTube and podcasts in the past five to 10

years, particularly among younger people. I think this is partly because of the ease and accessibility of the platforms and because people are eager to share their ideas in a format over which they have control.

You enjoyed water engineering when you were young. What whetted your appetite? What's been your favourite project?

I did civil engineering at the University of Sheffield and in the latter half of the course, the focus began to shift to water, including hydrodynamic 3D models, as well as case studies of sustainable urban drainage systems. I really enjoyed the combination of technical water design with sustainability as a key driver. One project that I remember reading about in a lot of detail at the time was the London 2012 Olympic Park. It incorporated many sustainable drainage techniques within the constraints of a brownfield site, and has become a legacy project.

What do you do when you're not promoting the industry through brilliant sketches?

Once I graduated, I began working for Arup as a public health engineer in London, where I worked on an array of diverse projects all over the world. I continued to develop my interest in sustainable water design, but also in building engineering as a whole. I've been lucky enough to work on some incredible projects, both visually and technically.

My past two projects have been London-based museums that have had complex fire suppression requirements, one of which was high-hazard storage. This has been an invaluable learning experience for me, and I've loved developing that aspect of my engineering work.

Where do you see yourself in 10 years' time?

I recently transferred to Arup's Los Angeles office on a two-year, long-term assignment to develop my knowledge of American codes and engineering, so that's my immediate focus.

Longer term, I would like to continue to work on, develop and drive sustainable design. With climate targets justifiably becoming more ambitious, more innovative engineering solutions must be realised, and we in the construction industry can make a lasting positive impact.

■ **KIER LOUDON** is a public health engineer at Arup

EVENTS

Event details are correct at the time of going to print but, please note, as a result of the ongoing coronavirus (Covid-19) situation, they may be subject to change. For updates please check cibse.org/training for training and cibse.org/events for CIBSE groups and regional events. CIBSE has a range of online learning courses available to support your learning. visit cibse.org/training-events/online-learning

CIBSE ASHRAE TECHNICAL SYMPOSIUM

The symposium has been postponed to 14-15 September as a result of the ongoing coronavirus (Covid-19) situation. Presentations, at University of Strathclyde, Glasgow, will include case studies, opinion and research papers, and poster presentations. Visit cibse.org/symposium

NATIONAL EVENTS AND CONFERENCES

SLL LightBytes series 2019-2020 People, Space, Time, Place 4 June, London

The series focuses on light and wellness, with presentations divided into four overarching sessions: People, Space, Time, Place. With guest speaker Dr Eleanora Brembilla, Research Associate in advanced building daylight modelling at Loughborough University. www.cibse.org/sll

CIBSE TRAINING

For details, visit www.cibse.org/training or call 020 8772 3640

Energy efficiency building regulations: Part L2 2020 1 May, London

Energy surveys 1 May, London

Successful design management 4 May, London

Building services explained 5-7 May, London

Low carbon consultant building operations 5-7 May, London

Mechanical services explained 5-7 May, Manchester

Design of ductwork systems 11 May, London

Practical controls for HVAC 12 May, London

Energy saving opportunity scheme (ESOS) 13 May, London

Low carbon consultant design training 13-14 May, Birmingham

Electrical services explained 13-15 May, London

Electrical distribution design 15 May, London

Air conditioning inspection for buildings 19 May, London

Understanding smoke control 20 May, London

Effective management of operational risk in buildings 21 May, Manchester

Low carbon buildings and infrastructure 26 May, London

CIBSE GROUPS, SOCIETIES AND REGIONS

For more information about these events, visit: www.cibse.org/events

Yorkshire: Membership briefing 5 May, Leeds

Session focusing on the routes to CIBSE Associate and Member grades and registration with the Engineering Council.

CIBSE Membership application workshop 19 May, London

Workshop designed to help you start the Engineering Practice Report for Associate and Member applications, with experienced CIBSE interviewers.

SLL: AGM, Awards and Presidential Address 21 May, London

AGM followed by annual SLL awards, and incoming SLL president Bob Bohannon's Presidential Address.

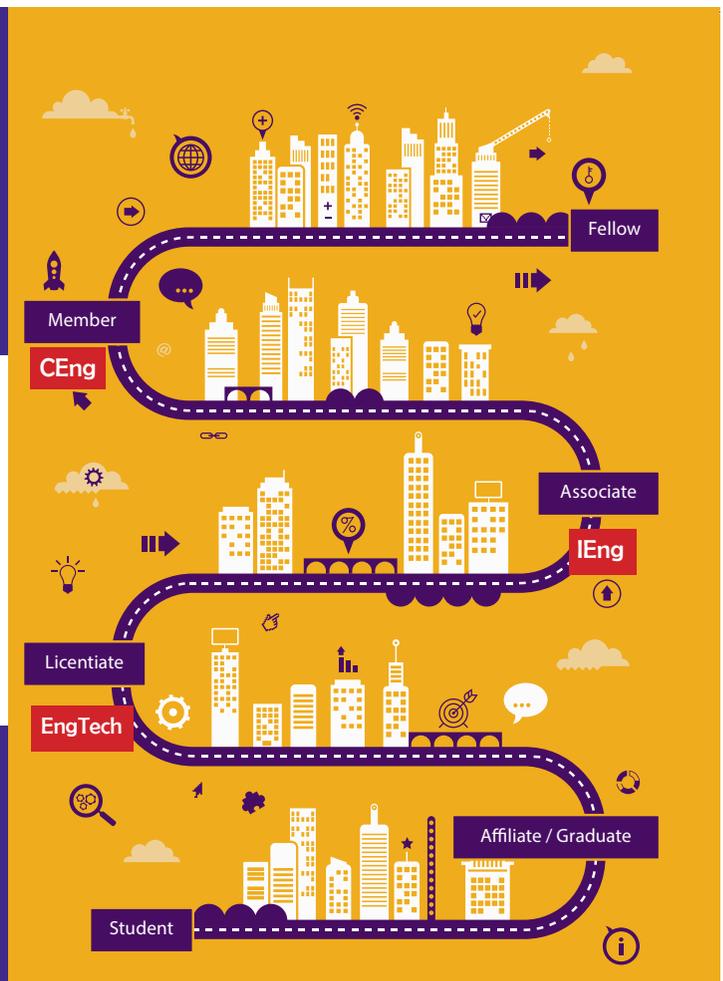
MEMBERSHIP WEBINARS

Planning to apply for our Licentiate, Associate or Member grades with professional registration?

Register for an upcoming webinar with a live Q&A, or listen to our webinar recordings for advice on writing your membership application.



Register for free now:
cibse.org/webinars





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 have more impact. The Nominations Panel is looking for a diverse range of candidates from across our community.

Find our more, nominate & check eligibility
[cibse.org/nominations](https://www.cibse.org/nominations)

Timeline:

1 June – Nomination forms due

August – Nominations Panel review

September – Recommendations to the Board

October – Feedback to nominees

May 2021 – Elected candidates take office

Forms must be submitted to jwigglesworth@cibse.org by **Tuesday 1 June**

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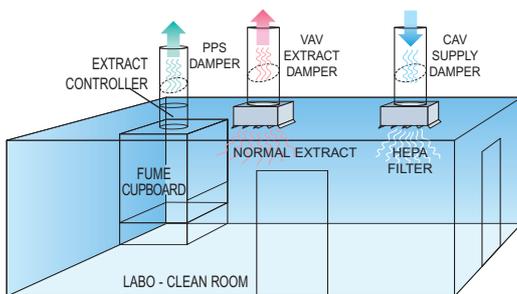


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