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A time to reflect

The 125th anniversary of CIBSE and its predecessor, the Institution of Heating and Ventilating Engineers, is a cause for celebration, but it should also be a time to reflect on how the building services engineering industry can best meet the future challenges of society.

We know we can no longer rely on fossil fuels to power and heat our buildings, and the skills that engineers developed to optimise gas and oil fired appliances are becoming obsolete.

We must put our energy into revising our skill sets to prepare for the decarbonisation of buildings. We must also attract a new generation of engineers who have the talent and enthusiasm to achieve our goals.

As part of his Presidential year, Kevin Mitchell is calling on CIBSE members to inspire new engineers by passing on their knowledge. On page 32, we hear from leading engineers about the building services icons who helped develop their careers.

Buildings must now be resilient to the effects of climate change, and this was a key issue identified by engineers at Buro Happold when we asked them to predict the trends in building services engineering (page 28). As the CIBSE Building Performance Consultancy of the Year (over 300 employees) for the past five years, they are proven experts in the field.

Fergus Anderson says a resilient building is one that is net positive energy, net zero water and future proofed against issues of resource scarcity. The issue of embodied carbon is rapidly emerging in our sector and was the subject of Will Arnold s keynote speech at the Technical Symposium (page 18). Buro Happold says clients are already preparing for their buildings to be absolute zero carbon, which means designers have to start thinking about the costs of embodied carbon in materials today.

While we may have been more profligate with material use in Victorian times, some things that happened in 1897 have a strong resonance today. It was, after all, the year of Queen Victoria s Diamond Jubilee and, this month, Queen Elizabeth II celebrates 70 years on the throne. The current monarch has given her name to the new Elizabeth Line, which happens to come 125 years after the completion of another monumental London transport link the Blackwall Tunnel, which, at the time, was the longest underwater tunnel in the world.

It has also been 125 years since Bram Stoker published his Gothic novel *Dracula*, the subject of which lends its name to an issue I m tackling right now namely, vampire devices, which, according to my smart meter, are sucking electricity from my power supply as I write.

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CONTRIBUTORS

Hywel Davies
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Sasha Krstanovic
Mstep founder discusses the mentors who inspired her engineering career

Julie Godefroy
Analysing building performance data from 2022's CIBSE Building Performance Awards entries

Tim Dwyer
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IN BRIEF

Octopus to build power cable to Morocco

Octopus Energy has entered into a deal to build the world s largest subsea power cable between Morocco and the UK. The supplier has formed a partnership with power project Xlinks to lay four 3,800km long cables between Morocco and Devon, which will connect with a 10GW renewable energy farm in the north African desert. The cables are designed to provide 3.6GW of green power to the UK for an average of 20 hours a day, which could give sufficient year round power for seven million heat pumps. Scheduled to become operational in 2027, Xlinks is expected to deliver power at £48/MWh, making it comparable with offshore wind.

Hinkley Point nuclear power station delayed until 2027

The date for generation to start at the Hinkley Point C nuclear power station in Somerset has been put back by another year. Developer EDF announced on 20 May that the first reactor at the 3.2GW plant, which is the first to be built in the UK for nearly 30 years, will begin generating power in June 2027 a year later than previously stated. The French owned company also said the projected price for Hinkley Point C has increased by another £3bn, to £26bn.

Atkins joins pro nature risk forum

Atkins has become a member of the Forum of the Taskforce on Nature related Financial Disclosure (TNFD), a recently established international initiative to help push global finance towards more nature positive outcomes. The TNFD s core mission is to develop and deliver a risk management and disclosure framework, which will enable organisations to report and act on evolving nature related risks, with the ultimate aim of supporting a shift in global financial flows.

Building Safety Act heralds 'fundamental reform'

Competency requirements and more stringent regulation central to changes

The Building Safety Act has completed its passage through parliament, heralding the 'most fundamental reform' of construction regulation in living memory', according to CIBSE.

The act, which was drawn up in response to 2017's Grenfell Tower disaster and Dame Judith Hackitt's subsequent report, received Royal Assent on 28 April. The 282-page act introduces a raft of building safety measures overseen by a new Building Safety Regulator.

The regulator will be responsible for the regulation of all buildings, with new statutory roles for designers and contractors on all projects.

The act imposes legal responsibilities on all those designated as principal contractors and designers, which go 'well beyond' 2015's CDM Regulations, according to CIBSE.

Clients will be subject to statutory duties to satisfy themselves that those they employ to undertake work are competent, both individually and organisationally. The act introduces new liabilities for manufacturers supplying products or providing information on their suitability.

The new regulator is also responsible, under the legislation, for professional standards and registration of building control officers, both in the public and private sectors.

In its commentary on the act, CIBSE said it 'is the most fundamental reform of regulation across the construction and residential property sectors in living memory'. The act also reduces leaseholders' liabilities for costs of remediating unsafe cladding.

Windfall tax to fund energy bill cuts

The UK government has announced a package of measures for households to mitigate soaring energy bills and the cost-of-living crisis, including a £400 discount on energy bills for all households, partly paid for by a £5bn windfall tax on oil and gas companies.

The £15bn support package, announced by Chancellor Rishi Sunak, will also see pensioners eligible for a winter fuel payment receive a one-off payment of £300, while six million people on disability benefit will receive a £150 payment. Eight million of the lowest-income families will also receive a £650 one-off payment.

In a U-turn on previous government policy, the Chancellor announced a temporary 25% windfall tax on the profits of oil and gas companies.

Household energy bills will rise by a typical £800 a year in October, according to regulator Ofgem, with the energy price cap set to increase to £2,800 a year as gas prices continue to be volatile following Russia's invasion of Ukraine.

The Chancellor said he was 'urgently evaluating' the scale of profits made by electricity generators, including renewable energy operators such as windfarms.

ELIZABETH LINE OPENS IN TIME FOR PLATINUM JUBILEE

The last section of the Elizabeth Line officially opened last month

The last section of the Elizabeth Line finally opened in London last month, just in time for the Queen's Platinum Jubilee celebrations. Twelve trains per hour will initially run on the central London stretch of the line, between the mainline Paddington station and Abbey Wood in the south-east of the capital. It was known as Crossrail until it was renamed in honour of the Queen in 2016. Construction of the line involved the boring of 42km of tunnels through central and east London, and the creation of 10 new stations on the 41-stop line.

GOOGLE CAMPUS BUILT ON GEOTHERMAL PILES

Google has opened its new Bay View campus in Silicon Valley. Designed by architects Bjarke Ingels Group and Heatherwick Studio, it is the company's first campus building and boasts the largest integrated geothermal pile system in North America.

The system will reduce carbon emissions by an estimated 50% and help heat and cool the campus. The massive geoexchange field is integrated into the campus's structural system, reducing the amount of water typically used for cooling by 90%, equal to five million gallons of water annually.

A large part of the 1.1m ft² campus is also 100% naturally ventilated.

New Building Regulations come into force on 15 June

Approved Document Part O set to reduce overheating in dwellings

Building designers will have to consider new overheating tests much earlier in designs under the latest changes to the Building Regulations, according to CIBSE's head of sustainability Julie Godefroy.

Overheating: Approved Document O will come into force on 15 June, alongside updates to Part F (ventilation) and Part L (conservation of fuel and power).

The Part O standard requires that all new residential buildings, including care homes, student accommodation and children's homes, be designed to reduce overheating.

Capping the glazing allowed on new residential buildings is likely to impact design, says Godefroy, who adds: 'In homes, the regulation should mean more reasonable proportions of external glazing, more shading, and more generous openings. If you do have glazing, in theory Part O should encourage that to be openable.'

Susie Diamond, founder of building physics consultancy Inkling, warns that Part O may have gone under the radar within the sector. 'Many may not realise how influential Part O could be on designs, and that may be a bit of a shock,' she says. 'We're going to see huge demand for dynamic thermal modelling assessments, too, which I'm not sure we have the capacity to deliver at this point.'

Under the new regulations, new homes must achieve a 'minimum standard for energy performance' and meet higher standards for fabric efficiency, while new non-residential buildings must also meet 'primary energy' and emission rates targets. The updated Part L will require CO_2 emissions from new-build homes to be around 30% lower than current standards, while emissions from other new buildings must be reduced by 27%.

Graham Temple, marketing manager at Mitsubishi Electric, says: 'The government has a target of 600,000 heat pump installations a year by 2028. With the changes to Part L, there's a greater focus on heat pump technology for helping to achieve net zero targets.'

An appendix has been included for Part L that sets out a good practice specification for homes built with heat pumps.

Industry backs net zero carbon standard

A cross industry steering group, including CIBSE, is to develop a common standard for verifying UK buildings as net zero carbon.

The UK Net Zero Carbon Buildings Standard will provide a single, agreed methodology defining what net zero means for buildings in the UK. Covering new and existing buildings, it will also set out performance targets addressing operational energy and embodied carbon emissions that align with the UK s 2035 78% reduction and 2050 net zero emissions targets.

The standard s metrics and performance targets are likely to include energy use, upfront embodied carbon, and life cycle embodied carbon. Other metrics, such as space heating/cooling demand and peak load, are also to be considered.

Individuals and organisations who wish to be part of the task and sector groups that are being set up to develop the standard have until 6 June to apply. These groups will be responsible for developing approaches on a range of technical considerations that underpin the content of the standard, and for providing recommendations to the technical steering group.

As well as CIBSE, the coalition includes BBP, BRE, the Carbon Trust, IStructE, LETI, RIBA, RICS, and UKGBC.

Government funding for waste heat networks and ammonia plant

Two heat networks using energy from waste (EfW) are the latest projects to benefit from a government backed fund to support communal heating systems.

The Heat Networks Investment Project (HNIP) has awarded Veolia more than £16m to bring an EfW sourced heat network to several estates in the south London borough of Southwark, which is currently being regenerated to accommodate 20,000 new homes.

The HNIP has also awarded £10.7m to support two new heat networks in the new town of Cranbrook, near Exeter. They will supply heat to 8,100 homes and 2.2m ft² of commercial space.

The Department for Business, Energy and Industrial Strategy has awarded £284,000 to kick start the development of a prototype green ammonia plant. Led by the Science and Technology Facilities Council, the project aims to deliver ammonia production from renewable energy rather than natural gas.

Ammonia has traditionally been employed as a fertiliser, but can also be used as fuel to carry hydrogen in internal combustion engines, gas turbines and fuel cells. It is cheaper to store and transport than hydrogen gas or liquid, and the energy density is higher.

WorldGBC pushes for circular economy ahead of COP 27

The World Green Building Council (WorldGBC) has launched a global programme to accelerate the adoption of resource efficiency principles in the building and construction sector.

The Circularity Accelerator programme, which is being launched in the run up to the Cairo COP 27 UN climate change summit later this year, is designed to create heightened demand for the implementation of resource efficiency solutions.

It also seeks to raise and align ambition across the construction industry by working towards WorldGBC s circularity and resource efficiency goals for 2030 and 2050.

The 2030 goal includes the elimination of construction waste in landfill and working towards a built environment with net zero whole life resource depletion. The 2050 goal is for a built environment with net zero whole life resource depletion, while working towards the restoration of resources and natural systems within a thriving circular economy.

EU races for renewables as it makes dash from gas

Commission's plan is designed to wean EU off Russian sources of energy

The European Commission is introducing a new legal obligation for solar panels to be installed on rooftops of new buildings, as part of efforts to increase the target for the proportion of electricity generated from renewable sources.

The final version of the REPowerEU plan, designed to reduce Europe's dependence on Russian natural gas, was published by the Brussels-based commission last month.

It proposes that the target for the share of EU generation from renewable sources should be increased to 45% by 2030, compared with 40% proposed in last year's 'Fit for 55' plan.

As part of this 'massive scaling up and speeding up' of renewable energy, REPowerEU proposes a dedicated EU solar strategy to double photovoltaic capacity by 2025 and install 600GW by 2030.

Other initiatives include a phased-in legal obligation to install solar panels on new public, commercial and residential buildings.

The commission has also recommended that the EU's Renewable Energy Directive should be amended to recognise such sources of power as being of an 'overriding' public interest.

The REPowerEU plan proposes that member states should put in place dedicated 'go to' areas for renewables, with shortened and simplified permitting processes in areas with 'lower' environmental risks.

The commission has confirmed proposals in March's draft REPowerEU plan to double the number of heat pumps installed across the EU to 30 million by 2030, saving 35 billion m^3 of natural gas.

To further reduce reliance on Russian gas, the plan sets a target of 10 million tonnes of domestic renewable hydrogen production by 2030 across the EU.

BIM 360 USERS EXPERIENCE AUGMENTED REALITY

Construction teams can view and position models to millimetre accuracy while wearing The Atom

Technology company XYZ Reality has integrated its engineering-grade augmented reality (AR) headset, The Atom, with Autodesk's cloud-based BIM 360 construction management software. The integration means construction teams wearing The Atom – which combines a construction safety headset with AR displays – to view and position models hosted in BIM 360 to millimetre accuracy on site, thereby improving productivity and efficiency, XYZ claims.

Energy Security Bill falls short on energy efficiency

Heat decarbonisation prioritised, but nothing new on energy efficiency

Industry bodies have welcomed new heat decarbonisation legislation in the Energy Security Bill, but have expressed dismay that it contains no fresh steps on energy efficiency.

The government says the measures announced in the bill last month are designed to deliver a 'secure, homegrown' energy system that reduces emissions and is more affordable.

For the first time, heat networks will be regulated by energy watchdog Ofgem.

The heat pump market received a fillip in the form of a new market standard and trading scheme, which is designed to cut the costs of the electric heating devices. The bill will also enable a large-scale hydrogen heating trial, which will inform upcoming decisions on the role it will play in heat decarbonisation.

However, the Queen's Speech contained no new measures to improve energy efficiency.

Stew Horne, head of policy at Energy Saving Trust, called on the government to include an 'ambitious timeline' for introducing Minimum Energy Efficiency Standards across all tenures.

But welcoming the moves on heat decarbonisation, he said the bill provided the opportunity for a 'much-needed update to legislation' to reflect the UK's 'significantly strengthened' commitments to curb emissions over recent years.

Supply chain issues increase lead times

Seven out of eight contractors (87%) have experienced price hikes as a result of the war in Ukraine, according to the latest UK market report by Gleeds.

The construction consultancy's spring market report, published on 20 May, also said more than two-thirds of the contractors questioned said some schemes are stalling because of the uncertainty resulting from the conflict.

Around two thirds (62%) of contractors report reduced availability of specified materials since Russia's invasion of Ukraine, with 60% experiencing disruption in the supply chain. Almost 90% said steel was the material most heavily impacted. The report voiced contractors' concerns about the impact that cost escalation will have on schemes' viability.

The war in Ukraine is likely to affect some timber supplies before the end of this year, according to the Construction Leadership Council's Product Availability working group. It said most products continue to be 'well stocked', but pointed to ongoing challenges continuing to affect the supply of bricks, aircrete blocks, concrete products, PIR insulation and gas boilers, resulting in long lead times.

IN BRIEF

CIBSE renews partnership with NBS

NBS has renewed its partnership with CIBSE for a further year. The construction data platform and Institution will deliver joint publications and events this year for CIBSE members. These will include the launch of a new technical guide aimed at best practice specification writing and webinars on key topics such as information management and sustainability.

Simon Parker, managing director of CIBSE Services, said: The partnership with NBS has allowed us to access quality technical information and helped us establish closer relations with specifiers and quality specifications across the supply chain.

Viessmann invests €1bn in heat pumps and green solutions

The Viessmann Group has announced that it is investing €1bn over the next three years to extend its portfolio of heat pump and green climate solutions. The investments will be ploughed into an expansion of the family owned company s manufacturing footprint and R&D labs. Viessmann said its 21% growth in turnover, to a record €3.4bn in 2021, was driven predominantly by increasing demand for premium heat pumps, sales of which jumped by 41% during the year.


The Morpheus Hotel won the Innovation Award in 2019

Nine categories to enter in SFE Fa ade awards

Entry is now open for the Fa ade 2022 Design and Engineering Awards. Held by the Society of Fa ade Engineering (SFE), the awards recognise and reward excellence and achievements in fa ade engineering, raising the profile of this discipline.

There are nine award categories, covering UK and international projects, product, and young fa ade engineer. The full list is:

- **UK Project of the Year New Build**
- **UK Project of the Year Innovation in Fa ade Design**
- **UK Project of the Year Sustainability**
- **Project of the Year Refurbishment**
- **Young Fa ade Engineer of the Year**
- **International Project of the Year New Build**
- **International Project of the Year Innovation in Fa ade Design**
- **International Project of the Year Sustainability**
- **Product of the Year**

The awards are being co located with Zak at the Zak World of Fa ades London conference on 3 November, and the deadline for entries has been extended to 17 June. For more information and to enter, visit **www.sfecompetition.org**

Working together to build a better future

CIBSE President Kevin Mitchell and his ASHRAE counterpart share a passion for developing engineers

Kevin Mitchell FCIBSE, the CIBSE President, met with ASHRAE President Mick Schwedler in May, to discuss their goals for the year ahead, and how the two organisations can continue to work and support each other and their members internationally.

CIBSE and ASHRAE have a long-standing relationship and are eager to explore avenues for collaboration and mutual support.

The themes underpinning Schwedler's presidential year are 'Personal growth. Global impact. Feed the roots' – as outlined in his inaugural address. They focus on ASHRAE's role in helping people foster connections for personal and professional growth, and supporting the development of future industry professionals.

Mitchell is also committed to inspiring and supporting the next generation in solving the technical and scientific challenges of today. He said: 'It was an absolute pleasure to welcome President Schwedler to London to discuss our numerous areas of common interest, our shared values, and our commitment to work together to further the art and science of building services engineering.'

Schwedler added: 'ASHRAE's theme of 'Feed the roots' lines up directly with President Mitchell's call to 'pay it forward'.

CIBSE and ASHRAE continue to build upon their strategic partnership, to create and deliver a collaborative roadmap that serves their respective memberships and the wider public in building a safer, more sustainable future. Joint initiatives include working to accelerate the progression of digital technologies, virtual design, and construction to improve the resilience of buildings and health of occupants.

The two organisations uphold a reciprocal membership agreement, which has been in place since 2007. This recognises the similarities in competence and experience requirements outlined within the membership criteria of both organisations.


Mick Schwedler (left) and Kevin Mitchell

Nominations for officers, Board members and Council members

New CIBSE officers, Board members and Council members take office from the AGM in May each year.

The CIBSE Board is the governing body of the Institution. It is made up of the seven officers (President, president-elect, three vice-presidents, honorary treasurer and immediate past president) and five elected members. The vice-presidents and honorary treasurer are appointed by the Board, but the president-elect and board member positions are subject to election if there are more candidates than vacancies.

The Council of the Institution is a much larger consultative body, which advises the Board on CIBSE policy. It includes several elected members, in addition to representatives of all regions, societies, groups and standing committees. There are usually three vacancies for candidates each year as the elected members rotate through their three-year term.

CIBSE members are invited to propose candidates for the positions of president-elect, Board members and Council members to take office at the AGM in May 2023. All suggestions received will be considered by the CIBSE Nominations Panel, and the Board will consider the panel's advice before deciding which candidates to recommend for the vacancies. Any candidates nominated to the panel but not recommended by the Board may also choose to go forward for election, subject to obtaining the support of 10 corporate members, in which case a ballot will be held.

Members may put themselves forward for consideration or suggest colleagues who are willing to be considered and who meet the eligibility requirements.

Further information on the process, role descriptions and eligibility requirements can be found on the CIBSE website at **www.cibse.org/nominations**, along with the nominations form that must be completed for all candidates who are put forward for consideration.

To meet the timescales required, all suggestions must be received at the CIBSE offices by 9 August.

Kevin Kelly presents Honorary Fellowships to Catherine Noakes and Geoff Prudence

CIBSE awards two Honorary Fellowships

Catherine Noakes and Geoff Prudence recognised by CIBSE

Professor Catherine Noakes and Geoff Prudence CEng FCIBSE have been awarded Honorary Fellowships of CIBSE in recognition of their contributions to the industry.

Noakes, professor of environmental engineering for buildings at Leeds University, was recognised for her contribution to research on indoor air quality and the control of airborne infection. She is one of the world's leading experts on ventilation and the transmission and control of airborne infection.

Dr Christopher Iddon, chair of the CIBSE Natural Ventilation Group, reading her citation, said: 'The importance of good indoor environments has never been so prominent in public discourse and Professor Noakes has helped raise this public knowledge through her many appearances on national news and radio shows. It is this lifetime of work and her recent dedication to the national efforts during the pandemic that led to the CIBSE Natural Ventilation Special Interest Group proposing Cath for an honorary lifetime CIBSE membership.'

Much of Noakes' work has gone on to inform CIBSE and government guidance. Specifically, she supported CIBSE in producing guidance on ventilation for Covid-19 and she has contributed to the World Health Organization guidelines on ventilation to control the virus.

Noakes' knowledge of ventilation and infection transmission led her to becoming one of the government's key scientific advisers on Covid-19. In recognition of her work, she was made an OBE in September 2020.

Prudence, sector leader and chair of the CIBSE Facilities Management Group, was recognised for his consistent and outstanding contribution to supporting the facilities management sector. He was lead author of the *CIBSE Guide M Maintenance Strategy* in 1996, 2005 and 2014.

In the most recent version of Guide M, he oversaw the introduction of various innovations, including asset life-cycles – a full list of economic life expectancies.

The latest version has had a significant and positive impact on the industry.

Prudence has consistently contributed to the development of CIBSE guidance, leading the production of documentation, events and writing standards.

In delivering his citation, David Stevens CEng FCIBSE MSLL, said: 'Over the past 30 years, it is abundantly clear that Geoff has strived to develop the industry and individuals wherever he can. His passionate and engaging style, and effective sector leadership, led to him being awarded the Silver Medal by CIBSE in 2010.'

Prudence has been involved with the CIBSE Facilities Management Group since its inception in the 1990s and has been the group's active chair since 2003.

He and Noakes received their awards at the CIBSE AGM on 5 May.

Geoff Prudence with Kevin Mitchell and his wife Joan Prudence

IN BRIEF

Benevolent Fund

The CIBSE Benevolent Fund provides help for members, former members and their dependents who are in need, whether through sickness, bereavement or financial hardship. It is the fund s 90th anniversary next year.

The fund has almoners in all CIBSE regions apart from Hong Kong and the United Arab Emirates.

It can help people by making payments to supplement pensions, giving assistance towards the cost of equipment and assisting with major, one off bills. During the pandemic donations fell and the fund may have to dip into its reserves. The quarterly grant has recently been increased from £500 to £600, in response to inflation and rapidly increasing fuel bills.

The establishment of a Benevolent Fund was suggested in 1933 by Comyn Ching, then vice president of the Institution of Heating and Ventilating Engineers (IHVE), and agreed by Council. Comyn Ching was the first chairman of the fund committee and elected IHVE president in 1934.

Engineering practice report surgery

The CIBSE Membership Team is offering the opportunity for those who are looking to become an Associate (IEng) or Member (IEng/CEng) in 2022 to have their draft engineering practice report reviewed by a professional interviewer.

The virtual, 30 minute slots, taking place on 20 June, are allocated on a first come, first served basis. To book, go to **www.cibse.org/training events**

For details of the full range of webinars and resources, visit: **www.cibse.org/membership**

Deadline looming for YEA awards

Entries for the CIBSE Young Engineers Awards 2022 need to be received by 29 July.

The awards recognise the best new talent entering the building services industry, together with those businesses that go the extra mile to support and nurture them.

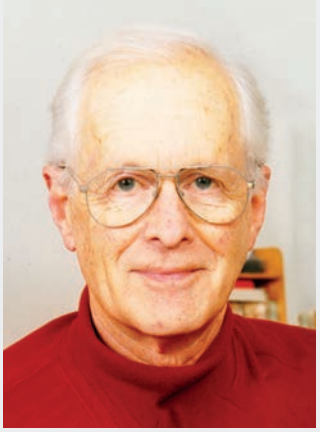
Entries are open for the Graduate, Apprentice and Employer of the Year awards, which will take place on 11 October at RIBA, 66 Portland Place, London, W1B 1AD. Visit **www.cibse.org/yea**

Obituary: David Russell, CIBS President 1980 81

David Russell, the last surviving past president of the Chartered Institution of Building Services (CIBS), died in early April, aged 95. He served as President in 1980-81, just four years after the merger of the Institute of Heating and Ventilating Engineers (IHVE) with the Illuminating Engineering Society (IES), and the move from Cadogan Square to Balham.
As he noted at the start of his Presidential address, the 1970s were a time of fundamental changes for the Institution.

David Russell was unusual as a CIBS President in coming from a contracting background. He was the third generation to manage the family firm, Rosser and Russell, which was very supportive of the IHVE and, subsequently, CIBSE, and of the Heating and Ventilating Contractors Association (HVCA), now BESA.

In 1980, the Finniston Report into the future of engineering had been published, with proposals for an engineering authority and statutory regulation of the profession, as well as various measures to redress the shortage of engineers and technicians. The Institution supported the report, but, sadly, it was a victim of being commissioned by one party and delivered after the 1979 election. The incoming government adopted a non-interventionist approach to the challenges identified.



David Russell

After much industry debate – in which CIBS, through the work of David and then deputy secretary Andrew Ramsey, played a full part – the Engineering Council was formed in place of statutory regulation. This development precipitated the transition of the CIBS to CIBSE in 1986.

July 1980 was the start of a severe recession. The incoming President chaired his first Council meeting against a backdrop of financial pressures and the prospect of the CIBS needing an overdraft. An EGM was held to approve subscription rises of 30% for Fellows and 25% for members.

David was a forward-looking President and keen to promote collaborative working, which was the key theme of his summer meeting that year. It was a time of growing CIBS cooperation with the RIBA, HVCA and ASHRAE, where David was ably supported by Richard Rooley.

He was a pioneer of computers in construction, noting in his Presidential address that 'our industry has been slow to make use of computers, but can no longer ignore their potential'.

He foresaw computer-aided design, noting that the main obstacle was the 'provision of suitable software'.

The third topic that was also foreseen as shaping the future was energy conservation. As with digitalisation of construction, we have made progress since 1980, but there is still some way to go.

David left two other legacies to the CIBS. Under his leadership, Patrons were established, with an initial 21 companies subscribing to the scheme to provide company support to CIBS. Under his stewardship, CIBS also acquired its first computer to support membership and finance, at a cost of £20,000.

We offer our sincere condolences to his daughter Sarah Delany MCIBSE and all the family.

New members, fellows and associates

FELLOWS

Cashmore, John
Sandwell, United Kingdom

Dominguez Moreno, Daniel
Chelmsford, United Kingdom

Green, David Bryan
Edmonton, Canada

Hughes, David John
Trowbridge, United Kingdom

Plant, Mark
Plymouth, United Kingdom

MEMBER

Ali, Zohab
Leeds, United Kingdom

Antalova, Martina
Ashton under Lyne, United Kingdom

Barry, Patrick
Business Bay, United Arab Emirates

Cabrini, Alessandra
London, United Kingdom

Chiu, Ho Kin Jeffery
Hong Kong, Hong Kong

Chorafa, Marguerita
London, United Kingdom

Chow, Kin Keung
Hong Kong, Hong Kong

Choy, Kwok Fai
Tsing Yi, Hong Kong

Figan, Magdalena Grazyna
Greenhithe, United Kingdom

Gao, Hongwen
Hornsby, Australia

Gkarliaridis, Dimitrios
Leigh, United Kingdom

Hart, David
London, United Kingdom

Hipwell, Graham
Gloucester, United Kingdom

Ho, Po Cheong
Kowloon, Hong Kong

Hui, Michael Kin Hei
Fanling, Hong Kong

Hui, Kin Lun
Hong Kong, Hong Kong

Ke, Chi Ho
Fanling, Hong Kong

Kwong, Ying Yeung Willie
Quarry Bay, Hong Kong

Li, Po Ki
Lai Chi Kok, Hong Kong

Lubkowska, Joanna
London, United Kingdom

Mak, Wai Ho Jonathan
Tuen Mun, Hong Kong

Monteiro, Ashley Constancio Savio
Sydney, Australia

Moodie, Stuart
Dubai, United Arab Emirates

Ng, Wa Hei
To Kwa Wan, Hong Kong

Ng, Pui Shan
Kowloon, Hong Kong

O Callaghan, Joe
Cork, Ireland

Osman, Zakria
Slough, United Kingdom

Pang, Chun Ming
Kowloon, Hong Kong

Poon, Ka Fai
Hong Kong, Hong Kong

Rajasekaran, Pradeep
Ashfield, Australia

Rathnayaka Mudiyanselage, Anura Kumara Rathnayaka
Homagama, Sri Lanka

Sherif, Mariem
Abu Dhabi, United Arab Emirates

Siamopoulos, Eleftherios
London, United Kingdom

So, Sheung Kwan
Yuen Long, Hong Kong

Sun, Chung Kei
Southsea, United Kingdom

Szeto, Wai Kit
Woking, United Kingdom

Tang, Vinh
Prospect, Australia

Tang, Sher Kin Kelvin
Tseung Kwan, Hong Kong

White, Alan Hugh
Glasgow, United Kingdom

Williamson, Martin
Dubai, United Arab Emirates

Wu, Wing Hong
Fanling, Hong Kong

Yapa Bandara, Ridma Hashantha
Etul Kotte, Sri Lanka

ASSOCIATE

Carey, Christy
Ennis, Ireland

LICENTIATE

Ahern, Daniel Kieran Liam
Croydon, United Kingdom

Bishop, Corie Scott
Mansfield, United Kingdom

Globe, Matthew William
Sheffield, United Kingdom

Studholme, Robert James
Leeds, United Kingdom

Sylvester, Harry
Hull, United Kingdom

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Reforming fire safety

In May, the Home Secretary announced comprehensive plans to reform fire safety in England, a major consultation on the future of fire and rescue services, and new regulations putting the provisions of the Fire Safety Act 2021 into effect. Hywel Davies outlines the package

On 18 May, the government announced its Fire Reform White Paper, which is intended to strengthen the fire service and introduces new requirements for risk assessments of dwellings in blocks of flats.

The changes include the Fire Safety (England) Regulations 2022, bringing into effect provisions of the Fire Safety Act 2021 requiring fire safety risk assessments on blocks of flats, including assessments of the structure, external walls and entrance doors.

Under the regulations, which started on 16 May 2022, responsible persons for flats need to ensure that these elements are included in future fire risk assessments, if they are not already included. There are also fact sheets and a simple online tool for prioritising fire risk assessments.

These regulations implement a number of the first phase Grenfell Tower Inquiry recommendations[1] to deliver fire safety improvements in multi residential buildings. As well as reinforcing and clarifying the requirements for fire risk assessments of common parts including structure, fa ades and fire doors to flats they require fire and rescue services to be provided with the information they need to plan their response to a fire in a high rise building.

The Fire Safety (England) Regulations 2022 impose a minimum frequency for checks on fire doors in mid and high rise blocks of flats

The regulations impose a minimum frequency for checks on all fire doors in mid and high rise blocks of flats. Where a responsible person already has a fire risk assessment that includes the structure, external walls and fire doors, they do not need a further assessment until the next periodic review.

As well as commencing sections 1 and 3 of the Fire Safety Act, a 10 week consultation opened on the most comprehensive plans for fire reform in decades in its White Paper. These aim to further develop changes to fire and rescue provision introduced since the Grenfell Tower fire, and findings from independent inspection reports on fire and rescue services.

They aim to increase public safety through improved professionalism of fire and rescue services and modern workforce practices, with proposals for a College of Fire and Rescue on similar lines to the College of Policing.

There is also a proposal to improve accountability by transferring fire governance to a single, elected official, overseeing service delivery by operationally independent chief fire officers.

Readers are encouraged to view the consultation and contribute to the CIBSE response (**www.cibse.org/consultations**).

In all residential buildings with storeys over 11 metres high, responsible persons must undertake annual checks of flat entrance doors and quarterly checks of all fire doors in the common parts.

In all multi occupied residential buildings with two or more domestic premises, responsible persons must provide relevant fire safety instructions to residents, including instructions on how to report a fire and what a resident must do once a fire has occurred, based on the evacuation strategy for the building.

They must also provide residents with information relating to the importance of fire doors in fire safety.

DR HYWEL DAVIES
is technical director at CIBSE
www.cibse.org

KEY SAFETY REQUIREMENTS

In high-rise residential buildings, responsible persons must:

- **Provide their local fire and rescue service (FRS) with up-to-date electronic 'building floor plans' and place a hard copy, along with a single-page building plan of key firefighting equipment, in a secure information box on site**
- **Provide their local FRS with information and a risk assessment about the design and materials in the 'external wall system', and tell the FRS of any material changes**
- **Undertake monthly checks on the operation of 'firefighting lifts and evacuation lifts' in their building, and check the functionality of other 'key pieces of firefighting equipment'**
- **Report defective lifts or equipment to their FRS as soon as possible, record their checks and make them available to residents**
- **Install and maintain a 'secure information box' in their building, with the name and contact details of the responsible person and hard copies of the building floor plans**
- **Install signage, visible in low light or smoke, that identifies flat and floor numbers in the stairwells of relevant buildings.**

References:

1 Phase 2 of the inquiry is still hearing evidence and is expected to report in the second half of 2023.

VIESMANN

Commercial Heat Pumps

High-efficiency air source heat pump for outdoor installation in offices and commercial buildings.

Low operating costs due to high coefficients of performance: COP value according to EN 14511 up to 4.3 for (A7/W35) and up to 3.7 for (A2/W35)

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viessmann.co.uk/vitocal

FULLER DISCLOSURE

CIBSE pioneered the disclosure of building performance data in its awards, giving the industry a unique opportunity to compare and share. **Julie Godefroy** analyses figures from the 2022 entries and reveals how the process will be refined to provide even more valuable data in the 2023 Building Performance Awards

CIBSE's 2022 Building Performance Champion, the Library and Study Centre at St John's College, Oxford University

Last year, following a review of past award submissions, CIBSE introduced new data entry forms for its 2022 awards. The aim was to offer more clarity for applicants on the essential information needed, and to provide a clearer and fairer basis on which judges could assess the entries.

The changes were also intended to make the awards of more value to the industry, as the building performance data can more easily contribute to the CIBSE energy database (if the entrants agree).

We have reviewed this year s awards to identify any improvements that could be made to the entry forms. We wanted to assess the quality of the data and identify any trends in building performance among the entries.

Quality of data

Last year s changes introduced a quantitative data entry form, alongside the usual more qualitative and descriptive form.
The data was grouped in three categories: essential; recommended, but not essential; and optional.

Essential is basic information on the project, approach to in use evaluation and disclosure, and the simplest level of information about the building s energy use and supply systems. For projects only connected to the gas and electricity grids, this tab was enough to obtain the total energy use, but not if onsite systems were present.

Recommended, but not essential is the contribution from onsite energy generation systems. In the review, this section was filled in by all entrants.

Optional is information such as air permeability, the project delivery process for example, whether Soft Landings was followed, or energy performance modelling carried out breakdown into energy uses, and peak demand. All entrants completed at least some of this section, with many filling in the majority.

The review of 2022 entries shows that the large majority went far beyond providing only the essential information.

The new forms have also removed a lot of the ambiguity in past submissions for example, whether the declared energy use included that from onsite systems; what type of floor area measurement was being used; and the time period covered by the data and whether it represented normal occupancy. All of these could lead to significant uncertainty when trying to get a picture of data quality and the building s performance.

The quality of data received from the majority of entries is encouraging, particularly given the effect of the pandemic on access to data and resources available. For this year s awards, the following changes will, therefore, be introduced.

There will be only two categories of data entries essential and optional . Most of the information previously recommended

Air permeability is to become essential ; this recognises its importance as a key performance parameter

will become essential . This covers onsite energy systems, so that all projects will now have to submit enough data to assess the project s total energy use, including grid as well as onsite supplies .

Air permeability is also to become an essential entry; this recognises its importance as a key building performance parameter, and the fact that a test is carried out on new buildings and some retrofits anyway.

As previously, the new forms will allow entrants to respond not sure or not available , where necessary.

What the data says about building performance

Last year, one of the aims of the data review was to identify best performing projects and where they sat against RIBA 2030 Challenge and LETI One pager targets for offices, schools and homes. The data from this year will feed into similar analysis for further sectors, as part of the bottom up approach to developing targets that are not only compatible with the UK s net zero carbon budgets, but also achievable.

This year s data shows trends in delivery processes and design solutions, illustrated below. As expected, projects paid attention (probably more than average) to setting energy targets beyond regulatory compliance at the design stage, following Soft Landings, and carrying out energy performance modelling. The large majority of projects have some sort of onsite generation systems.

The Library and Study Centre at St John s College, Oxford University was this year s overall Building Performance Champion, and epitomises these trends. The scheme followed Soft Landings, and TM54 modelling was carried out to inform energy use targets and to aid the assessment of in use performance.

Currently in its third year of occupation, the project is still subject to fine tuning and analysis of its energy performance, including monthly, end use breakdown, and key systems, such as the heat pump.

The energy use data should still be viewed with caution, as occupancy patterns are likely to have been affected by the pandemic, but it compares well with benchmarks (see summary, compared with two possible benchmark categories, in Table 1).

Entries for the 2023 awards open this month (June). Do contact the CIBSE technical team if you have any questions or comments about the entry forms, or would like to contribute project exemplars to inform industry net zero targets. CJ

	CIBSE 'good practice' benchmark	**Equivalent all-electric EUI** (simple approximation*)
Higher education – library or learning centre	Electricity: 69kWh/m² TUFA** Gas: 71kWh/m² TUFA	95kWh/m² TUFA
Public buildings – library	Electricity: 54kWh/m² TUFA Gas: 85kWh/m² TUFA	95kWh/m² TUFA
St John's College, Oxford, Library and Study Centre		61kWh/m² GIA (of which 16kWh/m² is supplied by onsite PVs)

Table 1: Energy-use data from St John's College library and study centre compared with two benchmark categories

* The benchmarks for these categories are not available for all-electric buildings, so – for the purpose of this comparison – they were simplistically converted to an all-electric equivalent by multiplying the gas benchmark by (0.9/2.5), as if the thermal demand was 0.9 times the gas consumption (assuming a 'good' boiler), and a heat pump system of overall seasonal efficiency of 2.5 was supplying that demand instead.

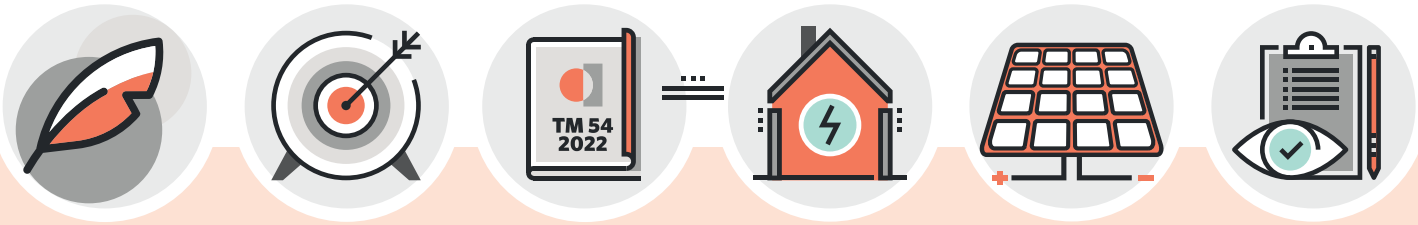
** Total useful floor area, TUFA, is the floor area metric used in display energy certificates, from which the current CIBSE energy data comes from for these building types. It is similar to gross internal area.

KEY CHANGES FOR ENTRIES TO 2023 AWARDS

- **Contribution from onsite systems to become 'essential' information, providing the project's total energy use**
- **Air permeability to become 'essential'**

Entrants will still be able to state if information is available.

Analysis of entries to 2022 CIBSE Awards



25% Entries that followed Soft Landings*

38% Entries with energy-use targets at the design stage* – but none was contractual

50% Entries carrying out energy performance modelling (most often TM54. Some with extra modelling for solar systems)

38% Entries that were all-electric projects

88% Entries that had onsite generation – most often PVs

38% Entries that carried out some form of post-occupancy evaluation beyond just energy use*

* Sometimes, the information was not provided in the submissions. For example, it is possible that more projects had energy-use targets at the design stage, but that the entrant did not fill in this question on the entry form

TECHNICAL KNOCKOUT

The CIBSE Technical Symposium returned as an in person event for the first time since the Covid pandemic, with delegates given plenty to think about over the two days of technical presentations. **Phil Lattimore** reports

With a packed itinerary of presentations and papers, the CIBSE Technical Symposium returned to London South Bank University (LSBU) on 21 and 22 April the first time in two years that the event had been held in a live, in person setting, rather than online only.

The theme for the two days was Delivering a safe, healthy and sustainable built environment , and 45 speakers from across industry and academia delivered a series of papers covering a wide range of topics on that agenda.

On the first day, two keynote presentations


A packed lecture theatre for one of the 45 speakers at the Technical Symposium

were delivered to delegates. Will Arnold, head of climate action for the Institution of Structural Engineers, kick started the day with *Embodied carbon and Part Z*, while, in the afternoon, Thomas Lefevre, from Etude, and Julie Godefroy, CIBSE head of sustainability, delivered a joint presentation entitled *Making SAP fit for net zero: the SAP 11 scoping report*.

Reducing embodied energy

In his keynote, Arnold addressed how the built environment contributed to 25% of the UK s carbon emissions, and highlighted the urgent need for the industry to take action to reduce its environmental impact.

He discussed the assessment of whole life carbon in the built environment, outlining embodied carbon in the construction, repair, maintenance and end of life of a building, and operational carbon in the running of the building throughout its lifetime such as in the energy required for power, heating, cooling and water.

According to Arnold, most studies show that, by 2030 for modern, low energy buildings embodied carbon will make up the majority of a building s overall emissions, with decarbonisation of the Grid and energy saving regulations and guidance, such as Part L, having an impact on the operational carbon impact.

As such, he emphasised the importance of reducing embodied carbon and called for urgent action to tackle the issue. Embodied carbon in this country has barely changed in decades , he said.

Around 40 50 million tonnes of carbon a year are emitted in the UK through embodied carbon more than aviation and shipping combined, although it doesn t receive the government policy attention these other industries do, said Arnold.

He highlighted the positive impact of guidance developed by and for the industry, such as the LETI one page documents on embodied carbon and whole life carbon, along with the work it has done around retrofit and net zero targets. He also pointed to CIBSE TM65 *Embodied carbon of building services: A calculation methodology* as a resource to help support building services engineers transition to, and deliver on, net zero targets.

In their joint presentation, Lefevre and Godefroy discussed the cross industry collaborative scoping report that is designed to inform the development of the new version Standard Assessment Procedure (SAP) 11 and Reduced Data SAP (RdSAP) 11. The report looked at how SAP 11, which is due to be available in 2025, can be enhanced to help support the transition to net zero in the built environment.

Listening to the views of experienced industry stakeholders was an important element of the report process. Contributing organisations were tasked with reviewing current versions of SAP/RdSAP, re evaluating and prioritising the key policy objectives for which SAP is crucial including net zero carbon; energy efficiency (demand reduction and flexibility); and heat decarbonisation. They reviewed literature and methodologies from around the world, both voluntary and regulatory, to get models that could inform the process.

The report highlighted 25 key recommendations for SAP to ensure it is capable of supporting the transition to net zero. These covered five categories, including: better aligning of SAP/RdSAP with its key objectives; improvements to methodology; improvements to SAP/RdSAP and its commitments to net zero; a better evaluation of energy use; and support for the decarbonisation of heat and electricity.

> Around 40 50 million tonnes of carbon a year are emitted in the UK through embodied carbon more than aviation and shipping

Lessons from Nabers

On the second day of the symposium, Grace Foo, of DeltaQ, delivered a keynote entitled *Design for performance: Lessons from the Nabers UK Independent Design Review Process*. She presented a collaborative paper looking at the Design for Performance (DfP) agreement, whereby building owners and developers commit to post occupancy Nabers UK rating targets during the design phase of a new building process.

Foo explored lessons learned from the Nabers UK independent design review process, reflecting on: design team and project owner motivations; integration of the DfP process into the RIBA Plan of Work from stage 2 onwards; and major risks inherent in the UK design, construction and building operation processes that threaten the achievement of the Nabers targets for new developments or major refurbishments with DfP agreements.

Presentation prizes

All the presentations were well received, but delegates were encouraged to vote for the speakers and presentations most deserving of two 2022 awards on offer. The winner of the Most effective delivery of material award went, perhaps fittingly, from the host venue, to LSBU s Graeme Maidment for *The generation gap! Are 5th generation district energy schemes better or just different?*

The other winner selected by delegates was Gareth Jones, from FairHeat, who was awarded Most significant contribution to the art and science of building services engineers for his paper *Field trial and design approach for improving hot water delivery time.* CJ

INSPIRING THE NEXT GENERATION

To mark CIBSE s 125th anniversary, new President **Kevin Mitchell** is calling on all Members to share their stories and knowledge to inspire the next generation and attract more engineers into building services

CIBSE s new President, Kevin Mitchell FCIBSE, has a clear goal for his year in office. He is calling on Members of the Institution to inspire the next generation of engineers to deliver the net zero buildings of the future.

During his Presidential address, he laid down the gauntlet to Members in the form of five challenges: to celebrate their building services heroes; inspire future engineers; boost the expertise of early career engineers; share their building services story; and engage with their peers to share knowledge and take actions to combat climate change (see panel on page 44).

The President s challenges are part of CIBSE s 125th anniversary celebration and will be prominent at upcoming events, including Build2Perform, the Building Performance Awards, the Technical Symposium, and Graduate of the Year. Mitchell is keen that building services engineers shout loudly about the achievements and opportunities the sector has to offer.

The work we do is phenomenal, but we re not as vocal as we could be about the role that we play, he says. CIBSE and our Members are central to so many crucial elements in the delivery of projects such as energy efficiency, building safety, and health and wellbeing. I want to create a buzz and momentum.

Inspiration

Mitchell is calling for engineers who were supported at the beginning of their careers to pay forward and inspire the next generation. This could be through mentoring, sponsorship or the setting up of a CIBSE Training and Development Scheme. Without mentors and support in the early part of his career, Mitchell says he would never have become a building services engineer, or have been given the opportunity to progress his career across a range of sectors all over the world.

Kevin Mitchell became CIBSE President in May

He first became aware of building services during a chance meeting with a Hoare Lea engineer at his rugby club. Mitchell had completed a pure mechanical engineering degree and was considering his options. I told him I fancied working at a sports car manufacturer and he said: Don t do that. You ll end up designing exhaust pipes your whole life. You should become a buildings services engineer .

Mitchell was invited to the Hoare Lea office and was soon given a full time job. He cut his teeth on a diverse range of projects, including schools, offices, and happily for Mitchell Formula 1 engine test facilities. He also had the opportunity to work on hospitals, which he particularly enjoyed as it meant doing something really helpful for society .

Having started at Hoare Lea in Plymouth, Mitchell moved to the consultancy s Bristol office, where he started as a graduate engineer under the tutelage of former CIBSE President Terry Wyatt.

Terry got me thinking about the impact of what we do and how it affects the people who occupy the

A chance encounter at a rugby club led Kevin Mitchell into a career in building services engineering

building and the communities they form. It s not just about delivery, says Mitchell, who worked with Wyatt on a number of projects. I would do the simulations and Terry would come up with the big idea.

It s never just the youngster or the older, wiser people who achieve success: it s the combination, adds Mitchell. I operated the computer that Terry wouldn t understand, but it was Terry who knew what questions to ask. It was really interesting. Over time, he motivated me to ask questions and find the answers myself.

Hoare Lea helped progress Mitchell s career by sponsoring him to do a Master s building services degree at London South Bank University. Here, he met fascinating people from the world of academia, including professors Graeme Maidment and Tim Dwyer, who was the building services course director at the time. Their academic rigour gave me a much greater depth of knowledge. To be able to get involved in lab projects and learn about the theory of building services was brilliant, says Mitchell.

With such a wide range of experience across academia and industry, it was no surprise that Mitchell won the first CIBSE ASHRAE Graduate of the Year Award in 1996. He also presented a poster on displacement ventilation at an early incarnation of the Technical Symposium in the same year. Mitchell says this was made possible because of the encouragement Wyatt gave him at Hoare Lea.

During his seven years at the consultancy, Mitchell did an MSc (on displacement ventilation), and worked on a wide range of prestigious projects, including the Principality Stadium in Cardiff. Here, he undertook computational fluid dynamics analysis to ensure the design allowed enough air movement for the grass to grow. He also put his research into practice, with a lot of chilled beam and displacement ventilation projects.

In 1998, Mitchell changed tack and moved to Amec Design and Management, a multidisciplinary engineer based in Stratford upon Avon. At the time, that was seen as a risky move. Hoare Lea was very well known and Amec less so. What drew me there was that it was a complete multidisciplinary outfit with QSs

One of the great things about our profession is that it is really broad and so accessible. There are so many skills [and] an unlimited number of routes in

[quantity surveyors], PMs [project managers], architects, process engineers, civil engineers, structural engineers, and BSEs. It meant you were in teams where the disciplines were working together.

Close collaboration was essential because of the exacting demands of the pharmaceutical and healthcare sectors in which Mitchell was working. These sectors really needed good engineering and well coordinated teams, he says.

Not only did Amec allow him to experience every facet of construction design, it also gave him the opportunity to relocate overseas. In 2001, Mitchell established a pharmaceutical team in Toronto, which resulted in him working with structural, process and building services engineers, as well as architects, which are mandatory in Canadian building designs.

I enjoyed working overseas, he says. It enabled me to understand how projects are delivered in other »

Mitchell delivering his inaugural address as CIBSE President

» parts of the world, and to observe patterns and similarities.

Mitchell returned to the UK, but only for two years. He joined Buro Happold and departed for Dubai in 2008, at the height of the Middle Eastern construction boom. Part of his motivation was the chance to bring sustainable design to the region. However, he found there was an awful lot there already, and it wasn t always possible to implement. I may have been naive, he admits.

Nevertheless, Mitchell enjoyed working and living among the expats and other engineers from all over the world many of them CIBSE Members and become a country director for Buro Happold. He returned to the UK and moved to Mott McDonald in 2016, as building services practice leader for the UK. Within a year he was working in the same role globally, providing technical leadership to a team of 800 building services engineers.

With a dearth of engineers to deliver the rapid changes needed to decarbonise buildings, Mitchell is keen that his five challenges raise the profile of the industry and attract new talent. He believes CIBSE Members, by sharing their stories, can get to people who may never otherwise hear about building services engineering, such as aeronautical and chemical engineers, and mathematicians.

One of the great things about our profession is that it is really broad and so accessible. There are so many skills required. There s an unlimited number of routes in, Mitchell says.

He believes young people and new career starters can have an energising effect on the industry: It s really exciting to hear different viewpoints; it makes more established groups think and listen.

There s something in human nature, I believe, that makes us feel very comfortable with doing the same thing as we always used to do, but we know that s not right. When the more experienced engineers work with young professionals, they can learn as much.

It works both ways, however, says Mitchell. We musn t also forget the contribution of the older generation. While the focus is to encourage the next generation, the older population are getting fitter and extending their careers.

He believes that s why people are joining an engineering career later in life. It s lifelong learning, not just for people who are young, he says.

A few years ago, I was talking to one of my partners who said they would be working until they were 70. I thought that was brilliant. **CJ**

THE PRESIDENT'S FIVE CHALLENGES

1 Celebrate – building services icons
Share your icons, whether it be an invention, technique, technology, publication, group, or someone who taught or mentored you – and, crucially, inspired you. CIBSE will compile a shortlist and announce it at the 125th President's Awards Dinner in October 2022. Tell your story on social media **#CIBSE125 #BSEHeroes.**

2 Inspire – future engineers
There is a shortage of teachers who can engage with students about engineering, and universities aren't consistently talking about building services as an engineering option. Reach out to students – from secondary schools through to colleges and universities – and engage them in engineering as a career.

3 Boost – the development of early career engineers
Companies can help by setting up a reverse-mentoring scheme, an exchange programme, a shadow board, or a CIBSE Training and Development Scheme. Part of the journey is for them to become professionally registered at IEng, EngTech or CEng, and for firms to connect, encourage and sponsor early career engineers. Nominate those in your sphere for awards, including the CIBSE Young Engineer Awards.

4 Share – your building services story
Share the reasons why you became a building services engineer, and what inspires and engages you. You could create a blog, video, podcast, share BSE-related content on social media, or compose a 'why I became a building services engineer' article in your LinkedIn profile.

5 Engage – with your peers to share climate impact reduction knowledge
All building services engineers must understand how their work can improve outcomes for the built environment. So, increase your understanding of net zero buildings and how your work can positively impact climate change. During 2022/23, challenge yourself to do 10, 20, or 30 hours of CPD, and record it in the CIBSE CPD portal. What have you done lately, what did you do, how can someone else do it? Share the knowledge, share the impact, make a difference.

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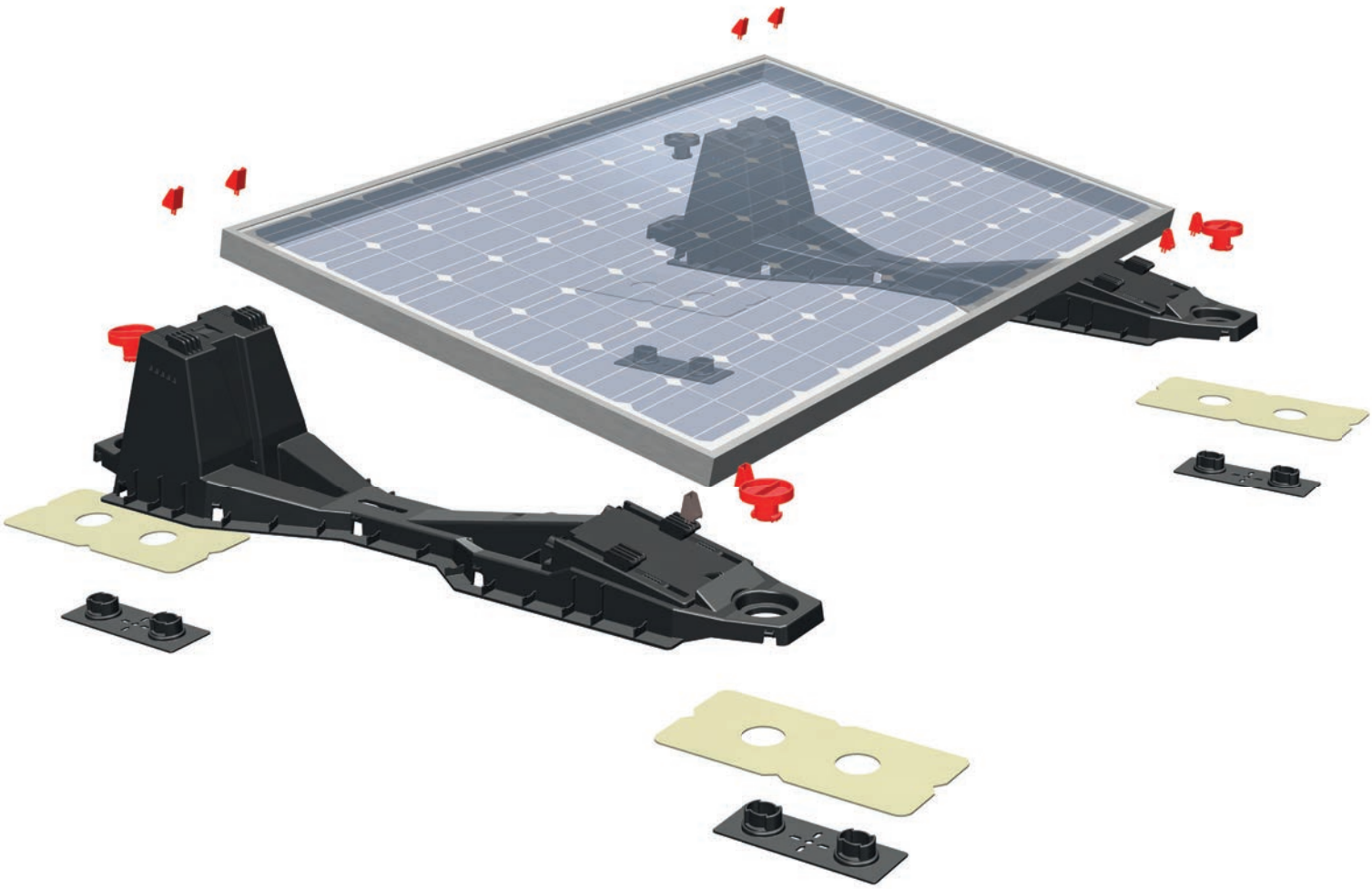

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BACK TO THE FUTURE

From a small group of dedicated Victorian engineers seeking to increase their knowledge about the science of heating and ventilation to a 21,000 member global organisation that covers every facet of building services **Phil Lattimore** traces the development of CIBSE over 125 years

'To the public, the science of heating is almost unknown, and ventilation exists largely in the imagination. These words, written 125 years ago, reflect issues facing the early pioneers of building services engineering as they rallied support for a new professional organisation to tackle this lack of technical and scientific knowledge.

Pointing to the success of their contemporaries in North America in influencing public opinion and raising standards of efficiency, the call came in the original prospectus of the new Institution of Heating and Ventilating Engineers (IHVE), formed in 1897, which would evolve into CIBSE. Every person engaged in the profession is, like any other scientist, necessarily a student, it declared presciently.

The organisation was established to create a forum for open discussion and debate, exploring issues by sharing professional knowledge through publications and lectures. The aim was improving the comfort of mankind. While much has changed over 125 years, the aims of these Victorian founding fathers still resonate in the 21st century.

The impetus for the creation of the IHVE was recognition within the growing and increasingly sophisticated Victorian building engineering sector of the deficiency in knowledge surrounding heating and ventilation. Notably, the idea emerged from the Institute of Sanitary Engineers in 1896, with secretary Jesse Kemsley proposing that a society be formed to foster the heating and ventilating trades.

Edmund William Mayner a member of the ISE council was largely responsible for setting up the IHVE, and became chairman of an executive committee, while John Grundy was its first President. It was the first serious attempt to organise the heating and ventilation profession, and the organisation s stated objectives were to promote the intellectual welfare of its members by periodical meetings, to read, consider and discuss papers or problems on heating, ventilating or other kindred subjects, and to take such measures to extend, develop or safeguard the

1890s

1897
The Institution of Heating and Ventilating Engineers (IHVE) founded

1897
First President John Grundy

1900s

1904
Psychrometry principles and control of humidity developed by Willis Carrier

1906
The Illuminating Engineering Society (IES) founded

1906
Term 'air conditioning' first used

1919
Mechanical air cooling first introduced in US movie theatres

1926
Electricity (Supply) Act passed, established the National Grid

1928
R12, the first synthetic refrigerant gas, developed by Frigidaire

1930
Assisted wiring schemes introduced to boost domestic electrification in UK

1933
First fan coil units developed

1937
Induction units introduced by Carrier

1938
The invention of the fluorescent tube

1941
The IES Code (forerunner to SLL Code for Lighting), including guidance for task lighting illuminance

1945
First full-scale water-source heat pump built in Norwich

1948
First electrical ground source heat pump developed by Robert C. Webber, USA

1951
Pimlico district heating scheme provides heat for 3,250 homes

1954
First solar panel invented by Bell Labs

1899 IHVE Council Meeting

IHVE's new London offices in the 1950s

interests of these important trades.

Around the same time, the lighting industry was also undergoing change, with increasing electrification. In 1906, the Illuminating Engineering Society (IES) was founded by a group of lighting, electrical and gas engineers, and architects.

Fast forward to 1976, and the Chartered Institution of Building Services (CIBS) was formally established (Engineers was added in 1985) with the grant of a Royal Charter, which enabled the IHVE to amalgamate with the IES. Since then, a number of specialist divisions and societies have been established under the auspices of CIBSE.

CIBSE Societies

In 1980, CIBSE Patrons was established as a group of corporate supporters, comprising businesses that collaborate to give financial, technical and moral backing to a range of Institution initiatives.

In 2000, the Lighting Division, which continued the lighting work of the IES became the Society of Light and Lighting with its own governance, membership classes and post nominals, and a world renowned collection of professional guidance.

This was followed, in 2003, by the Society of Public Health Engineers, which replaced the Public Heath Engineering Group of CIBSE.

In 2004, the Society of Fa ade Engineering was formed as a joint initiative of CIBSE, IStructE and the RIBA, bringing together individuals from all sectors who have an involvement in fa ade engineering.

In 2011, the Institute of Local Exhaust Ventilation Engineers (ILEVE) was launched by CIBSE, supported by the Health and Safety Executive, to recognise and assess competence in the practical application of LEV. Most recently, the Society of Digital Engineering was formed, in 2017, for those involved in digitising the built environment.

Our timeline plots CIBSE s evolution, from its origins to a global organisation that covers every facet of the building services industry.

Acknowledgements:
CIBSE Heritage Group for the images and former chair Brian Roberts for giving permission to reproduce sections from *Quest for comfort*, which he wrote to mark the centenary of CIBSE. The CIBSE Heritage Group has its 50-year anniversary in 2023.

1956 First nuclear power station in the world opened at Calder Hall by HM Queen

1974 Health and Safety at Work etc Act becomes law in UK

1973-74 Temporary three-day week in UK to conserve electricity

1980 Compact fluorescent lamps launched by Philips

1982 Variable refrigerant volume (VRV) system developed by Daikin

1991 First Passivhaus dwellings constructed in Darmstadt, Germany

1995 Shuji Nakamura, at Nichia labs, invents first practical blue LED and, with additional phosphor, white LED, starting an LED boom

2000s

2000 The CIBSE Lighting Division becomes the Society of Light and Lighting (SLL) as successor to the IES

2003 Society of Public Health Engineers (SoPHE) established by CIBSE

2004 Society of Façade Engineering (SFE) established by CIBSE

2006 Energy Performance of Building Regulations introduced to reduce carbon emissions from buildings

2008 Climate Change Act committing the UK to carbon reductions of 80% by 2050 (100% in 2019)

2011 The Institute of Local Exhaust Ventilation Engineers (ILEVE) established by CIBSE

2015 Construction Design Management Regulations (CDM) introduced

2017 Grenfell Tower disaster

2019 Climate Change Act amendment commits UK to 100% emissions cut by 2050

2020 Covid-19 pandemic begins

2022 The Building Safety Act becomes law

FUTURE

DIGITAL FUTURES

To mark 125 years since the formation of the Institute of Heating and Ventilation, we are asking today s CIBSE Societies what the future may hold for engineers. First in the series is **Carl Collins**, who writes on behalf of the Society of Digital Engineering

Carl Collins is head of digital engineering at CIBSE

As we look forward from the 125 year history of CIBSE, it is worth noting the trends emerging now to help us and our members prepare. In this article, I will be looking at how digital engineering is progressing, both in human and computing terms.

Progress on these fronts is becoming more organic, rather than the explosions of change we have seen in the past few decades.

This is to be expected as digital process and ways of working become normalised, and the improvements build upon the step change advances that have gone before.

What is a digital engineer?

This term has been tossed around for about a decade now, but it is becoming better defined and is merging with the base concept of engineering .

When was the last time you saw an engineer who did not have a computer? Almost all that we do has some reflection in the digital world, so what makes a digital engineer different from an engineer?

The main aspect is that the digital side is more advanced. For example, a digital engineer will prove a concept by modelling it virtually; a traditional engineer will prove the same by thought, experience and calculation. The two are mutually supportive; we can add the thought and experience to the virtual modelling and create better outcomes.

This means there really is no difference between a digital engineer and the more traditional notion of an engineer. This mends a rift that happened maybe 30 years ago, when computer aided design (CAD) started to emerge and was just too difficult for most engineers to incorporate.

Before CAD, most young engineers would be on the boards to earn their wings before progressing into the ranks of engineers. CAD technicians never had that route available to them, but this is now changing, as the modelling function which still creates the drawings also creates the engineering and calculation workflows.

The other side of the digital coin is the suite of software platforms that we use to perform the digital engineering function.

Starting in the 1950s, computer programmes have set out to replicate and speed up processes. They have now become very powerful, all encompassing platforms so where will the future lie for the essential tools of our trades?

First of all, there has been an inherent mistrust of the calculations done inside these black boxes . Many organisations have done stress test trials of software to make sure that they are happy with the results.

CIBSE is now doing this as a service to software vendors with its Software Verification Assessment. This saves hours of testing by customers, and provides a mark of quality that the vendors can use.

Further to this manual checking of calculation outcomes, there is the prospect of artificial intelligence (AI) and machine learning to validate the assumptions and predictions that our calculations generate.

AI can look forward in time by running scenarios, understanding what they mean and recalculating, using revised precepts, to create a holistic solution that has thought about more variables than humans can. This leaves us to do what we do best which is to think of new ways to solve the problems with which we are faced.

The single source of truth

We often hear about the single source of truth , but how single is that source? Generally, it is at the project level; data exists about a particular project in one place and all the outcomes that require that truth are fed it from this centralised resource.

Yet this is not the whole story. There are some truths that are universal, and this is rarely treated as such. By way of a simple example, the value of Pi can be expressed as 3.14, 22/7 or 3.141592654. These are all correct to various degrees of accuracy, but will produce slightly different results. If the constants were all fed from one source and called up as required, that would remove the variations.

CIBSE is working on a solution for this, by making our data available from a single source that engineers can access by calling them up programmatically. Watch this space for progress reports in the near future! **CJ**

There really is no difference between a digital engineer and the more traditional notion of an engineer. This mends a rift that happened maybe 30 years ago

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BUILDINGS FOR THE FUTURE

Future structures will be carbon negative, climate resilient and integrated into the local community, according to engineers and sustainability experts at Buro Happold. They tell **Andy Pearson** why the next generation of buildings must be designed today

What will the building of the future be like? The climate crisis is bringing new and evolving challenges to the way we live, work and build. The changing climate is shifting the parameters for urban design and building performance: communities, infrastructure and built assets will have to be increasingly resilient to enable them to cope with higher temperatures, increased wind speeds, more intense rainfall and the associated risk of flooding.

Construction has a leading role to play in minimising the impact of the climate crisis but construction, too, will need to change. It currently contributes more than 23% of the world s greenhouse gas emissions and is responsible for more than 30% of global resource consumption.

Many buildings currently being designed will not be occupied until 2035 or even 2040, so how will the industry bring about positive social, economic and environmental change?

Climate resilience

Buro Happold has won Consultancy of the Year (over 300 employees) at the CIBSE Building Performance Awards for the past five years. We asked experts at the firm what will make a resilient building and community in the future.

If you were to plot on a map the areas of high heat risk, and then add the areas where there is likely to be future flooding, you are left with a much smaller part of the world where it is actually feasible to be building, says Nancy Wood, associate director, sustainability and physics.

Mark Dowson, associate director, says climate resilience is becoming increasingly important for buildings, and adds: The commercial real estate sector is taking resilience very seriously at the moment, with the new Task Force on Climate related Financial Disclosures requirements.

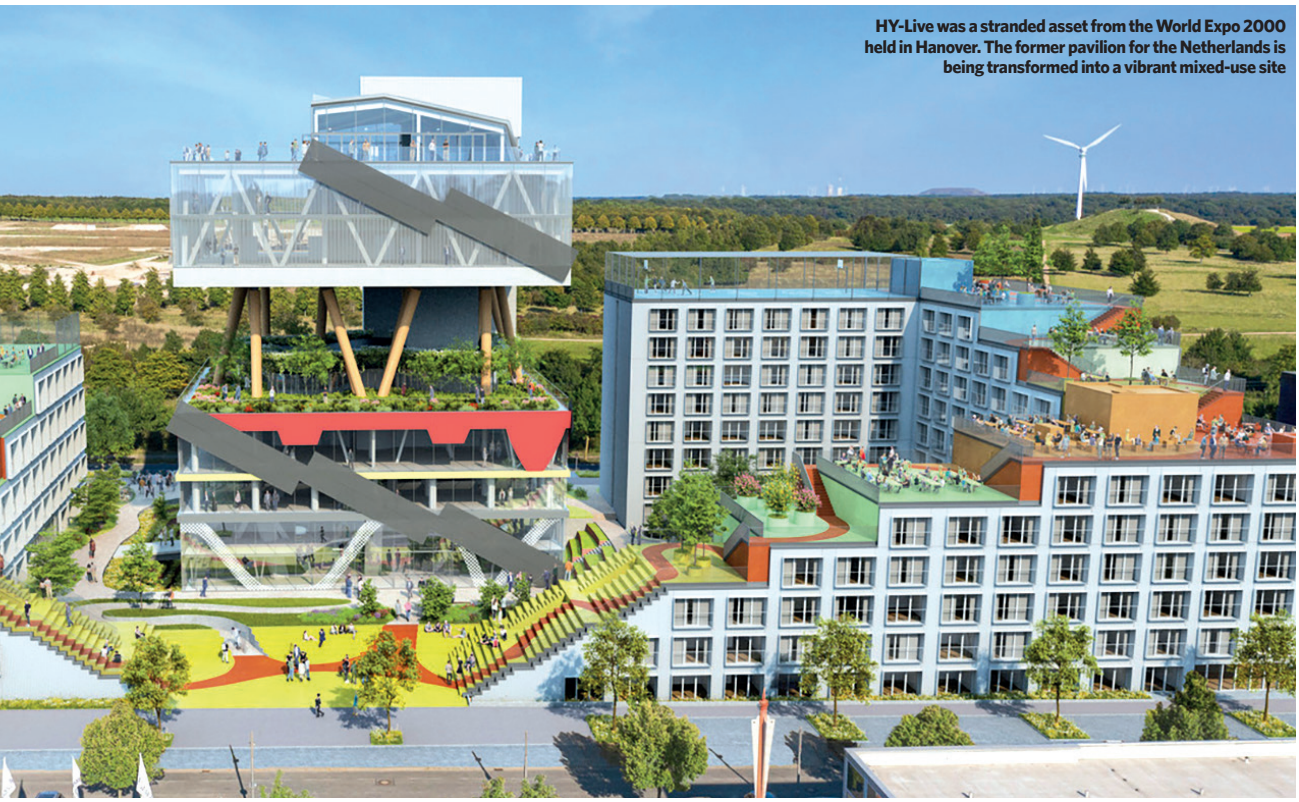
Fergus Anderson, sustainability and environment associate, explains that a resilient building is one that is net positive energy, net zero water and future proofed against issues of resource scarcity. By doing these things, you are making your building more resilient against future geopolitical tensions and the challenges associated with resource flows, he says. There is the need to design for the different shocks and stresses that we ll see as the climate changes through rising temperatures and extreme weather events.

Sustainability consultant Martha Dillon says designers should be thinking about what happens to buildings when they start to degrade, so that they can be adapted. Maybe we need to think about a modular approach and access for maintenance becoming a much bigger part of a design than it has been, she says.

Embodied carbon

As buildings become more energy efficient in operation, the carbon embodied in the structure and plant is increasingly significant. Anderson says embodied carbon should be brought into Building Regulations.

Dillon is part of the Buro Happold



HY-Live was a stranded asset from the World Expo 2000 held in Hanover. The former pavilion for the Netherlands is being transformed into a vibrant mixed-use site

team working with C40 Cities and its clean construction campaign, which is focused on reducing embodied carbon and environmental impact.

She says Buro Happold has published Clean Construction research that outlines what it would look like for cities on different continents to completely transform their construction industry to be healthy and non polluting, and without the use of raw materials.

Some clients with which Buro Happold works, such as developer Lendlease, are starting to set very challenging net zero requirements that are increasing the focus on embodied carbon. By 2040, Lendlease is looking to achieve Absolute Zero Carbon, scope 1, 2 and 3 emissions, across its Europe operations.

The Ellinikon Marina Residential Tower designed by Foster + Partners aims to be Greece's first green high-rise tower

[Suppliers] are going to have to change from being extractors of raw materials to reusers if they are to be net zero

Currently, it is looking at developments in and around London, some of which are five or 10 years away, so it is already having to think very hard now about how to close the carbon gap, Dowson explains. Mostly, the issues are around embodied carbon, because it is relatively straightforward to get operational carbon to net zero now.

He adds that there will have to be a massive shift in the industry supply chain for all companies that manufacture and deliver materials to sites: They are going to have to change from being extractors of raw materials to reusers if they are to be net zero.

Building services is one of the areas in which more work is needed on embodied carbon, says Dowson: All suppliers need to raise their game, and they need to do it quickly, because big clients are demanding it now.

Dillon uses the example of Kaesong City, in the Philippines, to explain how reusing materials could work. There is an informal, efficient materials recycling system, which means that, when a building is demolished, nothing goes to waste. Instead, materials get resold by junk shops and other groups that take it to resell it, she says.

Dowson adds that developers may soon be sharing materials between sites, which will mean allocating sufficient space for storage and radically changing how office fit outs are undertaken, to prevent materials from being thrown into a skip. Developers may also start to make connections with the local community to share materials. It will be a huge shift in approach and a big opportunity, he says.

Anderson believes industry must

find a balance between embodied carbon and how much material is put into a building to make it resilient. The extraction of materials impacts the environment and the humans and communities that live nearby, he says, which is why designers, clients and developers need to increase their understanding.

Our economic system should start to acknowledge the true cost of materials; maybe that will push people to say how do we reuse this asset or the parts of our cities that are underutilised or decaying , Anderson adds.

Smarter buildings

According to building performance engineer Georgios Grigoriou, buildings will need to become smarter to interact more effectively with occupants, services plant and equipment, and energy infrastructure. Data will be key, he adds, and will be supplied by a network of sensors to give information on everything from environmental conditions to the status of components.

Maintenance will change to being proactive, using data and data analysis, to allow us to predict and prevent failures, and save money, he says.

Smart, Grid interactive buildings are emerging that incorporate electric or heat batteries that can respond to the Grid and make use of surplus generation capacity and cheaper electricity, says Grigoriou.

Perhaps the most radical change he predicts is that smart buildings will allow gamification of building performance. Gaming software could be used to engage, entertain and educate building users about potential energy savings, with players awarded points for turning off lights, for example, he says.

Placemaking

Placemaking is about the spaces between buildings. Climate resilience ties in well with lots of placemaking topics, particularly when dealing with the smaller spaces between buildings.


Newcastle University's Urban Sciences Building has 4,000 sensors to help optimise user comfort and energy performance

On one of my projects, where our client is a London borough, the brief asked us to address fuel poverty, says Wood. Climate resilience is key to that whole strategy: we re pursuing the scheme using Passivhaus principles and using placemaking to knit the development together.

Dowson agrees that outdoor spaces have a key role to play in residential design. He s working with the London Legacy Development Corporation [planning authority for Queen Elizabeth Park] on a residential pilot project. We ve completed two years of post occupancy monitoring, he says. Detailed findings are being collated, but initial findings indicate the importance of placemaking and outdoor spaces in allowing different elements of the community to connect and thrive.

Dillon says community energy models are really taking off , which will help decentralise energy production and protect people against energy price rises. Building services are the lifeblood of this change and will enable a lot of the big structural changes to happen, she adds.

Anderson believes we should think of buildings as a system connected to a city of systems. There is a need to look at the role the building plays in community resilience, also looking at where it can draw on the services or systems delivered by the buildings and infrastructure around it, he says.

> There is a need for political direction to signal where we need to go with retrofit, and to make the funds available

A different approach to building design is needed, he adds, if we are to minimise the risk of assets becoming stranded when shock or stress events change social needs, service provision or ways of working. Build what we currently need and then expand, contract and adapt the building as needs change over time, he says.

There are technical challenges with this approach, but the biggest challenge is a shift in the designer s mindset from success being seen as delivering the final scheme to delivering something that may never be finished, but continues to evolve.

A different approach will also be needed for developing nations, to use the skills they already have and to support them to develop in clean ways. Smith Mordak, Buro Happold s director of sustainability UK, and architect Julia Watson have worked on the installation Our Time on Earth, where Buro Happold established what could be learned from indigenous communities and the low tech solutions they have been using for centuries.

They start from the point of how do we design something to last for seven generations? ; it s about working with available materials, respect for the natural environment and ecosystems, and the natural cycles of ecosystems, says Anderson.

The retrofit challenge

There was agreement that the current rate of retrofit of existing buildings to improve energy performance is not ambitious enough. Energy Systems Catapult released a study recently that showed that, even in leaky, Victorian terrace buildings, it was possible to retrofit to EPC A, says Dillon, who adds that the study made clear there are not many types of UK housing that cannot be retrofitted to enable heat pumps or electric heating. It s the financial and stimulus barriers that are the issue.

A major challenge with retrofitting homes to make them more energy efficient is upfront cost. While the investment will pay back over time, it requires financing that many people don t have. There is an important need for political direction to signal to the market this is where we need to go with retrofit, and to make the funds available, Dillon says.

Dowson believes retrofit is a social issue that industry needs to address, and adds: Tackling the retrofit challenge is fundamental to reducing the cost of living and preventing fuel poverty; our industry cannot ignore that. **CJ**


The modular Edge Suedkreuz offices in Berlin will have a timber structure

POST-OCCUPANCY

After the success of Nabers in Australia, the UK is playing catch-up on building performance monitoring. The Department for Business, Energy and Industrial Strategy is currently looking at a new performance-rating standard for commercial buildings. 'All new builds are going to have to achieve 5- or 6-star ratings for operational performance, and existing buildings are going to need a lot of hard work around fine-tuning,' Dowson says.

He adds that the Greater London Authority (GLA) has introduced a 'be seen' policy, which means major developments need to monitor and report on their actual performance for five years to create a central GLA database.

While the initiative is focused on energy, Dowson says some Buro Happold clients – such as Old Oak and Park Royal Development Corporation – have undertaken pilot studies on post-occupancy evaluation methodologies that include gathering user feedback. There are barriers to overcome, including the General Data Protection Regulation (GDPR), but Dowson says monitoring and disclosure 'will transform the way clients decide to design, procure and retrofit their buildings'.

CELEBRATING CAREER PIONEERS

Kevin Mitchell FCIBSE has called on CIBSE members to inspire the next generation of building services engineers. **Alex Smith** finds out what makes a great mentor and looks at the value of paying forward

At his inaugural address, new CIBSE President Kevin Mitchell made special mention of four people who had helped develop his career. They were past President Terry Wyatt FCIBSE, Treve Mitchell, Tim Dwyer FCIBSE, and Alan Knight, who at Hoare Lea had encouraged Mitchell to explore the world of building services when he was still on the road to becoming an automotive engineer.

Mitchell said he was lucky to have been surrounded by brilliantly supportive people and challenged the audience to celebrate their icons, including people who had inspired them in their careers. It was one of five challenges laid down by the President (see page 20). Two more relate to careers: the second was to reach out to future engineers and encourage them to join the industry, and the third was to boost the development of early career engineers.

Mitchell was asking the audience to pay forward the support they received from their mentors to the next generation of talented engineers.

Immediate past President Kevin Kelly says a great mentor will help develop someone s full potential. He remembers past president of the Dublin Institute of Technology (DIT) Professor Brian Norton as his great inspiration , encouraging him during his doctoral degree.

He inspired me to increase research output by supervising PhD research and, later, through my staff, when I was a head of department and again as head of school in DIT. He himself supervised dozens of PhD students and was a towering intellect and inspirational leader, says Kelly.

In the autumn, Mitchell will host an event that celebrates the industry s icons and, to get the ball rolling, we have asked engineers to name those who inspired them, and tell us how mentoring can help develop the next generation of engineers. **CJ**

THEY BROUGHT JOY AND PASSION TO ENGINEERING

Mstep founder Sasha Krstanovic FCIBSE describes how Bob Spittle and Paddy Conaghan FCIBSE helped develop her career

Bob Spittle was my first boss in the UK and he was very egalitarian. In my interview, he made me feel very comfortable and I found it easy to explain myself. It was the best and kindest interview I ve ever had.

He was very incisive in the way he approached engineering; one of those rare engineers who simplified things. He was elegant and clear there was no complication, no faff. Working with him was a joy.

Bob was my biggest supporter and promoter. His support meant I had the respect of my peers, and I could face the opportunities and challenges with confidence.

Paddy Conaghan also stood out. His mantra was that you should always try to delight. He was really into his craft, and spoke with joy and passion; the richness of his language was phenomenal. Paddy was super prepared for every meeting and there was such strength and rhythm in what he said he was mesmerising.

In an era when we were being driven to conform to a template and wear a suit, Bob and Paddy were breaking out of the mould and paving the way for a more diverse industry.

Bob was a surfer and a bit of a hippy, while Paddy had his big cigar but they didn t go against the grain for the sake of it. The best engineers embrace a different way. The industry realised this about 10 years ago, when it saw there was a dearth of engineers.

At the start of my career, everyone was indentikit, but the industry has mushroomed into this rich, beautiful tapestry that we have now.

Being a mentor

The best mentors are those who listen to what is needed and then explain what can be done and provide the tools to do it. They let people develop, but if they get too close to the edge they will intervene. Sometimes it s hard to let go. I m learning that people are better than I give them credit for, and I have to stand back and make space.

Communication is super important. Being courteous and delightful is key, as the industry can be stressful.

I work on the diversity and inclusion board of the Equilibrium Network at the University of Nottingham and teach at the University of West of England, plus there are interns at Mstep. I learn a lot from young people and it is very rewarding. For example, they all use iPads to draw, and I ve now learned how to use it for tracing. That s how we stay fresh, by learning from the next generation. **CJ**

Sasha Krstanovic

Paddy Conaghan

David Lindsey

Tom McNeil

Katie Clemence-Jackson

BACKING THE NEXT GENERATION

David Lindsey MCIBSE, senior partner at Max Fordham, was inspired by his uncle, a chemical engineer, to get into building services. He in turn is supporting two early career engineers:

Tom McNeil is a senior building performance engineer at Max Fordham. He's been with us for nearly 10 years, having previously studied environmental design of buildings and completed research with the Glasgow School of Art.

I've always noticed his ability to engage with an issue and with people. Likewise, his skill at listening and responding to a client or a contractor in a positive, concise and considered way. He's now a Soft Landings specialist, works on many Passivhaus projects, and leads our approach to post-occupancy evaluation.

Tom is also a CIBSE Low Carbon Consultant and Low Carbon Energy Assessor, and a member of the CIBSE Homes for the Future group. His passion and ambition for building design is infectious, and he is inspiring many junior and senior members of the industry to strive for better.

Katie Clemence-Jackson is also a very inspiring engineer. She leads our Net Zero group, chairs the CIBSE Technology Committee, is one of our newest managing partners, chairs the Max Fordham equality, diversity and inclusion group, and advocates for improving diversity in the industry by organising STEM outreach. She's been heavily involved in progressive projects such as Agar Grove Estate. Engineers like Katie are the future of the profession!

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Setting the standards for central ventilation equipment in healthcare premises

This module provides an introduction to Health Technical Memoranda and explores one of the most recent updates

CPD CIBSE APPROVED

Continuing professional development (CPD) is the regular maintenance, improvement and broadening of your knowledge and skills, to maintain professional competence. It is a requirement of CIBSE and other professional bodies.

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Modules are also available at **www.cibsejournal.com/cpd**

For those who work in the design of technical services and installations for UK healthcare premises, the primary set of references are the Health Technical Memoranda (HTMs) (which exist in a parallel form for each of the four health systems of the UK nations). The freely downloadable HTMs provide an incredibly useful resource well beyond the confines of healthcare premises, and make a useful adjunct to any building services engineering library. This article will provide an introduction to the HTMs and concentrate on information from one of the most recent updates, part A of HTM 03 01 *Specialised ventilation for healthcare premises*.

Emissions resulting from building energy use in the NHS dropped by almost 50% in the period 2013 to 2019, most significantly as a result of the decarbonisation of the UK electricity grid.[1] However, robust design and operation present continuing opportunities to reduce systems energy use towards the goal of net zero by 2040.[2]

The potential for significant environmental and cost benefits of good quality, holistic design and operation of engineering systems is immense. The various HTMs are connected by HTM 00,[3] which considers the policies and principles of healthcare engineering, providing the underpinning management and operational policies that have been drawn and developed from earlier documents, and also explores issues of risk management. The series of HTMs has evolved and transformed since the establishment of the NHS in 1948, and is now focussed on eight specialist areas.

HTM 03 01 *Specialised ventilation in healthcare premises* has two parts. Part A: *The concept, design, specification, installation and acceptance testing of healthcare ventilation systems* sets the standard for new installations and major refurbishments of existing installations. Part B: *The management, operation, maintenance and routine testing of existing healthcare ventilation systems* sets the standard irrespective of the age of the installation.

This article will focus on the recently updated HTM 03 01 A that provides extensive guidance amounting to more than 200 pages, which is complemented by the 60 pages of HTM 03 01 B.

In many areas, the challenges for ventilation include appropriately reducing the bioburden and other contaminants in the air to protect the patient, other patients and personnel, both locally and beyond, as well as addressing the control of increased fire risks where there are more flammable materials and chemicals, or less able patients. Practically all areas will require reasonable comfort conditions, even where widely diverse clothing is worn by occupants patients and personnel in the same space. The updated HTM includes revised design information for specific healthcare applications, together with rationale given for any significant changes. A substantial section of the HTM provides the requirements that relate to particular healthcare zones, such as operating departments and interventional imaging suites, as well as explaining the needs for more generic zonal functions such as ultra clean ventilation systems, extract systems and plantroom ventilation.

A brief commentary on legislation for UK healthcare premises covers the Building Regulations, COSH, Health and Safety at Work Act, and Workplace Regulations, as well as those specific to healthcare such as the »

» Health and Social Care Act, the Medicines Act, and Human Medicines Regulations.

Among other significant changes, notes on resilience and diversity permeate across the guidance.

Required standards of air quality have developed since the previous 2007 edition, now aligned with BS EN 16798 3:2017,[4] and filter requirements now refer to ISO 16890.[5] In tune with the zeitgeist, there is more specific coverage on refurbishments and change in the use of an existing installations, with specific information on life cycle analysis and updating of mid life plant. The importance of appropriate handover information is highlighted as aiding this process, as well as informing the selection of replacement parts and equipment. All new major projects are required to use BIM to ensure coordinated design, providing information for the operational phase and possible future development. The soft landings [6] approach is strongly recommended for the client and contractor.

The considerations that relate to the equipment selection and installation provide the largest section in HTM 03 01 A. These include extensive and detailed recommendations to ensure that the equipment is suitable for application in a healthcare setting, as well as ensuring the best life cycle performance. When discussing installation standards, the HTM frequently emphasises the need to include sufficient space, access and facilities to reach and handle all elements of the plant that would reasonably need maintenance or replacement. The newer technologies and increased versatility of control have enabled increased granularity in the specification of acceptable airflow rates for specific applications aimed at reducing energy consumption while maintaining air quality. As an example of the depth of detail provided by the HTM, when selecting an AHU, criteria drawn from the various HTM

Dampers

9.19 – motorised spring-return low-leakage isolation dampers should be located at the intake, supply, return air and discharge duct connections of an AHU and associated extract unit

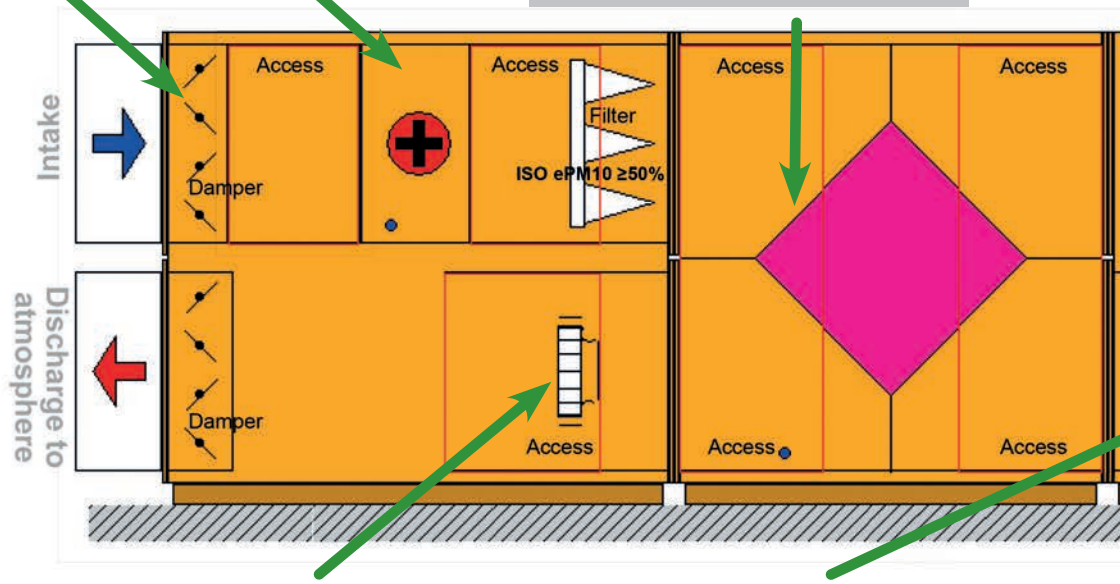
9.18 – plastic-bladed dampers, internal bypass dampers or gears should not be fitted

Fog (frost) coil

9.75 – constructed of plain tubing without fins
Raise air temp by 2K above dew point to minimise condensation
9.76 – frost coils not normally used – use fog coil
9.77 – if steam coil, may be of cleanable spiral finned copper tube
9.8 – access on both sides of the coil

Energy recovery

9.65 – energy recovery fitted to all supply and extract systems.
9.67– Energy-Related Products minimum efficiencies required
9.66 – plate heat exchangers are the preferred option.
9.68 – PHE should be constructed of metal; in coastal areas stainless steel is preferred - no plastic
9.69 – if thermal wheel then only a sensible heat wheel with purge sector
9.109 – drain trap of clear borosilicate
9.105 - 9.112, 11.24 – explicitly detailed drainage provisions required
9.66 – cleaning access on both sides



Intake and discharge

9.31 – designed and located so wind speed and direction have a minimal effect on the plant throughput
9.33 – intake situated away from external sources of heat or contamination
9.36 – fitted with corrosion-resistant weatherproof louvre or cowl
9.35 – locate to prevent short-circuiting discharge to intake
9.38 – cleaning access required

Construction and position

9.15 – corrosion-resistant external finish, potentially coloured to aid identification
9.16 – no organic materials or substances that can support the growth of microorganisms
9.38 – duct behind a louvre, preferably self-draining or suitably tanked and drained
10.13 – positioned so that all parts are easily and safely accessible

Extract fan

9.4 – direct-drive (EC) fans are preferred
9.41 – if beyond capacity of EC fans – direct-drive plug fans with external mount inverter
9.43 – must be swappable within 20 minutes. Preferably on the bottom deck of AHU, with optional run and standby configuration
9.45 – belt- and pulley-driven fans not to be used
9.46 – supply fan positioned to blow through the central plant so that coil/humidifier drains under positive pressure. Energy-recovery device may be either side with drain on extract side
9.49 – fan output should be set to give a constant volume of air, controlled from measuring pressure drop across the fan suction nozzle
9.21 – access doors to have two-stage opening to prevent the door blowing violently open when unlatched

Supply fan

sections would be applied as illustrated in the example notes of Figure 1.

Detailed information is given on the commissioning process, and standards and methodology for acceptance have been completely revised. All new and refurbished ventilation systems are required to be independently validated (not simply commissioned) to assess fitness for purpose as a whole prior to acceptance by the client. The validator, a suitably qualified competent engineer familiar with healthcare ventilation requirements, will be appointed and paid for by the client and be completely independent of all those involved in delivering and operating the installation. They will be involved throughout the complete project cycle and have extensive responsibilities, although the validator will not be responsible for snagging.

The HTM requires that the energy consumption of ventilation systems should be minimised by specifying solutions with the lowest life cycle environmental cost, with the core objective of energy saving strategies in the HTM aimed at providing the required ventilation service using minimum energy. HTM 00 notes that whatever the solutions, they should be specified with the lowest life cycle environmental cost. Routine inspection and maintenance guidance has been revised and updated, with pragmatic recommendations included.

The changes to HTM 03 01 made since the previous 2007 edition are significant and merit a thorough inspection of the revised document. However, the changes are not retrospective but look forward to the revised recommendations being carried through in new installations and major refurbishments.

The HTM provides a salutary warning that designs that are simply repeated from previous installations, designed to superceded standards and guidance, will not meet the revised energy or operational standards and will not produce a compliant result.

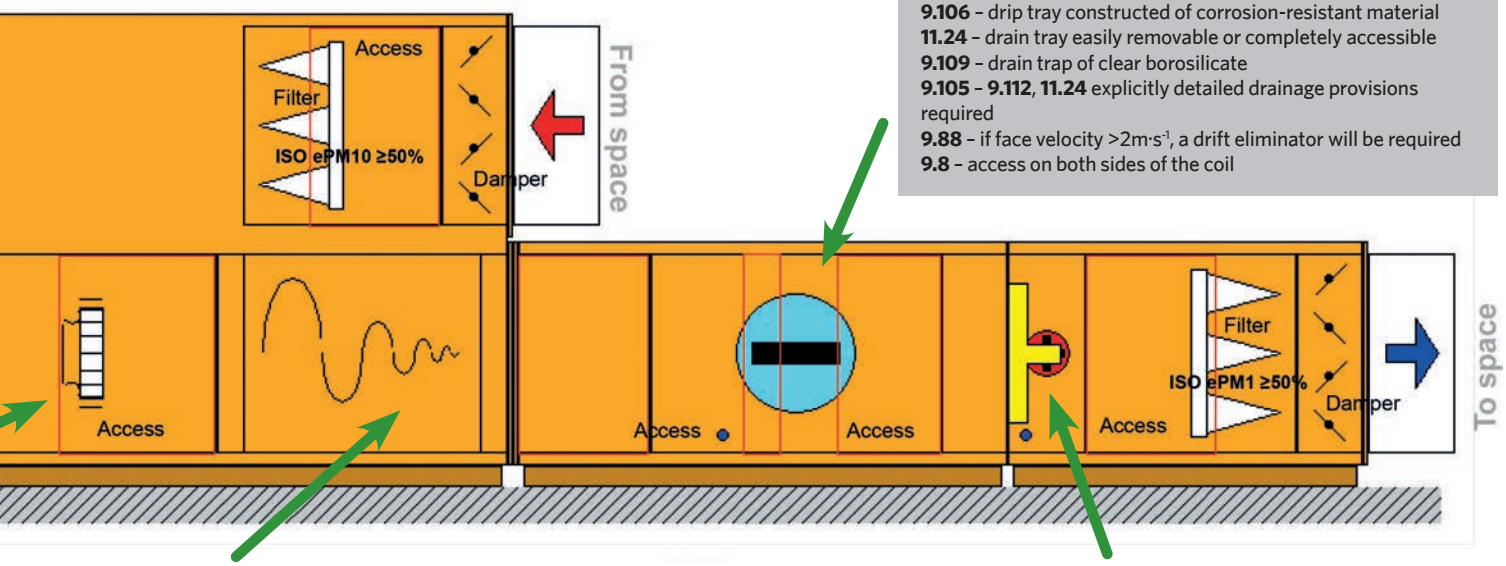
Turn to page 38 for references.

Filters

9.56 – compact filters preferred.
9.58 – EPA and HEPA filters kept to a minimum – replaceable panel type, properly and verifiably installed
9.60 – required where heat recovery devices are installed and used to reduce the load on EPA filters in recirculation applications
9.51 – securely mounted in well-fitting frames so airflow pushes the filter into its housing
9.52 – readily accessible and internal illuminated upstream side visible through viewing port
9.53 – pressure drop monitored by sensor linked BMS, with capped pressure tappings for portable manometer
9.61 – where hazardous substances, provision included for safe removal/ replacement
11.56 – maintained clean with a replacement set available

Cooling coil

9.86 – chilled water is the preferred option, else DX
9.91 – preference for copper tubes with copper fins electro-tinned after manufacture. Aluminium fins only if vinyl-coated
9.87 – coils should be cleanable – fin spacing ≥2.5mm and ≥0.25mm thick
9.88 – eliminator unit required to be removable
9.89 – fitted with independent drainage system
9.92 – parts and associated ductwork manufactured from corrosion-resistant materials. Stainless steel preferred
9.106 – drip tray constructed of corrosion-resistant material
11.24 – drain tray easily removable or completely accessible
9.109 – drain trap of clear borosilicate
9.105 – 9.112, 11.24 explicitly detailed drainage provisions required
9.88 – if face velocity >2m·s^{-1}, a drift eliminator will be required
9.8 – access on both sides of the coil



Attenuator

9.113 – in low pressure systems, should only be needed to absorb fan noise
9.116 – made of suitable sound absorbing in-fill protected with perforated sheet metal preferred. Attenuators downstream of the filters require a cleanable membrane

Humidifier

(Not included in this system)
9.95 – humidification not required unless there is a very specific requirement
9.98 – if required, only steam-injection manifold-type humidifiers with locally-generated steam
9.100 – cleanliness of water supply essential for safe operation
9.102 – draining down supply pipework and break tanks required for periodic disinfection and cleaning
9.105 – 9.112, 11.24 – explicitly detailed drainage provisions required

Re-heat coil

9.78 – constructed of solid drawn copper tube coils with copper fins
9.8 – access on both sides of the coil

Figure 1: Examples of detailed recommendations provided by HTM 03-01A in the selection and provision of an AHU – notes abstracted and edited from HTM 03-01 Part A; paragraph numbers as indicated

Module 197

June 2022

» **1. Which specific HTM is likely to be most useful when considering routine testing of existing ventilation systems in healthcare settings?**

- ☐ A HTM 03 01 A
- ☐ B HTM 03 01 B
- ☐ C HTM 03 01 C
- ☐ D HTM 03 01 D
- ☐ E HTM 03 01 E

2. Which of these areas is not explicitly noted in the article as having requirements set by the HTM?

- ☐ A Extract systems
- ☐ B Interventional imaging suites
- ☐ C Operating departments
- ☐ D Out patient waiting areas
- ☐ E Plantroom ventilation

3. Which of these legislative instruments is not shown as being included in the HTM s commentary?

- ☐ A Building Regulations
- ☐ B COSH
- ☐ C Health and Care Act
- ☐ D Health and Safety at Work Act
- ☐ E Medicines Act

4. Which of these is least likely to be true for the validator?

- ☐ A Appointed and paid for by the client
- ☐ B Familiar with healthcare ventilation requirements
- ☐ C Independent of those delivering and operating the installation
- ☐ D Responsible for snagging
- ☐ E Suitably qualified competent engineer

5. Which paragraph of the HTM requires that a thermal wheel should have a purge section?

- ☐ A 9.8
- ☐ B 9.18
- ☐ C 9.43
- ☐ D 9.60
- ☐ E 9.69

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References:

1 Tennison, I et al, *Health care's response to climate change: a carbon footprint assessment of the NHS in England*, Lancet Planet Health 2021-5.
2 *Delivering a 'Net Zero' National Health Service*, NHS, 2020.
3 *Health Technical Memorandum 00: Policies and principles of healthcare engineering*, UK Government, 2014 Edition.
4 BS EN 16798-3:2017 *Energy performance of buildings – ventilation for buildings. For non-residential buildings – performance requirements for ventilation and room-conditioning systems*, BSI 2017.
5 BS EN ISO 16890-1:2016 *Air filters for general ventilation — Part 1: Technical specifications, requirements and classification system based upon particulate matter efficiency (ePM)*, BSI 2016.
6 **www.bsria.com/uk/consultancy/project-improvement/soft-landings/** – accessed 29 April 2022.

Low GWP chiller solutions for Oxford science labs

Three laboratories replace old chillers with air-cooled scroll chillers using R32 refrigerant

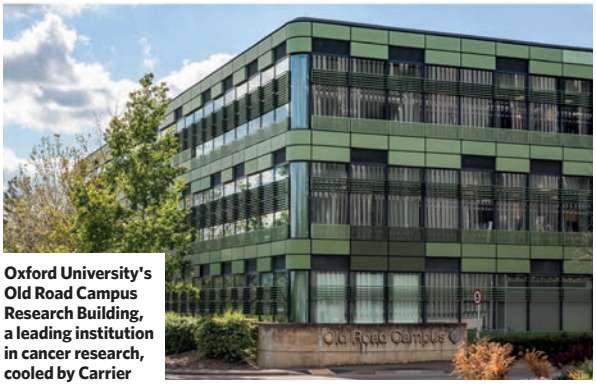
Three medical science laboratories at the University of Oxford have been equipped with Carrier chillers using low-global warming potential (GWP) R32 refrigerant, in line with the university's sustainability strategy of achieving net zero carbon emissions by 2035.

Four Carrier AquaSnap 30RBP air-cooled scroll chillers with Greenspeed intelligence have been installed at the Henry Wellcome Building for Genomic Medicine, the Weatherall Institute of Molecular Medicine at the John Radcliffe Hospital, and the university's Old Road Campus Research Building, a leading institution in cancer research. The Carrier chillers were specified by Heaton Design and Engineering, a building services consultant based in Witney, Oxfordshire.

The Carrier R32 units replaced less efficient chillers that were coming to the end of their working lives, delivering a significant improvement in the seasonal energy efficiency ratio for the Carrier replacements.

The new chillers were treated with super enviroshield condenser coating to protect the aluminium heat exchange surfaces from corrosion, with the aim of extending their working life. As a result, the condensers are covered by an extended seven-year warranty.

The project was carried out by installer Aircon Services.



Oxford University's Old Road Campus Research Building, a leading institution in cancer research, cooled by Carrier

New standard revision on refrigerants

The International Electrotechnical Commission (IEC) has approved a revision to safety standard EC 60335-2-40 to allow higher charge limits for hydrocarbons such as propane (R290) and other flammable refrigerants in domestic air conditioners, heat pumps and dehumidifiers.

The revision was approved on 29 April and allows for a larger charge of flammable refrigerants in new equipment designed according to certain additional safety requirements. Asbjørn Vonsild, convenor of the IEC working group that oversaw the revision process, said: 'The new edition of IEC 60335-2-40 will enable R290 to be used in many AC and heat-pump systems that were previously blocked from using this refrigerant. This will enable a thousand-fold reduction in direct climate emissions compared with systems using R410A.'

The new standard is expected to be published on 24 June.

Cost rises could hit steel based ductwork

The continuing rise in energy costs and the increase in price of galvanised steel could encourage the construction industry to adopt cheaper and more environmentally friendly ventilation systems, according to Spiralite ventilation technology manufacturer Khansaheb Industries.

Rising energy prices resulting from Russia's invasion of Ukraine have led to a rapid increase in wholesale electricity prices, raising the cost of running and manufacturing new ventilation systems. At the time of writing, British Steel had reported a 33% increase in the cost of steel because of energy cost hikes, from £750 per tonne to £1,000 per tonne.

Khansaheb believes these cost pressures, as well as increasing manufacturing process and transportation costs, could result in construction firms moving away from steel-based ventilation systems towards solutions such as its resin-based, prefabricated Spiralite system.

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CLEAR EVIDENCE

Cleanroom ventilation systems are used to ensure pathogen free indoor spaces in life science buildings, but can the technology be used in commercial offices? Clean Air Technologies **Brendon McManus** MCIBSE, **Richard Fagg** and **Steve Robinson** put the theory to the test by measuring the clean up rate in a mock up of a boardroom

Metrics are instrumental in assessing the level of performance in all aspects of life, be it engineering, sport or business tensile strength, lap times, share price; the list is endless.

Cleanroom technology for life science buildings is an area that demands particularly robust performance validation; every research establishment or pharmaceutical manufacturer s licence application must be supported by validated metrics.

The data delivers assurance that the correct levels of operator, product and environmental protection are being delivered by the ventilation systems providing clean, particle and pathogen free air to the critical space.

With the ongoing Covid pandemic, we believe there is an opportunity for a technology transfer from the established cleanroom design and validation principles to mechanically ventilated spaces in commercial buildings.

Covid has highlighted the importance of ventilation in the mitigation of risk from airborne infection in mechanically ventilated spaces. It s essential that equipment that claims to clean air has been tested and validated, as CIBSE emphasised in its 2020 Covid 19 guidance.[1] It notes that there was a lack of data supporting the claims of a new generation of air cleaning systems and technologies.

We set out to demonstrate and measure the potential benefits of the technology transfer of the principle of clean air technologies from the life science sector to offices and other commercial buildings.

For many decades, the life sciences industry has employed sophisticated ventilation systems and contamination control protocols, with the efficacy validated under stringent regulatory guidance. Pharmaceutical products are manufactured in cleanroom environments that control levels of airborne particulate for product protection.

We believe the tested system with its associated refined, disciplined and accountable processes provides the framework to improve and quantify workplace ventilation systems.

What is a cleanroom?

A cleanroom is a room with environmental control of particulate contamination, temperature and humidity, constructed in such a way as to minimise the introduction, generation and retention of particles inside the cleanroom. All cleanrooms are classified based on the number of particles in a cubic metre of sampled air, down to the sub micron scale, as per BS EN ISO 14644 *Cleanrooms and associated controlled environments*. Tables 1 and 2 provide

some context, demonstrating the required reduction in airborne contamination.

This level of cleanliness is reached by employing a range of technologies and procedures, with the key methods being:

- HEPA filtered supply air
- Positive room air-pressure cascades
- High air-change rates
- Room finishes
- Gowning of operatives
- Cleaning regime.

The key principle is to achieve top down air diffusion ventilation, with sufficient velocity and distribution to keep particles buoyant, so that they may be driven to air extraction/return grilles and removed from the air ventilation system by HEPA filtration.

Ventilation air diffusion patterns are usually a compromise between the ideal arrangement of high level laminar supply and low level extract, and the practical arrangement of the space to accommodate equipment and processes.

Figure 1 illustrates the impact of air diffusion, and the difference between two systems with identical filtration and airflow volume flowrates.

Pre emptive techniques such as gowning protocols or micron scale cleaning are extremely challenging to practically implement in a typical workplace environment. However, proactive methods such as HEPA filtration, air diffusion technology and positive pressurisation require minimal adaptation. These tests measured the impact that proactive methods could have on the reduction of airborne particulate and, thereby, the associated risk of airborne infection of occupants

Constructing a full scale mock up

A boardroom measuring 3.3m x 5.5m x 2.5m was selected to act as the test cell for a cleanroom type ventilation installation. This room accommodates eight occupants in a relatively tight space, which provides a good representation of a high risk environment for the transmission of viruses (see Figure 2).

The boardroom was fitted with two 600mm x 600mm H14 (99.995% effective against most penetrating particle size) HEPA fan filter units (FFUs) with bespoke swirl diffusers, each diffusing 540m^3·h^{-1} of clean air into the space.

One unit was connected to a low level return air grille, designed to blend aesthetically with the office environment, which ran at a constant rate to manage the base load of particulate contamination generated by the occupants. The second unit was ducted to a fresh air supply and was controlled from a signal provided by a wall mounted CO_2 sensor.

Increased energy consumption is an unavoidable consequence of filtering air because of the resistance generated by the filter media and the corresponding load on the fan. So it is important to keep the volume of air filtration to the minimum required to mitigate risk rather than to operate at 100% duty, 24/7.

Real time particle counting was investigated for controlling the fan speed, but these counts are not a good analogue for risk, as particles will be generated by the surfaces and objects within the space. »

There is an opportunity for a technology transfer from the established cleanroom design and validation principles to mechanically ventilated spaces in commercial buildings

Particulate	Size (µm)
Human hair	80
Limit of visibility	40-50
Fog	1-50
Pollens	30
Fungi	6
Tobacco smoke	0.3
Bacteria	0.3
Virus	0.1

Table 1 (left): Typical particulate sizes

Environment	Particulate concentration @ ≥ 0.5µm (particles/m^3)
Urban ambient	7,000,000 - 70,000,000
Office environment	7,500,000 - 35,000,000
Typical semiconductor cleanroom	350 - 3,500
State-of-the-art cleanroom	35

Table 2 (above): Typical environmental particle counts: cleanroom particulate concentrations (BS EN ISO 14644), and ambient and office environment representative values obtained from test studies

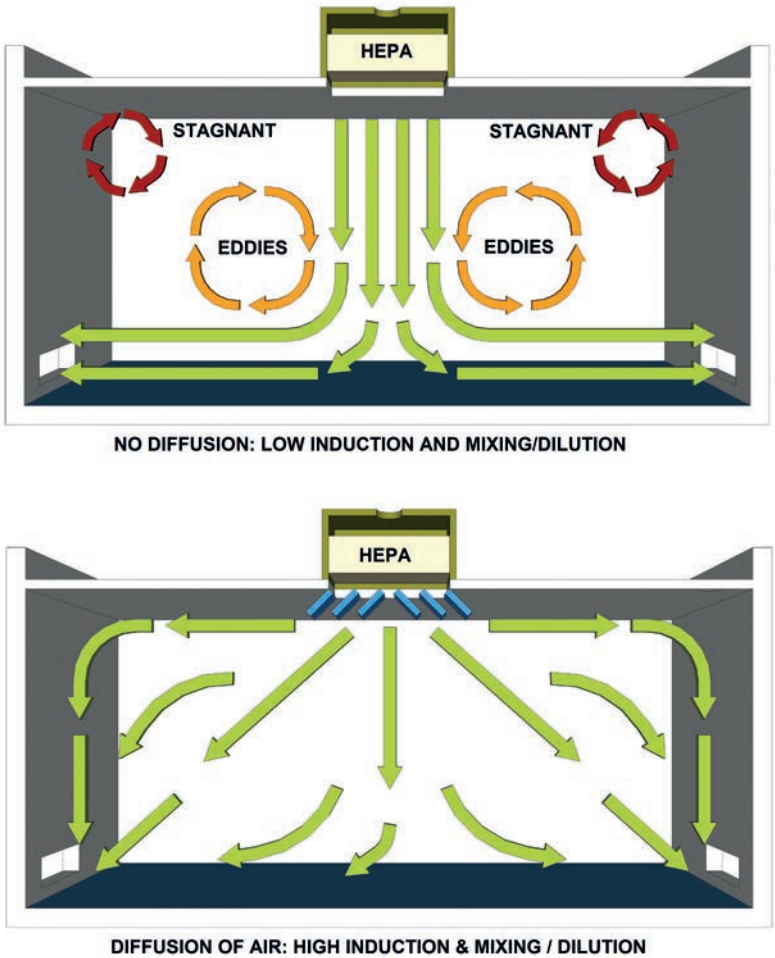


Figure 1: The impact of air diffusion in two systems with identical filtration and airflow

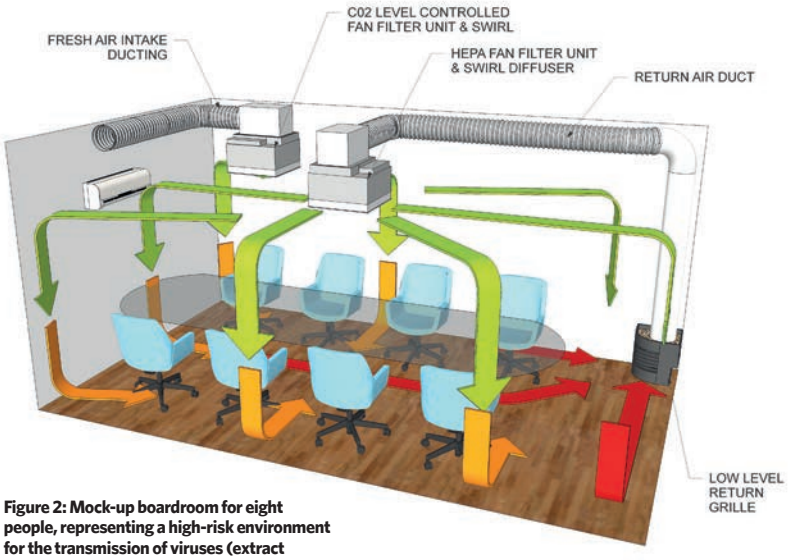


Figure 2: Mock-up boardroom for eight people, representing a high-risk environment for the transmission of viruses (extract system not shown)

» Elevated CO_2 concentration corresponds very well with elevated human activity this was employed as a proxy for potential air contamination in these tests. This second unit remains idle until there is a demand for ventilation air that is triggered by rising CO_2 levels the unit s fan speed modulates to manage the associated airborne risks presented by the human activity in the room.

The first unit provides approximately 12 recirculation air changes per hour, and the CO_2 activated fan will double this at peak occupant demand with ventilation air.

Comparative testing of solutions

To assess the efficacy of the boardroom system, a test based on cleanroom industry practices was devised to compare its performance against a commercially available mobile unit.

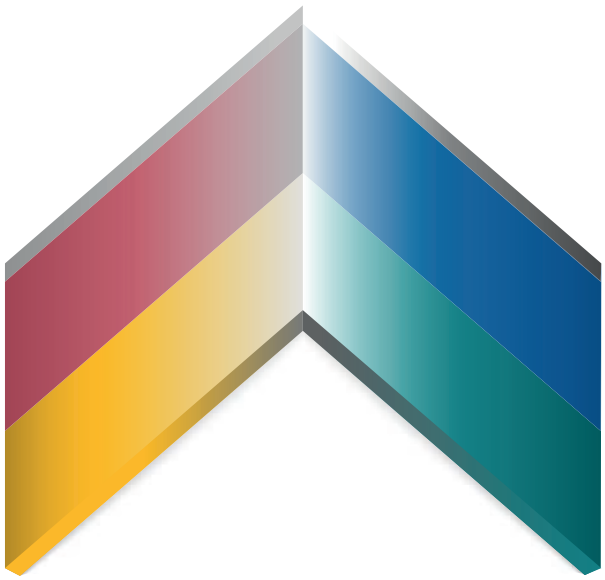
The space was challenged with particulates at a concentration of more than 100,000 per m^3. A particle counter took cumulative counts every minute to determine the rate at which each ventilation system cleaned down the space.

The top down, highly diffused air supply system cleaned down to zero detectable particles after 30 minutes, with occasional trace values logged thereafter this was achieved running a single recirculating fan, with the fresh air system disabled.

A mobile unit, circulating the same volume of air across the same grade filter, achieved a much slower clean up rate, achieving a particle volume of around 1,000 per m^3 after three hours.

These results show a significant improvement in clean up rates through the use of a top down, highly diffused air supply.

Research carried out using the test cell indicates that »



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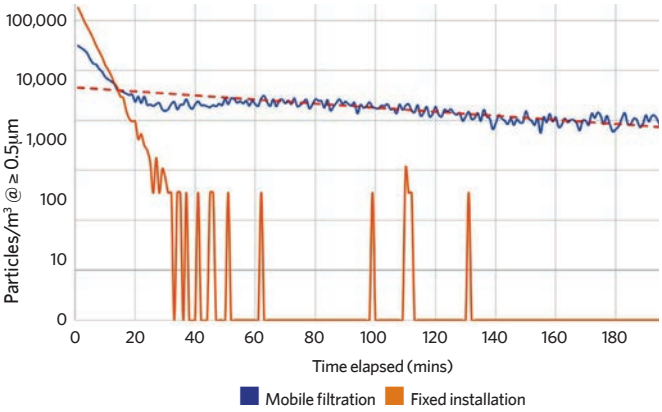

Figure 3: Clean-up rate comparison of mobile filtration unit and fixed installation at ≥ 0.5µm particle range

» trapping particulates and managing energy consumption on a matched to demand basis, using CO_2 monitors, provides an acceptable trade off between energy use and air quality. Outputs from the work can inform a number of design parameters that go beyond those discussed in this article see panel Design considerations (below).

One consequence of this research is real time monitoring of particles in the cleanroom sector. Currently, HEPA filters may be checked once every six to 12 months, but real time monitoring using a particle counter will allow operators to see when filters need changing.

CIBSE s call to action to effectively meet, and evidence, the needs of air cleaning not only led us to understand the efficacy of diffuse air systems in commercial settings, but also enabled knowledge transfer back to the cleanroom sector, which will potentially save time and money in the maintenance of life science laboratories. CJ

References:

1 CIBSE Covid-19 Ventilation Guidance, v5 (July 2021)

BRENDON MCMANUS MCIBSE is CEO, **RICHARD FAGG** is lead designer and **STEVE ROBINSON** is senior technical engineer, all at Clean Air Technologies

DESIGN CONSIDERATIONS

- Employ inline or terminal HEPA filters
- Utilise suitably sized and specified air-diffusion technology to drive air towards low-level return paths
- Apply top-down airflow to minimise disruption from base-build ventilation systems instead of reliance on convection/plumes to transport contaminants
- Maintain sufficient velocity and air turbulence throughout the room to keep particulates buoyant and ensure their capture by HEPA filters
- Correctly position high-level air diffusers for consistent sweeping of the space
- Actively monitor occupancy and CO_2 levels; ensure the ventilation rates are scaled to risk, reducing energy consumption
- Undertake downstream monitoring of airborne particulate levels, filter condition and ventilation rates for real-time reassurance that the system is protecting room users
- Consider other important comfort factors, such as attenuation of noise levels from fan/air
- Provide visual indications of system efficacy, reporting positive airflow and downstream particulate counts
- Colour code the air diffusers

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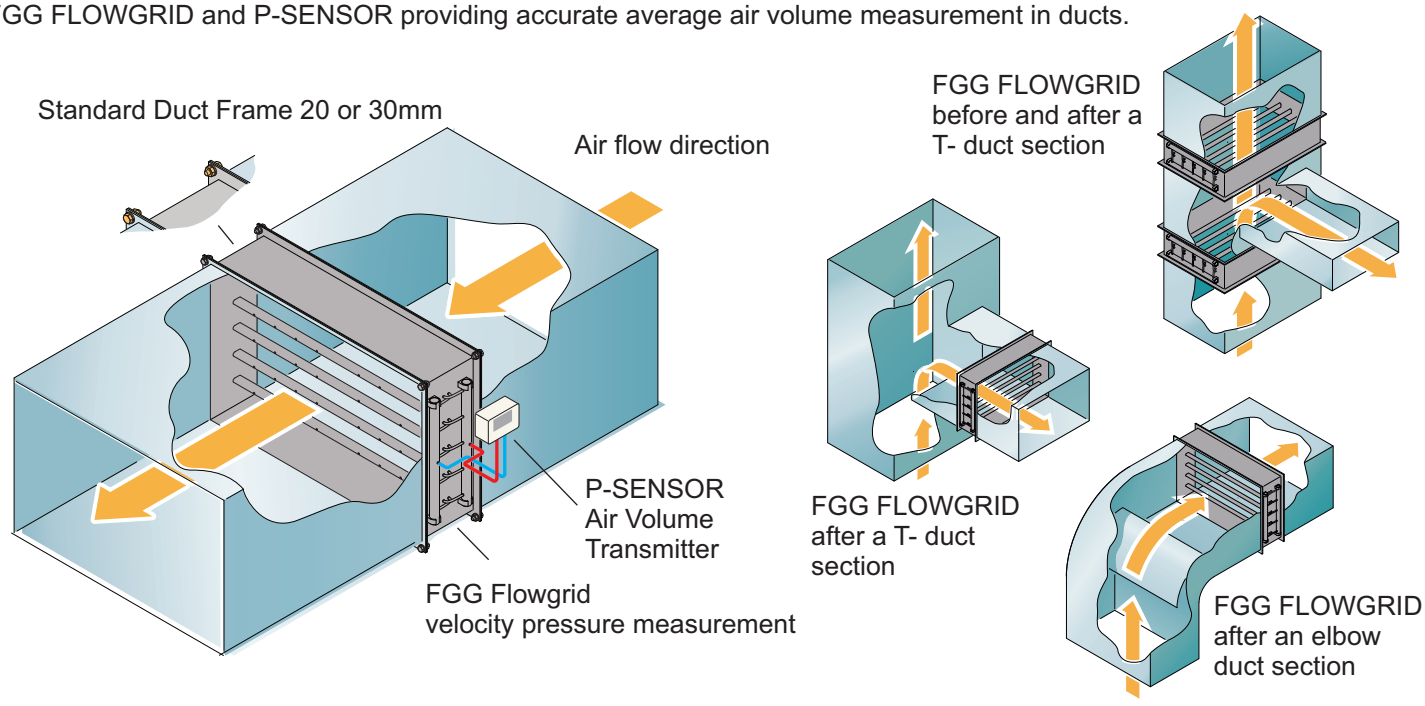

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ADDING SALT TO THE MIX

When comparing the energy use of air chilled and water cooled chillers, power used in desalination plants must be taken into account in places such as the Middle East, say Mott MacDonald s **Jismi Mohammed** and **Fergus Donaghy**

A changing landscape on chiller solutions is inevitable in the Middle East

With the impacts of global warming, the depletion of freshwater resources is accelerating. In Middle Eastern countries, with low rainfall, natural freshwater resources are limited, and desalination of seawater is the primary source of potable water.[1] However, desalination consumes energy, so any process that uses potable water generated from desalination will have a high level of embodied energy. The term water energy nexus defines this scenario.

Global building standards, such as ASHRAE 90.1/189.1, and region specific standards, such as the Dubai Green Building Regulations, consider water cooled chiller systems as the baseline for energy performance analysis/ audits. Water cooled chillers use cooling towers in which water is evaporated to provide cooling. Even though a water cooled chiller consumes less electric power to deliver the same cooling compared with an air cooled chiller, it is important that the in built energy expenditure of desalinated water used in chilled water production is accounted for in the comparison of chiller energy usage.

Type of project	Electricity		Water	
Residential customers: villa – expats	26.8 fils.kWh^{-1} – average daily consumption up to 200kWh	30.5 fils.kWh^{-1} – average daily consumption more than 200kWh	7.84 AED/1,000 litres – average daily consumption up to 5,000 litres	10.41 AED/1,000 litres – average daily consumption more than 5,000 litres
Commercial customers	20.0 fils.kWh^{-1} – all consumption		7.84AED/1,000 litres – all consumption	

Table 1: Water and electricity tariffs 2017, Abu Dhabi Distribution Company[2] (Conversion: 1 AED = 100 fils = around £0.22)

Desalinated water

In Dubai, approximately 90% of potable water produced is desalinated, and this is representative of other Middle East regions.

Desalination, storage and distribution of potable water is energy intensive. Each cubic metre of potable water supplied in Abu Dhabi costs 10.41 United Arab Emirates Dirham (AED)[2] (£2.35). This corresponds to around 34kWh of electricity, based on the Abu Dhabi municipality rate of 30.5 fils per unit (£0.07 per kWh) of electricity. The rates mentioned here are based on the actual cost of water and electricity production, because most countries in the region are planning to reduce

or eliminate subsidies for energy and water.

Treated sewage effluent (TSE) may seem like an efficient alternative for potable water in cooling towers in buildings. Each cubic metre of TSE water delivered will typically cost AED 1.3 (£0.28). With the additional cost of treatment required, through a reverse osmosis (RO) plant, the total cost per cubic metre will increase to approximately AED 5 (£1.08) about 17kWh of electricity, based on the Abu Dhabi municipality rate above.

Chiller plant efficiency

A comparative analysis of air cooled and water cooled chiller types in a 1,000 tonne chiller plant is summarised in Table 2. It includes full load and part load efficiencies for standard and high efficiency chillers.

For a 1,000 tonne cooling plant at its full load, a standard air cooled chiller consumes 1,255kW of electric power, compared with 576kW by a water cooled chiller. This shows that a water cooled chiller is 56% more effective at full load operation. To analyse the total energy impact, however, part load operation and auxiliary equipment efficiencies should also be considered.

Chillers will operate on a part load for most of the hours in a year. Hence, to assess power consumption, the part load performance should also be considered. An average of 66% load for an 18 hour operation per day is considered in this assessment. At 66% of full load, the same air cooled chiller will consume 621kW of electric power, compared with 363kW by a water cooled chiller. This shows that the water cooled chiller is 41% more effective, even in part load operations.

To verify the overall performance of the plant, rather than the chiller, this assessment is enhanced to include power consumption from auxiliary equipment (Table 3). By including auxiliary plant components, the efficiency figures start to come down. This is because a water cooled chiller uses additional evaporative cooling towers and condenser water pumps for heat rejection. Once these are included, the total efficiency figure for a water cooled chiller plant is only 28% higher than a similar capacity air cooled chiller.

To calculate and compare the actual energy consumed in producing each cubic metre of chilled water for a water cooled system, it is necessary to include the embodied energy of the water that is consumed in the cooling tower. Approximately 106m^3 per day of potable water will be consumed by a 1,000 tonne chiller plant, at 66% part load operation for 18 hours per day. The same plant, by using polished TSE, will consume 155m^3 of water per day.

Table 4 includes the cost and interpolated energy for potable and polished TSE water, based on cost figures from the region. This embodied energy of water typically will not be considered in building energy analysis. However, if embodied energy from the source of water is also included, the plant efficiency figures show a significant difference.

Table 5, over the page, summarises the energy usage from both systems and source. The data indicates that total electrical energy consumed per day by a 1,000TR air cooled chiller plant will be less than a potable water cooled chiller plant by 358kWh, if source water embodied energy is considered in the efficiency figures. This is equivalent to 150kg of CO_2 emissions per day. By using TSE, the energy consumption is marginally lower than an air cooled chiller plant. This is not significant when comparing the cost of »

Item	Air-cooled	Water-cooled
Cooling capacity	1,000-tonne	1,000-tonne
Chiller	Screw	Centrifugal
Chiller full-load efficiency (at AHRI 550/590 conditions)	Standard: **1.255kW/tonne** High efficiency: **1.089kW/tonne**	Standard: **0.576kW/tonne** High efficiency: **0.531kW/tonne**
Chiller part-load efficiency, IPLV (at AHRI 550/590 conditions)	Standard: **0.941kW/tonne** High efficiency: **0.640kW/tonne**	Standard: **0.549kW/tonne** High efficiency: **0.323kW/tonne**

Table 2: Chiller efficiencies from ASHRAE 90.1

Description	Air-cooled	Water-cooled
Part-load capacity at 66% load, tonnes	660	660
Chiller kW/TR at part load	0.94	0.55
Total kW for chiller at 660 tonnes	620	363
Chilled water pump kW at 660 tonnes – variable primary flow system	32	32
Condenser water pump kW at 660 tonnes	N/A	38
Cooling tower fan kW at 660 tonnes	N/A	38
Total system kW	**652**	**471**
Total plantroom efficiency, kW/tonne	0.99	0.71
Total kWh/day for an 18-hour operation	11,743	8,478

Table 3: Chiller plant efficiencies at a part-load condition

» maintaining a polishing RO plant. A detailed life cycle analysis will be required to assess the efficiency of polishing RO plants.

Conclusion

Air cooled chiller installations can offer better efficiency and energy/cost savings than a similar water cooled installation, if source water embodied energy is considered in the efficiency figures. With a rapidly growing sector of clean energy, the challenge is to reduce the consumption of water, as water becomes more expensive.

ASHRAE Standard 191, *Standard for the efficient use of water in building, site, and mechanical systems* is expected to explain the modelling compliance paths for water usage in building projects. The public review draft states: If a life cycle analysis is performed to compare an air cooled chilled water plant to a water cooled chilled water plant, the total energy of the air cooled plant may end up being approximately the same as the total energy that would be used by a water cooled plant if, for example, the water cooled plant was evaporating desalinated water that was being delivered to the site.[3]

We are working to assess indirect life cycle costs, as TSE plant component maintenance is expensive, and can have an impact on decision making. We are also working on the life cycle cost analysis of all three chiller plant types, over 20 and 35 years, to take into account environmental conditions in the region. As revealed by this stage of the study, the capital cost of water cooled plant with potable water is only 83% of air cooled plant, whereas with TSE associated water cooled plants the capital cost is about 200% that of an air cooled plant. This is primarily because of the cost of TSE/polished water tanks and RO polishing plant. However, when cost of space is considered, indoor versus outdoor (typically, roof for air cooled chillers) different scenarios are apparent. These are yet to be fully assessed.

When selecting chillers solutions in the Middle East, designers should be challenged on their chosen cooling source, keeping in mind that the energy consumed at the source of water impacts on the efficiency of the system and overall CO_2 emissions. CJ

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JISMI MOHAMMED IEng, MCIBSE, MASHRAE, is principal engineer, and **FERGUS DONAGHY**, CEng, technical director, at Mott MacDonald

Description	Potable water	TSE
Chiller plant capacity	**1,000 tonnes**	**1,000 tonnes**
Cycles of operation	6	10 (polished by RO)
Water consumption for 66% part-load for an 18-hour operation, in m^3 per day (for TSE – 70% efficiency considered for RO treatment)	106	129
Total rate of dilution water to discharge blowdown to sewer (20% of TSE consumption), m^3 per day	-	26
Total water consumption, m^3 per day	**106**	**155**
Total cost of makeup water, AED per day (£ per day)	1,103 (239.05)	775 (167.09)
Cost of electric power, AED per kWh (£ per kWh)	0.305 (0.07)	0.305 (0.07)
Interpolated electric power equivalent to the cost of water, kWh per day	3,616	2,540

Table 4: Water cost and interpolated energy equivalent

Description	Air-cooled	Water-cooled with potable water	Water-cooled with TSE water
Energy spent by chiller, kWh per day	11,160	6,534	6,534
Energy spent by cooling towers and condenser water pumping, kWh per day	-	1,368	1,368
Energy spent by chilled water distribution pumps, kWh per day	576	576	576
Energy equivalent of the makeup water consumed, kWh per day	-	3,616	2,540
Total energy spent by chiller plant, kWh per day	**11,736**	**12,094**	**11,018**
Equivalent CO_2 emissions, kWh per day (at the rate of 0.42kg·kWh^{-1})	4,930	5,080	4,628

Table 5: Energy comparison for chiller plants

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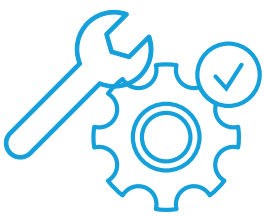

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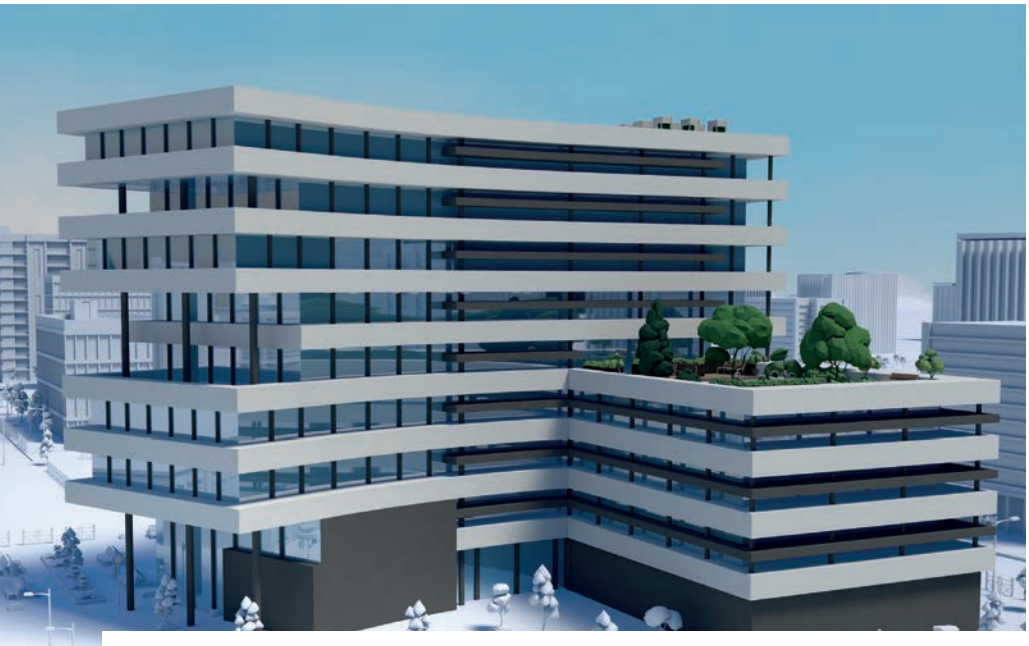

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The application of lower GWP HFC refrigerant for air conditioning

This module explores the move towards lower-GWP refrigerants in heating, ventilation, air conditioning, and refrigeration applications and solutions

Legislation continues to move forward to accelerate the reduction of the environmental impact of hydrofluorocarbon (HFC) refrigerants employed in heating, ventilation, air conditioning, and refrigeration (HVAC&R) applications, and this will significantly impact design decisions made by many building services engineers. This CPD article explores the key drivers for change, considers the rise of lower flammability refrigerants specifically R32 as a lower global warming potential (GWP) HFC and provides an example of good practice in the application of R32 in air conditioning.

It was 35 years ago that the Montreal Protocol established a global phase out schedule for the production and consumption of almost 100 ozone depleting substances (ODS). An unintended consequence of the resulting worldwide action was the unexpected GWP of the replacements that were introduced to provide functional equivalency of the ODS that were being phased out. So, in 2016, the Kigali Amendment initiated the control of these fluorinated greenhouse gases (F gases), calling for a global phase down of more than 80% by 2050. In HVAC&R applications, these F gases are principally HFCs. The EU (which, at the time, included the UK) adopted the F gas Regulation EU 517/2014[1] and the mobile air conditioning systems (MACs) Directive[2] that essentially:

- Limited the amount of HFCs that can be sold planning to phase this in stages down towards one fifth of 2014 sales by 2030
- Minimised emissions of F gases from existing equipment by requiring robust checks and efficient servicing, together with the recovery of gases at the end of product life
- Prohibited use of F gases where more environmentally friendly alternatives are available.

In January 2021, post Brexit UK specific versions of ODS and F gas regulations came into effect, replacing the EU regulations. All the technical rules that were applied under the European legislation have been retained, but responsibility for reporting and management were amended to UK specific authorities. A Common Framework Agreement was established to ensure a unified approach across the four nations of the UK, although some of the reporting arrangements are different in Northern Ireland (as part of the EU single market) compared with those in Great Britain (England, Scotland and Wales). Currently, the practical result is that the UK will continue to restrict ODS, in line with European legislation EC 1005/2009, and maintain the phase down schedule for F gas in line with EU 517/2014, reducing the placing on the market of F gas by 79% by 2030 compared with the annual average demand during 2009 2012.

As described in a recent EU report,[3] the supply of HFCs in terms of their total CO_2 equivalent impact, as illustrated in Figure 1 has declined in Europe by 47% between 2015 and 2019. In contrast, the supply of »

» unsaturated HFCs, or hydrofluoroolefins (HFOs) such as R1234yf (GWP = 4) as an alternative to R134a (GWP = 1,430); lower GWP HFCs, such as R32 (GWP = 675) as an alternative to R410A (GWP = 2,088) in split air conditioning, variable refrigerant flow (VRF), and heat pump applications; and R448A (GWP = 1,273), which is typically used to displace R404A (GWP = 3,922) in commercial refrigeration has grown appreciably. In the EU, refrigeration, air conditioning, heating and other heat transfer fluids account for the majority of F gas use, estimated[4] as 63% in 2019. A significant share of the shift in warming impact of HFCs has resulted from the reduced use of key high GWP HFCs and HFC blends such as R134a, R404A and R410A and while the amount of HFC contained in imported products and equipment has remained practically constant, the GWP of these HFCs dropped by 33% owing to increased application of lower GWP HFCs. In work[5] undertaken for the EU, it is noted that there may be some undesirable environmental effects from the application of HFOs as a low GWP alternative, related to the generation of environmentally persistent and accumulative trifluoroacetic acid (TFA) in the atmosphere, which will require further investigation.

There has also been a shift to natural alternatives such as CO_2 (GWP = 1), propane (GWP = 3) and ammonia (GWP = 0) that are not restricted under the F gas regulations.

As a result of the HFC phasedown, and the consequent restricted supply, prices for higher GWP HFCs have, by design, seen significant increases. In contrast, prices for alternatives that are not covered by the phasedown have largely remained more stable, making climate friendly technologies more competitive. However, it was recently reported that HFCs still represent around 90% of F gas emissions in Europe,[6] contributing 2.5% of the EU s total greenhouse gas emissions. (Internationally, F gases are among the fastest growing greenhouse gases, largely as a result of increasing demand for refrigeration and air conditioning, especially in developing economies.). The analysis[5] undertaken on behalf of the EU indicates that the 2030 F gas goals may not be fully reached under the current regulation. So, in April 2022, and coincident with the publication of the Intergovernmental Panel on Climate Change s (IPCC) 6th assessment report,[7] the European Commission (EC) made a proposal[8] to transform the F gas Regulation, upping the bar so as to reduce the amount of HFCs on the market by 98%[9] by 2050 compared with 2015 (the target was previously 80%). Also, as of 1 January 2027, the proposal would ban split air conditioning and heat pump equipment with a capacity of more than 12kW that employs F gas with a GWP of 750 or above. The new proposals have raised mixed concerns,[10,11] in industry circles, with a key challenge acknowledged by both the EC and the industry being the skills shortage for the safe and effective installation of low GWP refrigerants; the new EC proposals would require EU countries to expand their certification and training programmes. In the UK, the trend of GWP gas emissions resulting from fluorinated gases, as shown in Figure 2, has generally echoed that of EU emissions, as illustrated in Figure 1. There are suggestions that a revision of the UK F gas regulations is in the pipeline, but neither the scope nor timetable is known.

Refrigerants are classified according to toxicity and flammability by BS ISO 817:2014+A2:2021.[12] The toxicity of refrigerants is divided into two groups: class A (lower chronic toxicity) that have an occupational exposure limit of 400ppm or greater; and class B (higher chronic toxicity) that have an occupational exposure limit of less than 400ppm.

Refrigerants are also assigned to one of four classes (1, 2L, 2 or 3) based on lower flammability limit (the minimum percentage in the air that is tested as flammable), the maximum burning velocity, and the heat of combustion (class 1 being tested as no flame propagation through to class 3, higher flammability[12]). The classification 2L was most recently added to better accommodate the increasing use of low GWP HFCs and HFOs, as otherwise they were simply categorised as class 2 (now known as flammable) as 2L, they are designated lower flammability . As reported in last month s *CIBSE Journal*,[13] recent tests have reinforced the understanding that A2L refrigerants are difficult to ignite, have slow flame speed and low heat of combustion, and can be safely applied with proper designs and installations.

R32, designated as an A2L refrigerant, is a well established refrigerant with a lower GWP (of 675), zero ozone depletion potential (ODP), and lower flammability. It was initially mainly used in blended refrigerants, notably in equal parts with fire suppressant R125 to form R410A. Around 10 years ago, small R32 compressors were developed for the Japanese market and their use has subsequently spread globally, particularly in applications that would have previously used R410A. R32 has operating characteristics that are similar to R410A, but it requires a lower refrigerant charge and can provide significant efficiency gains.[14] As a single component fluid, with a single carbon molecule, there are no glide or fractionation issues that exist with blended (zeotropic) gases and, as a single component refrigerant, it has a single pressure temperature relationship that eases the understanding of performance in the field, and is more straightforward

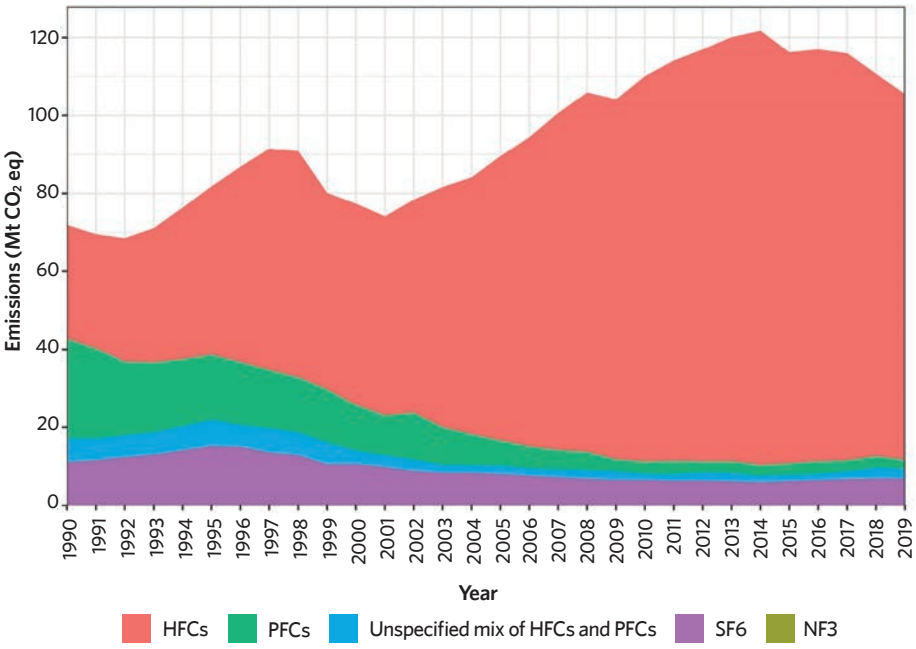

Figure 1: F-gas emissions in the EU27+UK from 1990 to 2019 (Source: see reference [5])

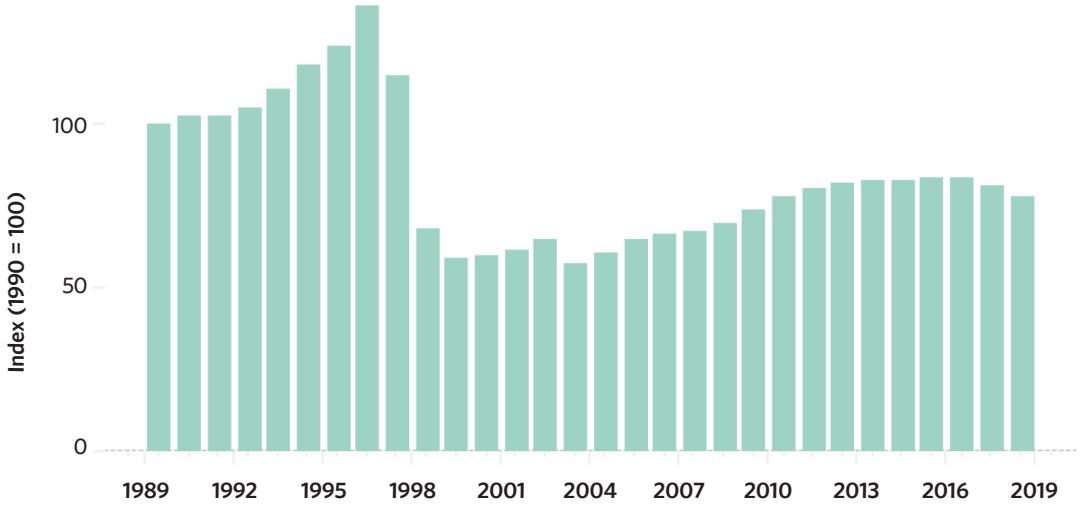

Figure 2: Indication of trend of greenhouse gas emissions in UK related to fluorinated refrigerants (Source: bit.ly/CJJun22CPD1980)

to recycle than blended refrigerants. Current R32 compressor designs have been introduced that very closely match the design and footprint of R410A compressors. (R32 is not suitable as a drop in replacement for R410A and must only be used in systems specifically designed for R32.)

In the UK, all classes of refrigerant are within the scope of the 2002 Dangerous Substances and Explosive Atmospheres Regulations (DSEAR), and so all refrigeration, air conditioning and heat pump (RACHP) installations must be compliant.[15] As noted by REFCOM/BESA Technical Bulletin 33[16] for a new installation, there needs to be a risk assessment carried out that reviews the application, refrigerant charge, location of components, and occupancy of any room containing refrigerant holding components. BS EN 378:2016: *Refrigerating Systems and heat pumps – Safety and environmental requirements* contains design information for the risk assessment and management process, and is a key publication when at the planning stage of an A2L installation. The standard is used for calculating the maximum permissible refrigerant charge in a system, based on both toxicity and flammability. However, BS EN 378:2016 notes that where product standards exist for particular types of systems and where these product standards refer to refrigerant quantities limits, such quantities shall overrule the requirements of this standard . The most recent revision of BS IEC 60335 2 40:2018,[17] a product standard, was developed to safely accommodate the application of the lower flammability refrigerants in heat pumps, air conditioners and dehumidifiers, and is currently scheduled for publication by BSI[18] in July 2022. This standard will work together with BS EN 378:2016 to provide contextual flammability guidance for the application of products, including heat pumps and air conditioners.

As noted in the recently published BSRIA TG 21/2022[19] mitigating measures, as set out in BS EN 378:2016 may include fixed refrigerant leak detection, audible and visual alarms and forced ventilation to dilute any refrigerant build up. A combination of these mitigating measures will often allow for a much greater refrigerant charge to be applied than without them . The methods that can be implemented depend on the smallest room area and total system charge, and any measures must be triggered by a leak detection system, unless there is permanent and adequate natural ventilation or continuous and suitable mechanical ventilation. As the regulations evolve to accommodate the safe application of A2L refrigerants, manufacturers are producing solutions that simplify the rollout of new systems that employ these lower GWP refrigerants. For example, the system shown in Figure 3 integrates technology to overcome the technical barriers to applications of A2L refrigerants, at both the design and operational stages, to provide safe and legal deployment. The system[20] is supplied with factory fitted components and integrated controls to meet safety requirements, ease the installation process, and ensure compliance. This includes self monitoring, with integrated sensors to detect refrigerant leaks in indoor units, which automatically activates visual and audible alarms as well as selectively isolating the refrigerant line serving the affected area.

The applications of lower GWP refrigerants in HVAC&R are, by necessity, increasing swiftly. This is ushering in new technologies that require new skills and a solid understanding of the benefits and risks and demand a holistic appreciation of the wider impacts of system installation and operation. Advice and regulation are racing to keep up and are likely to change rapidly, so designers and operators need to maintain a close watch on developments.

Turn to page 54 for references.

Figure 3: An example of an inverter-controlled external unit supplying VRF (VRV) internal units with integrated refrigerant safety measures and heat recovery, employing R32. This range delivers up to 90kW heating capacity (@indoor 20°C DB, outdoor 7°C DB, 6°C WB) and 80kW cooling (@indoor 27°C DB/19°C WB, outdoor 35°C DB) with standardised SEER 7.1, SCOP 4.1 (Source: Daikin[21])

Module 198

June 2022

» **1. What was the 2050 phase down of fluorinated gases called for by the Kigali Amendment?**

- ☐ A 20%
- ☐ B 40%
- ☐ C 60%
- ☐ D 80%
- ☐ E Practically 100%

2. Which refrigerant has a GWP of 2,088?

- ☐ A R32
- ☐ B R134a
- ☐ C R410A
- ☐ D R448A
- ☐ E R1234yf

3. What is likely to be the correct designation for a refrigerant that had been tested as being flammable and higher toxicity?

- ☐ A A1L
- ☐ B A2L
- ☐ C B2
- ☐ D A3
- ☐ E AB

4. Which standard was noted in the article as having been developed to accommodate the application of lower flammability refrigerants?

- ☐ A BS EN 378
- ☐ B BS IEC 60335 2 40
- ☐ C BSRIA TG 21
- ☐ D EC 1005/2009
- ☐ E EU 517/2014

5. Which of these was not noted as easing the installation process and ensuring compliance in the illustrated system?

- ☐ A Automatic activation of visual and audible alarms
- ☐ B High visibility manual override valves in each zone
- ☐ C Integrated sensors to detect refrigerant leaks
- ☐ D Selectively isolating the appropriate refrigerant line
- ☐ E Self monitoring

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CIAT launches new VectiosPower rooftop air conditioning range

Solution lowers environmental impact without increasing operating costs, says company

CIAT has introduced a new range of VectiosPower rooftop air conditioning units operating on R-454B refrigerant. With a global warming potential (GWP) of 466, the R-454B's overall carbon footprint is more than 80% lower than HFC R-410A, the refrigerant it replaces.

'We believe VectiosPower operating on R-454B offers the best all-round solution for the environment, installers and building occupants,' says Natividad Molero, product manager at CIAT. 'It offers all the space-saving and low-noise benefits of the previous generation, while using the best refrigerant for rooftop applications, reducing environmental impact without increasing operating costs. It supports the highest levels of comfort and wellbeing and aligns with #CIAT4life for the creation of healthier indoor environments.'

The updated VectiosPower range exceeds

Ecodesign 2021 seasonal energy efficiency ratio requirements for cooling by up to 42% and seasonal coefficient of performance for heating by 10%. Aligned with CIAT's goal of providing customers with high-quality, verifiable information on environmental performance, VectiosPower and Vectios were the first rooftop air conditioning products registered under the internationally recognised Ecopassport programme, which is based on the ISO 14025 Environmental Product Declaration standard.

Solutions such as CIAT's VectiosPower support Carrier's 2030 environmental, social and governance goals of reducing customers' carbon footprint by more than one gigaton.

VectiosPower operating on R-454B is available in 12 sizes, with airflow rates from 10,800m³/h to 54,000m³/h. The Eurovent-certified range is ideal for large applications such as supermarkets, cinemas, offices, industrial buildings and food-storage facilities. The units are easy to lift and position on rooftops because of design optimisation and use of lightweight aluminium panels, and, once in place, simply require electrical connection.

For end users and occupants, VectiosPower units deliver low noise, with quiet-running scroll compressors and fans that adjust their speed to match building load.

Visit ciat.uk.com/product/vectios power tm r 454b

Rinnai s new carbon cost comparison aid online and on demand

New service allows Rinnai to analyse user s carbon emissions and advise on potential savings

Water heating solutions provider Rinnai continues to make innovations in both products and service, with the introduction of the Rinnai Carbon Cost Comparison Form. This offers a free appraisal of a site's current hot-water delivery system, along with recommendations for reducing the carbon load.

The process of using the service is straightforward: the user fills out a form and submits it via the Rinnai website, after which Rinnai's technical team will make a thorough analysis and return it to the user.

Using only a small amount of data provided by the user (current model and system, quantity, type of outlet and daily peak demands), Rinnai is able to make detailed predictions of carbon emissions and potential savings.

Rinnai is an international manufacturer of temperature-controlled continuous flow hot water heaters with an output of more than two

million units per year. Rinnai hot-water products offer a limitless, instant supply of temperature-controlled hot water that at 65°C can act as a thermal disinfectant on all known bacteria.

All units are UKCA certified with A-rated water efficiency and can be accessed through multiple fuel options. The Carbon Cost Comparison Form is part of the Rinnai suite of innovative digital touchpoints, which are designed to make customer decision-making fluid and specific.

Chris Goggin, director of operations at Rinnai UK, says: 'Continuous flow hot-water heating units and systems deliver proven reductions on working costs and quantifiable improvements in energy efficiency, as well as provision of temperature-controlled end products whenever the need arises.

'Our carbon calculation service will compare our complete array of hydrogen blend-ready water heaters, hybrid solar and heat pump systems, with conventional stand-alone heat pump solutions, providing our customers with market-leading low carbon solutions.'

To try out the Carbon Cost Comparison Form visit **www.rinnai-uk.co.uk/contact-us/carbon-cost-comparison-form**. Hard copies of the form are available on request.

Rinnai offers comprehensive training courses and technical support in all aspects of the water heating industry. More information is available on Rinnai's website and its 'Help Me Choose' webpage.

For more information on the Rinnai product range, visit www.rinnaiuk.com

Products of the month

Rinnai CPD on hot water applications the instantaneous approach

Course shows the savings that can be made by switching to systems using natural gas

Hot-water heating specialist Rinnai has launched the continuing professional development (CPD) course *Hot water applications relying on gas – the instantaneous approach*, showing the cost and energy savings that can be made by switching to systems using natural gas.

The CPD's analysis shows that natural gas heaters using continuous flow systems can save nearly 20% of the operating cost and more than 30% of the capital cost, along with reductions of 15% in carbon footprint, more than 75% in physical space and more than 85% in weight. The CPD is available to anyone in the consulting, contracting, facilities and premises management, or end user sectors of the industry.

The course was created to evaluate the carbon savings in hot-water applications that rely on natural gas. This is specifically intended for non-domestic applications, such as offices

and hospitality. There are more than 1,656,000 non-domestic buildings in England and Wales, and it is estimated that 85% of the current buildings are connected to the gas grid.

Pete Seddon, technical manager at Rinnai, says: 'It has become clear that natural gas is likely to continue for the next decade or so as hydrogen comes on stream. One immediate solution to the current energy crisis is to reduce the gas consumption. Most of the time, the efficiency of the heating system is provided by the burning appliance, but energy waste can also occur in other parts of the system.

'For instance, in domestic hot water, water storage can considerably increase the energy consumption of the system. The CPD shows the savings of the continuous/instantaneous heating.

'This approach is found to save a considerable amount of capital and operational cost while also generating important savings in carbon, space, and plant area.'

This CPD uses the notional building methodology and focuses on commercial buildings such as offices, schools, hotels, restaurants and hospitals.

To find out more about the CPD, or for information on Rinnai s product range, visit Rinnai s Help Me Choose portal at: www.rinnai uk.co.uk/contact us/help me choose product

Luceco s installation friendly sigma

Luceco has recently supplied Sigma luminaires for the new facilities at UK-based building and engineering company Tilbury Douglas's offices in Birmingham.

The lobby, breakout areas and kitchen spaces were lit with Platinum Mini downlighters, a recessed luminaire offering an efficacy up to 117Llm/cW with a unique swing-tab design for easy installation.

The meeting spaces were lit with Sigma, a stylish, installer-friendly, direct/indirect recessed luminaire for low-glare applications, offering UGR 19 compliance and less than 3,000cdm^2 at 65deg. As well as being a visually pleasing, energy efficient luminaire, offering a 2,000 to 4,200 lumens range and an efficacy of 130Llm/cW, Sigma delivers more than 100,000 hours of maintenance-free operational life.

Thomas Francis, project manager at Luceco, said: 'The Sigma luminaire installed at Tilbury Douglas's new facilities provides an energy-efficient and user-friendly lighting solution, and an enhanced lit environment: a primary consideration for lighting designers when working within commercial settings.'

Visit www.luceco.com, email uk_sales@luceco.com or call 01952 238100

Tamlite Lighting up for Insider Made in the Midlands Awards

Midlands-based LED lighting manufacturer Tamlite Lighting has been shortlisted in two categories for this year's Insider Made in the Midlands Awards.

The firm has again been named as a finalist for the Sustainable/Ethical Manufacturer Award – having been crowned the winner of this category last year – and has been shortlisted in the Manufacturer of the Year (Over £25m) category.

Since 2018, Tamlite has reduced plastic packaging use by 80%, while also focusing on using recyclable materials within its luminaires.

Visit www.tamlite.co.uk

Tamlite Lighting's managing director John Allden

Toshiba rolls out new generation ESTIA heat pumps on R32 ›

Toshiba Carrier UK (TCUK) has rolled out the latest generation of its high-performance ESTIA air-to-water heat pumps operating on lower global warming potential (GWP) refrigerant R-32, with an outstanding energy efficiency rating of A+++.

ESTIA provides highly efficient space heating and domestic hot water for year-round comfort in homes and small businesses. The units harness ambient thermal energy from outdoor air, increasing efficiency and reducing energy costs. Four models are available in sizes ranging from 4kW to 11kW. At the heart of ESTIA is Toshiba's award-winning twin rotary compressor, which enables the heat pump to continue supplying hot water even during exceptionally cold weather.

ESTIA is quick and easy to install and maintain, with hydro-modules providing front access to all key components.

■ **Visit www.toshibaheatpumps.com/products/residential/estia air water**

Micromatic booster set has the power ›

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Aquatech Pressmain's compact Micromatic HM2AV is a sophisticated, small-footprint, yet powerful booster set for supplying water to flats, schools and hospitals. Approved by the Water Regulations Approval Scheme, the energy-saving pumps start softly, then increase the water pressure to 7.0bar or the water flow to 4l/s. The design of the HM2AV also ensures easy servicing, tidy build and ample safe water.

■ **Email sales@aqpm.co.uk or visit www.aquatechpressmain.co.uk**

New commercial heat pumps from Ideal Heating ›

Ideal Heating is proud to launch the ECOMOD range of commercial heat pumps.

Developed to meet the changing needs of the commercial heating market, these monobloc air source pumps provide a simple solution for today's evolving heating needs.

ECOMOD pumps are available in six outputs, ranging from 14kW to 70kW, and can cascade up to seven units for an output of up to 490kW, ideal for large-scale building applications. They use R32 refrigerant to offer highly efficient COP performance with low environmental impact. They are compact and lightweight for ease of delivery and installation, as well as being hybrid and bi-valent compatible. Free commissioning by Ideal Heating will be available.

'We have a product that is comparable to those within the current domestic environment, which far exceeds what is presently accepted in the commercial marketplace,' says Jason Allen, product manager at Ideal Heating. 'These units also have a very low starting current, creating opportunities for installations that previously would have struggled to use a larger heat pump solution.'

■ **Visit www.idealcommercialboilers.com/products/ecomod**

New Condair engineer at your service

Humidity and evaporative cooling specialist Condair has appointed Paul Threlfell as a service engineer covering Scotland and the north of England.

Threlfell has more than 25 years of experience in the HVAC industry, having worked for Hussmann Refrigeration, City Refrigeration, Russell Air Conditioning and Linaker.

Tony Tullett, service director at Condair, said: 'Paul's F-Gas accreditation is a great benefit, as we service not only humidifiers, but also refrigerant-based dehumidifiers, so he can really hit the ground running.'

■ **Visit www.condair.co.uk**

Pump Technology s DrainMinor has major benefits

Pump Technology's new DrainMinor S shower tray drainage pump is ideal for pumping wastewater from single or multiple shower trays and sinks.

It is fitted with a Jung Pumpen U3SL pump, which features a rigid float arm with a low-level float, enabling inlets to be as low as 70mm from base to centre line. The DrainMinor S can also handle static heads up to 5m.

■ **Call 0118 9821 555 or visit www.pumptechnology.co.uk**

Sharks Mind Gym gets Toshiba R32 solution

Toshiba Carrier UK is helping one of Europe's top professional rugby union clubs move away from use of high global warming potential (GWP) refrigerants.

Sale Sharks have installed a high-efficiency Toshiba air conditioning system in its 'Mind Gym' at its training facility in Manchester. The Mind Gym provides a light and airy exercise therapy space, but has high heat gains in summer and losses in winter.

Toshiba's solution consists of a duplex DX split-system based on a high- performance R-32 RAV outdoor condensing unit, delivering a total of 12.1KW of cooling and 12.8KW of heating, even with no ceiling void in the space.

'We identified a need for temperature control to allow the Mind Gym to be used by the players all year round,' said Sale Sharks facilities manager David Hulme. 'The equipment was commissioned and installed within a matter of days. Our sincere thanks to the Toshiba team for their support throughout the project.'

Visit www.toshiba aircon.co.uk/products/r32 products

Aquatech Pressmain celebrates 40 years

Aquatech Pressmain is celebrating 40 years of supplying high-quality, reliable, innovative water booster sets and pressurisation units for industrial, commercial and domestic buildings. Starting out in 1982 as Aquatech Limited, it bought Pressmain Pressurisation and Warmac in 2006, changing its name. Still a family-run business, it manufactures products in its Essex factory for a wide range of customers in the UK and across the world.

Email info@aqpm.co.uk or visit www.aquatechpressmain.co.uk

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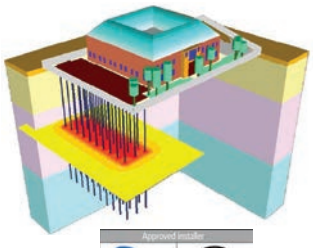

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EVENTS

NATIONAL EVENTS AND CONFERENCES

Young Engineers Awards
Entry deadline 29 July
Awards 11 October
Entries are now open for the Young Engineers Awards, encompassing Apprentice of the Year, Graduate of the Year and Employer of the Year. The 2022 Awards will be held at a new location: RIBA, London. Enter now at **www.cibse.org/yea**

Build2Perform Live
29-30 November
The flagship occasion returns as a face-to-face event at London ExCeL. It will feature a carefully curated CPD programme with more than 160 speakers and in excess of 70 exhibitors. Register your interest and keep up to date with the latest news: **www.build2perform.co.uk**

CIBSE REGIONS AND GROUP EVENTS

Check the website for up-to-date information on regions and groups meetings, webinars and podcasts. Visit **www.cibse.org/events**

CIBSE T&D forum Mentor training
8 June
Webinar covering fundamentals of being a mentor and matching trainee to mentor.

CIBSE online application workshop
14 and 21 June
'Bitesize' membership application workshop to help you prepare to apply for ACIBSE or MCIBSE, with CIBSE interviewers guiding you to get started on your application over two sessions

Engineering practice report surgery
20 June
For those looking to become an Associate or Member, this online session provides an opportunity to have your report reviewed by a professional interviewer.

North East: Summer BBQ
24 June, Newcastle upon Tyne
The CIBSE North East Region's first summer BBQ. Come along to catch up with friends and make new connections in your region. Book in advance.

LIVE ONLINE TRAINING COURSES

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

Upcoming building services explained
7-9 June

Mechanical services explained
13-15 June

Design of ductwork systems
14 June

Below ground building drainage
15 June

Energy efficiency related building regulations: Part L
16 June

Air conditioning and cooling systems
22 June

High voltage (11kV) distribution and protection
23 June

Power system harmonics
28 June

CIBSE JOURNAL WEBINARS

The latest *CIBSE Journal* webinar, Upfurbishment: designing new pump technology into older spaces – sponsored by Grundfos in May – is now available on demand.

You can watch this, and all other previous webinars, on demand at **www.cibsejournal.com/cpd/webinars**

Introduction to the Building Safety Act
28 June

Energy efficiency related Building Regulations: Part L
29 June

Energy Savings Opportunity Scheme (ESOS)
29 June

Introduction to the Building Safety Act
30 June

Electrical services explained
5-7 July

Above ground building drainage
5 July

Emergency lighting to comply with fire safety requirements
6 July

Air conditioning inspection for buildings
7 July

Energy efficiency related Building Regulations: Part L
14 July

Overview of IET wiring regulations (18th edition)
19 July

Residential fire sprinkler design BS9251:2021
19 July

Fire safety Building Begulations: Part B
20 July

Introduction to Building Safety Act
25 July

For details and the full programme visit **www.cibse.org/training**

ONLINE LEARNING

CIBSE has a portfolio of online learning courses, which contain interactive content with quizzes and additional resources to support your learning. **www.cibse.org/training**

Membership webinars

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

To register for this and for all other membership webinars: **www.cibse.org/webinars**

Upcoming webinars:
- 7 and 14 June

For further details and to register: www.cibse.org/webinars

CIBSE Training

What's new from CIBSE Training?

Discover the 2022 CIBSE Training Programme

July-December training courses dates released

New regulations training:

- Introduction to the Building Safety Act
- Energy Efficiency related Building Regulations: Part L

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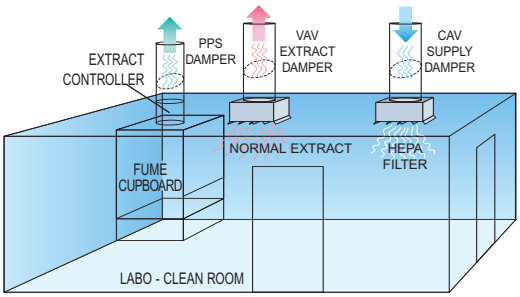

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