

CIBSE JOURNAL



#Build2Perform

March 2021

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**BURO HAPPOLD TRIUMPHS
AT CIBSE AWARDS**

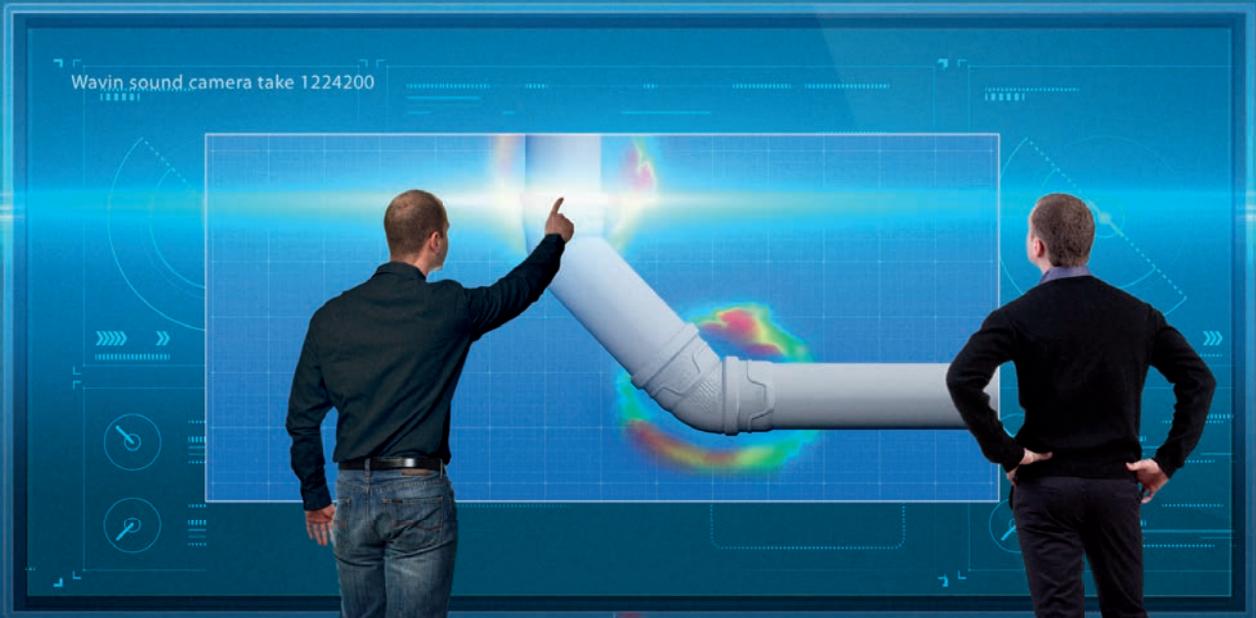
**HOW TM63 HELPS MEASURE
REAL PERFORMANCE GAPS**

**AMBIENT LIGHTING
MANIFESTO REACTIONS**

UNCHARTED WATERS

How award-winning modelling
by Atelier Ten helped realise the
world's highest indoor waterfall at
Jewel Changi Airport, Singapore





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Proven winners



For many of us, the 2020 CIBSE Building Performance Awards last winter was the last large social gathering before Covid-19 took hold and forced the UK into lockdown. Shouted conversations over the buzz of hundreds of guests at a packed Grosvenor House seem a distant memory now.

On the day of the awards, 11 February, only eight cases of Covid-19 had been confirmed in the UK, but within two months nearly a thousand people a day were losing their lives to the virus and hospitals were struggling to cope with the rising level of infection.

In response, the UK built seven Nightingale Hospitals to ensure there were enough beds for

Covid-19 patients. Engineers that helped design and deliver those hospitals in record time have now been recognised in CIBSE's Covid Achievement Awards, which were part of last month's virtual 2021 CIBSE Building Performance Awards.

The judges commented on the spirit of collaboration and can-do attitude of the teams that converted conference centres and sports stadia into huge health facilities in days. These teams created incredible outputs, remarked one judge. 'Imagine what the industry could do if it worked in this way all the time,' he said.

The Building Performance Awards winners demonstrate what the industry is capable of. The leading light this year was Buro Happold, which not only took the Building Performance Champion crown, but also won three other categories: Project of the Year – Public Use; Learning and Development; and Building Consultancy of the Year (over 300 employees).

Aleksandra (Sasha) Krstanovic became the second women to win the Engineer of the Year, after the judges praised how she had challenged the norm and, in the process, delivered exemplar low energy/carbon projects, such as the Energy Technologies Building at the University of Nottingham.

There is some way to go before the same high levels of excellence are achieved across the whole of construction, as the ongoing Grenfell Inquiry uncovered more evidence of a dysfunctional industry (page 7).

The Construction Products Association has responded to Dame Judith Hackitt's call for radical change in the area of product testing and marketing by introducing proposals for a Code of Practice for Construction Product Information. It will require manufacturers to support claims of compliance with industry standards or certification schemes. It won't just apply to construction materials, but also to those products that make claims about eliminating Covid-19. Hywel Davies explains what it might mean for building services on page 14.

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How two initiatives will tighten the regulation and marketing of construction products in the UK



Linda Salamoun

Lighters, including PSLab's Salamoun, respond to the ambient lighting manifesto proposed by four academics



Chris Twinn

Why a switch from methane to hydrogen in the gas grid will struggle to provide zero carbon heating



Tim Dwyer

The challenges in selecting LED luminaire diffusers in office and educational lighting applications



*Models shown KE+ and E+.

Greenstar HIU's now BESA registered. Heat Network CPD also available.

We are delighted to announce that our KE+ and E+ Heat Interface Units (HIU) are now registered to the Building Engineering Services Association (BESA) HIU test regime.

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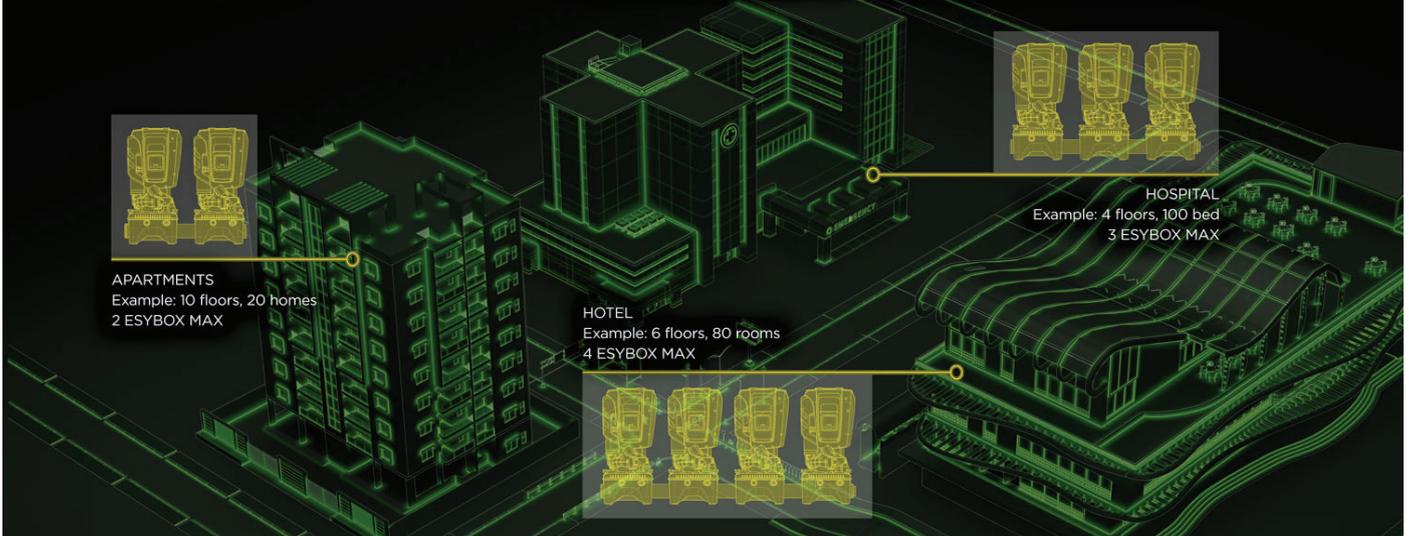
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esybox MAX - The Future of Water Boosting



Taking the Esyline concept to the next level.

DAB Pumps have always been committed to innovation and forward thinking. With a determination not to accept the status quo and to press for continual improvement.



With the Esyline concept, DAB Pumps took a bold step towards revolutionising the thinking around cold water boosting solutions. Esyline introduced simplicity, modularity, easy installation, easy service, quiet running, compactness, connectivity, and a whole host of other benefits. Above all, Esyline supports the drive towards improved efficiency and a zero-carbon future.

Esybox Max is the next step in the Esyline journey. All of the benefits that were previously made available through Esybox, Esybox Mini and Esybox Diver now become available for large, commercial environments. With a pressure capability of up to 11.3 bar and flow rate potential of 4.8 litres per second per pump, Esybox Max is a truly commercial solution.

Modularity remains key with the capability to assemble a four-pump packaged booster set on-site, literally within minutes. This means no more access or portability problems; no more costly, time-consuming, demounting and rebuilding pump sets prior to installation.

Modularity also means readily available. Three individual pump performance models and a few accessories are all that's needed to produce a range of booster set solutions that were previously covered by more than thirty separate models! That means it's extremely easy to carry in stock and get delivered to the customer without unnecessary delays. An off the shelf solution rather than a made to order lead time.



There are carefully considered benefits built-in at each stage of the Esybox Max product lifecycle.

In the manufacturing process, where efficiency and conservation are deliberately incorporated into every step.

In transportation, handling and storage. Reduced dimensions and weight along with packaging uniformity all provide benefits at a

vital stage that can often be overlooked. This directly translates into time and money saved as well as carbon footprint reduced.

Design selection is made easier, multiple solutions are possible from a few components. Meaning decisions are simplified and become faster and more intuitive.

The unique assembly and installation system is much quicker than any conventional booster set. Service and maintenance benefit from the ability to install and change component parts speedily.

Designed for the environment
"SUSTAINABILITY, for DAB, is not just technology, it's much more.."

- The Esybox Max is state-of-the-art in the field of energy efficiency
- Constructed with recycled materials wherever possible
- Incredibly efficient in lowering CO2 emissions during transportation

Due to the integrated WiFi connectivity and our DConnect remote monitoring platform, Esybox Max is able to log and store real-time data as well as provide up to date system reports on request. This supports ongoing improvement, efficiency, and intelligent targeted maintenance

Esybox Max features a robust stainless-steel construction and incorporates highly efficient permanent magnet motors, along with cutting edge hydraulics delivering a 20% efficiency improvement over conventional products. It is a friend to the acoustic engineer at 63dB being extremely quiet in running compared to fan cooled pumps. It is also a friend to the architect due to its compactness and flexibility of installation.

To learn more about the way DAB Esyline products can enhance a building design follow the link below;

www.d-web.co.uk/esyboxmax



HSE appoints Peter Baker as chief inspector of buildings

Head of Building Safety Regulator has more than 30 years of experience at HSE

The Health and Safety Executive (HSE) has announced the appointment of a chief inspector of buildings to establish and lead the new Building Safety Regulator.

Peter Baker, HSE's current director of building safety and construction, will head up the Building Safety Regulator to deliver the new regime for high-risk buildings, oversee work to increase the competence of professionals working on buildings, and ensure effective oversight of the building safety environment. He will also be the first head of the building control profession, and lead the work to give independent, expert advice on building safety to industry, government, landlords and residents.

The government asked HSE to establish a new Building Safety Regulator in the wake of the Grenfell Tower disaster, and following recommendations in Dame Judith Hackitt's *Building a Safer Future* report. Baker said: 'I am honoured for the opportunity to play a lead role

Peter Baker



in bringing about the biggest change in building safety for a generation.'

Baker has more than 30 years' experience with HSE, as an inspector and in senior operational posts, including chief inspector of construction. Since 2017, he has led HSE's involvement in the government's building safety programme.

CIBSE said: 'This is a key appointment in the drive to transform the construction sector and to prevent anything like the Grenfell Tower tragedy from ever happening again.'

Manufacturer stopped selling Grenfell cladding in France

The French company that supplied the flammable cladding used on Grenfell Tower had already stopped selling the same product in its home market before the fire tragedy that claimed 72 lives in 2017.

Arconic ordered its French sales team to stop selling combustible ACM cladding Reynobond PE a year before the fire, but its UK sales manager denied receiving an instruction to stop selling it here.

An internal email from the company's sales director, Alain Flacon, telling his French sales teams to stop recommending the product because of flammability issues was shown to the public inquiry into the Grenfell Tower disaster.

Arconic's managing director also told the inquiry that the cladding had never achieved the Class B fire rating claimed in its specification documents. Claude Schmidt said it was only after the fire that the company became aware of what was written in the fire test for Grenfell. He accepted responsibility for selling the cladding on a 'false basis', but said it was because of 'incomplete information'.

He said the fire-classification information was not false, but 'didn't go into detail, it didn't mention according to European standards the different reactions to fire'.

Schmidt said Arconic would have had a 'basic understanding' of the regulations where it was selling its products, but would not have detailed knowledge of the building regulations in each market.

Product code of practice to force manufacturers to verify claims

A new code of practice will force manufacturers to provide evidence to support claims made about their construction products.

The draft Code for Construction Product Information has been developed under the leadership of the Construction Products Association, and is designed for products installed in buildings or civil engineering works. It will require manufacturers to support claims of compliance with industry standards or certification schemes. Manufacturers will also have to provide verifiable information to support any claims about the product.

The code was developed in response to the issues raised in Dame Judith Hackitt's report *Building a Safer Future*, which confirmed radical change was needed for construction products, particularly in the areas of testing, information and marketing.

■ Read more in Hywel Davies' column on page 14.

New funds not likely to end cladding scandal

The additional £3.5bn to 'end the cladding scandal' announced by Housing Minister Robert Jenrick could lead to further injustices, and will not cover all at-risk buildings, according to many observers.

The new money, which increases the funds available to replace flammable cladding on buildings more than 18 metres high (or above six storeys) to more than £5bn, was condemned as 'too little too late' by the Grenfell United group, which represents bereaved families and survivors of the 2017 disaster.

Building services bodies have also questioned the height threshold, pointing out that many low-rise buildings are equally as dangerous.

Jenrick told parliament that the funding was the government's biggest direct investment in building safety and was designed to 'finish the job we've started' of removing and replacing unsafe cladding.

Starmar calls for cladding task force

As many as 11 million people in the UK are living in buildings with unsafe cladding, according to the opposition Labour Party.

Its leader, Sir Keir Starmer, has called for the establishment of a National Cladding Task Force to speed up work to improve the safety of high-rise residential buildings, and his plea has received backing from the British Safety Council.

'We support the call for a National Cladding Task Force and for legislation to protect leaseholders from costs,' said the council's chief executive Mike Robinson. 'Four years after the Grenfell tragedy, the pace of removal of unsafe cladding has been disappointing, particularly given the risk to life that it presents.'

'A legally enforceable 2022 deadline to make homes safe would... provide some comfort to leaseholders.'

Alliance promises to speak with one voice

An alliance of eight building engineering services bodies has been formed to improve the sector's political representation, lead its response to the post-Covid economic revival and support efforts to deliver a net-zero future.

Actuate UK, brings CIBSE together with BESA, the research organisation BSRIA, ECA, the Federation of Environmental Trade Associations (FETA), the Lift and Escalator Industry Association (LEIA), the Electrical Contractors' Association of Scotland, and the Scottish and NI Plumbing Employers' Federation (SNIPPEF).

The group said it would support the 'delivery of a safer, more productive and sustainable UK built environment' and would lead the sector's response to the building safety agenda.

IN BRIEF

ASHRAE updates reopening guidance

ASHRAE has updated its guidance on the reopening of buildings and the implications for HVAC systems in the wake of the pandemic.

Building Readiness includes additional information and clarifications to help designers and commissioning engineers carry out pre- or post-occupancy flush calculations to reduce the time and energy needed to clear spaces of contaminants between occupancy.

It addresses the tactical commissioning and systems analysis required to develop a building readiness plan, including the need for increased filtration, air cleaning strategies, domestic and plumbing water systems, and overall improvements to mitigate virus transmission.

ASHRAE President celebrates digital age

ASHRAE President Chuck Gullledge has hailed the digital age of connection in his address at the first online ASHRAE winter conference.

Without technology, he said his presidential year would have been muted, but he revealed that he had connected with more than 1,777 industry stakeholders last year.

The online audience at the four-day event also heard about the work of the ASHRAE Epidemic Task Force, which has resulted in briefings with members of the US Congress and with the Biden transition teams.

ASHRAE CEO and Secretary Jeff Littleton said its Covid-19 web pages had been visited more than half a million times.

London Plan adopted

The government has finally approved the new London Plan – the planning framework for the capital – more than a year after it was submitted to ministers by Mayor Sadiq Khan.

The strategic planning guide for the capital includes policies designed to help the city's recovery from the coronavirus pandemic, including: space and quality standards for new-build properties; tackling poor air quality; ensuring Londoners have access to open and green spaces; increasing local community infrastructure, such as schools and medical facilities; and providing a mix of retail, leisure and workspaces on high streets.

Government urged to adopt WHO air quality guidelines

MPs say air pollution is largest environmental risk to UK health

The government should adopt the World Health Organization's (WHO's) guidelines on air pollution and provide more help for businesses and communities to achieve higher air quality standards, according to a report from the Environment, Food and Rural Affairs (EFRA) Select Committee.

It warned that air pollution is the largest environmental risk to UK public health and is linked to as many as 64,000 early deaths a year.

The EFRA report calls for stricter and legally binding clean-air targets, a long-term funding structure for councils to deliver local strategies and a public communication campaign around transport. It calls for the WHO's recommendations on particulate matter, NO₂ and ammonia to be enshrined in the Environment Bill, which is currently before parliament but has been delayed for six months.

EFRA said the government's Clean Air Strategy relies too much on local authorities to improve air quality without providing sufficient resources to deliver the plans.

Air pollution is linked to as many as 64,000 early deaths a year



'While the Clean Air Strategy is a step in the right direction, the government needs to be more ambitious,' said committee chair Neil Parish MP. 'Before the Environment Bill comes back, commitments to reduce the levels of toxic particulates that cause the most harm must be strengthened – and targets on reducing the health impacts of air pollution included.'



Wood burning biggest cause of UK particle pollution

Domestic wood burning in stoves and open fires was responsible for 38% of PM2.5 emissions in 2019, while road traffic contributed 12% of emissions.

A government report said that PM2.5 emissions from wood burning had more than doubled since 2003, to 41,000 tonnes a year, and had increased by 1% in the past year.

A second report, produced by Kantar for the government, found that just 8% of people in the UK burned fuel indoors,

with two-thirds living in urban areas.

Other research has revealed that wood burners triple the level of harmful pollution in the home. In the study of wood burners in 19 homes, researchers from Sheffield University found that tiny particles enter the room when the burner doors are opened for refuelling.

Over four hours, average particle levels rose to between 27 and 195 micrograms per cubic metre of air. The WHO limit is 25µg/m³ over 24 hours.

Uncertainty over contract liabilities

There is growing confusion about who is legally liable for any additional costs and delays in the event of projects being disrupted by the pandemic.

Research by quantity surveyor Turner & Townsend found that one in three construction contracts did not address the consequences of notifiable Covid-19 events, but most of the liability seemed to fall on the contractual 'employer' – that is, the person appointing the contractor rather than the supplier.

In its survey, 83% of respondents said they had experienced a pause in work or site closures, while 72% said they had seen dips in productivity as a result of the crisis. This makes the need for contractual clarity more urgent, according to the firm.

Of those surveyed, 45% said contractual disputes had increased since the start of the pandemic, while more than 30% said there was confusion over the use of clauses covering liability for unforeseen events and reliance on '*force majeure*'.

In addition, 63% of respondents said they had sought guidance from the government, while another third consulted their trade bodies or took professional advice.

Buro Happold is Building Performance Champion

Virtual ceremony also recognises firms in first Covid Achievement Awards

Buro Happold has been named Building Performance Champion at CIBSE's first virtual Building Performance Awards, which took place last month.

The global consulting engineer won three other award categories: Project of the Year – Public Use; Consultancy of the Year (over 300 employees); and Learning and Development. Judges praised the company for taking a 'holistic view of building performance that draws back into wider sustainability views, and for going beyond the standard engineering offer'.

Buro Happold was also one of five teams recognised in the new Covid Achievement Awards, which were created to draw attention to the work that building services professionals, and their supply chains, have done to help combat the effects of Covid-19.

Its analytics team worked with seven UK and Irish universities to help facilitate the safe return of students after the first lockdown. The engineered modelled spaces to safely optimise teaching areas and highlight campus hot spots where social distancing might be challenging.

Other firms recognised in the Covid Achievement Awards were all involved in the design of the Nightingale Hospitals in 2020. These were Hoare Lea, Ridge and Partners, RSP/BDP, and Services Design Solution. Details of their contributions are on page 24.



Engineers' work on the Nightingale Hospitals was praised

Engineer of the Year: Sasha Krstanovic



Buro Happold won Project of the Year – Public Use with The House at Cornell Tech

Aleksandra 'Sasha' Krstanovic was named CIBSE's 2021 Engineer of the Year. The judges said her passion for the role of engineers in mitigating climate change makes her a great ambassador for CIBSE.

They said: 'Sasha's proactive approach to informal post-occupancy evaluation enabled her to discover and ameliorate issues, particularly in innovative systems.'

'In an industry with few female role models in leadership positions, Krstanovic has broken the mould. As an experienced designer, she challenges the norm.'

Coverage of all the winners of the CIBSE Building Performance Awards and CIBSE Building Achievement Awards starts on page 18.

Place human impact at heart of design, says Professor Noakes

Professor Catherine Noakes has called for a new paradigm that 'places human impact at the heart of building design'. The keynote speaker at the online 2021 CIBSE Building Performance Awards, she said that Covid-19 had increased awareness among the public of the importance of the indoor environment for health and wellbeing. 'Many of us already know that ventilation is highly variable and, in some places, it is inadequate, but the pandemic has really brought this to the fore,' she said.

Professor Noakes said the industry would need to think differently about the whole construction process, from conceptual design to construction, commissioning and maintenance. New performance metrics were needed, she added, that incorporate health and wellbeing and new technologies would have to provide low carbon heat, good ventilation and effective microbial and pollutant control.

'We need buildings and systems that address energy demands and carbon emissions alongside providing spaces that are thermally comfortable, manage wellbeing, enable productivity and limit exposure to pollutants and infectious pathogens,' she said. 'It will not be delivered overnight, but it is essential to ensure that our built environment is sustainable and resilient to the future.'



Professor Noakes says the pandemic has brought ventilation to the fore

Covid-19 guidance authors recognised with President's Award

The authors of the Institution's *Emerging from lockdown* series have received the President's Commendation at the CIBSE Building Performance Awards 2021.

A special case was made for this year's awards to recognise the authors who wrote and updated the series, including *Safely reoccupying buildings; Recommissioning of lifts and escalators post-lockdown; Ventilation guidance; and Occupancy and use of lifts.*

CIBSE President Stuart MacPherson said the award recognised those who 'worked tirelessly to update the guidance to reflect current research, public health information and, subsequently, to adapt to changes in Covid-19 restrictions'.

The guidance, which has been downloaded 65,000 times, is updated as new research and information becomes available. You can read it at [cibse.org/knowledge](https://www.cibse.org/knowledge)

IN BRIEF

Construction VAT cut can boost Scottish recovery

Cutting VAT by 15% for Scottish specialised construction activities could boost the economy by £400m and support up to 7,500 jobs, according to a new report by the University of Strathclyde.

The report by the Fraser of Allander Institute looked at the benefits of stimulating repairs and improvements to the Scottish built environment to aid a green recovery from Covid 19.

It found that construction activities, which were defined as including electrical and HVAC work, had a bigger impact than civil engineering and building construction in terms of gross value added and employment impact.

For every pound spent on specialised construction activities the report calculated that around £1.09 would be generated for the Scottish economy.

Funding for green home grants slashed

The government has removed most of the funding from the £2bn Green Homes Grants scheme. It said the initiative, set up a year ago to improve the energy efficiency of 600,000 homes, was a 'short-term stimulus', even though it was extended for 12 months until March 2022.

Business minister Anne-Marie Trevelyan told parliament that only £320m of the original funding would now be made available.

A damning report from the Environmental Audit Committee said it would take 10 years to reach the government's 600,000 homes target at the current 'snail's pace'.

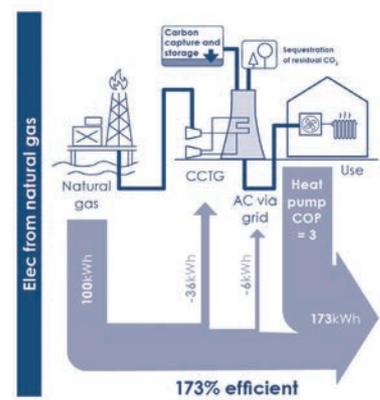
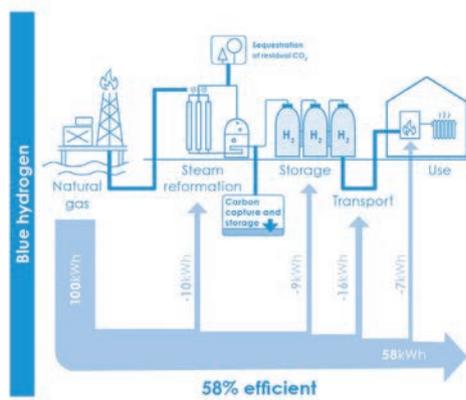
New technical director at BSRIA

Tom Garrigan has been appointed as the new BSRIA technical director.

After joining BSRIA in 2007 as a test engineer, he gained broad experience in the sector, becoming business manager for the BSRIA Test House in 2015. He maintains a distinguished profile in the sector and is well known for his expertise in the UK and overseas.

Garrigan said: 'I am honoured to take on this important role for BSRIA and for the sector. I look forward to taking BSRIA forward into the forthcoming challenges presented by its strategic agenda.'

The difference between blue hydrogen and electricity from natural gas supplying a heat pump, according to LETI



Hydrogen not viable for zero carbon heating, says LETI

Switching to clean electricity cheaper and more efficient, says organisation

Switching from methane to hydrogen gas to heat buildings will not enable the UK to meet its zero carbon targets, according to the London Energy Transformation Initiative (LETI).

Delivering zero carbon hydrogen will be more expensive and less efficient than using heat pumps on an electric grid, according to new research in *Hydrogen: a decarbonisation route for heat in buildings?* The report concludes: 'It is unlikely that zero carbon hydrogen supplied via a repurposed gas mains network will be available for the vast majority of buildings for the foreseeable future.' It also states that hydrogen conversion, delivery and combustion has a third

to one-sixth of the efficiency of alternatives, such as heat pumps – and energy storage can be done more efficiently using the National Grid.

The cost of new infrastructure is also a major delivery risk, said LETI. It said funding seems unlikely given the alternative of investing in renewables with falling electricity costs. The gas-supply industry's proposal to manufacture hydrogen from methane will require carbon capture and storage (CSS), which has yet to be proven at scale. With CO₂ capture being only 90% efficient, the report's lead author, Chris Twinn, said sequestration would be needed.

'The gas industry seem to be proposing CCS and green sequestration at scale without saying how they're going to do that,' he said.

■ Read our Q&A with Chris Twinn on page 61.

Energy calculation method must reflect real-life performance, says CIBSE

CIBSE has raised concerns about how energy efficiency is measured in proposed changes to the Building Regulations for new non-domestic buildings. The proposals are contained in the consultation for 2021 Part L and F and the 2025 Future Buildings Standard. These set out energy and ventilation standards for non-domestic buildings and mitigate against overheating in residential buildings.

CIBSE's main concern is the use of primary energy and carbon emissions as the two metrics, as it said neither facilitates comparisons of performance and are not commonly understood by consumers. The Institution said energy use must become a key metric in the evaluation of building performance for regulatory purposes.

CIBSE acknowledges the intent to retain performance-based standards, but says they are undermined by the proposed approach of using a notional building (a hypothetical building similar to the actual one being designed). This did not incentivise attention to building form and passive design measures, and it wouldn't encourage the evaluation of building-based and network solutions on a like-for-like basis, the Institution added.

The proposed continued use of the National Calculation Model (NCM) was also questioned by CIBSE, which repeated feedback that space heating is often underestimated by NCM. It hoped to see changes to the heating calculation method.

CIBSE welcomed proposals to mitigate the risk of overheating in new dwellings. The consultation introduces two methods to control overheating: the simplified method and dynamic thermal analysis method, which is based on CIBSE's TM59 design methodology for the assessment of overheating risk in homes.

■ To access the policy documents and respond to the consultations on higher performance targets for homes and non-domestic buildings, visit [cibse.org/News-and-Policy/](https://www.cibse.org/News-and-Policy/) The consultation deadline is 13 April 2021.





Breathe easy

Create a healthier workspace, with fresh air from Daikin

Clean, healthy air shouldn't be limited to the great outdoors. It's time for a fresh approach to indoor air quality with Daikin.

Energy efficiency standards in building design are rising. As a result, commercial spaces have become more airtight, meaning ventilation and fresh air supply are more important than ever.

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IN BRIEF

Wanted: applications for lighting bursary

Applications are invited for the SLL Jean Heap Research Bursary.

Open to anyone with an interest in light and lighting, the bursary makes available up to £4,000 for a specific piece of lighting study or research designed to benefit SLL members and industry.

Launched in 2014, the bursary is a tribute to the commitment to lighting research and education that Jean demonstrated throughout her career in the lighting industry.

Manuel Spitschan won the 2020 bursary for his research proposal *Luox.app: development, validation and refinement of a free, open-access tool for calculations related to light and lighting*.

To apply and to view Spitschan's video, visit bit.ly/CJMar21CN1 The entry deadline is 31 March 2021.

TM65 embodied carbon methodology now available

CIBSE Knowledge has released a new publication: *Embodied carbon in building services: a calculation methodology* (TM65). It presents why the assessment for embodied carbon of products linked to mechanical, electrical and public health (MEP) systems is needed to facilitate research in whole-life carbon in MEP systems.

It also offers guidance on using environmental product declarations (EPDs) for MEP systems and how to estimate the embodied carbon of MEP products when EPDs are not available. Download your copy at cibse.org/TM65

Don't lose your membership

CIBSE is busy managing membership renewals at this time. Thank you to all who have renewed.

In the last year, membership has granted you access to 20 new titles produced by the CIBSE Knowledge team Portal. CIBSE has also brought to you a large number of webinars and events. CIBSE's training offering has grown, and in 2021 the discount members can receive for training has increased to 15%.

Receive all the benefits of being a CIBSE member by renewing your membership today. Email membership@cibse.org

CIBSE's unsung heroes tackling the global pandemic

CIBSE's 19 Special Interest Groups publish key Covid-19 advice while engaging online, as Julian Jones, senior membership services coordinator, explains



Volunteers from CIBSE's Special Interest Groups (SIGs) have spent the past 12 months navigating the Covid-19 crisis with a combination of resilience, intelligence and technical expertise. As well as publishing key guides on reducing the risk of Covid-19 in the built environment, they have also had to manage the migration online of committee meetings and technical discussions.

The SIGs contribute towards research and knowledge in specialist areas of the built environment, for the benefit of CIBSE members and beyond. All have a common objective: to improve the built environment with a focus on the sustainability and health and wellbeing of buildings. The industrious work these volunteers carry out justifies their status as the unsung heroes of CIBSE.

One early adopter of online meetings was the Intelligent Buildings Group (IBG), which aims to help built environment specialists use intelligence (in systems, scope or design) to realise buildings with 'high social, environmental and economic objectives'.

Professor Derek Clements-Croome's monograph *Designing buildings for people: sustainable liveable architecture* was published in June 2020. This work typifies the IBG's approach to transdisciplinary research, and it has collaborated with designers, architects,

planners, digital sociologists and many others. Online seminars have been held on intelligent buildings post-Covid, with subjects including intelligent campuses, biophilic design, and the fourth industrial revolution.

Other groups have been working to minimise the disruption caused by the pandemic. The Energy Performance Group, chaired by Roger Macklin, has migrated online its popular 'power hour' sessions, in which speakers give speed presentations on topics such as carbon offsetting, responsible refurbishment, low carbon heat networks, and energy use under Covid-19. The Young Energy Performance Group delivered a series of CPD sessions and podcasts aimed at engineers starting out on their careers.

High-calibre technical guidance has also flourished despite the pandemic and, in many cases, has been led by the group volunteers. Among the most ambitious technical outputs has been that of the Lifts Group, which published a comprehensive revision of *Guide D: Transportation systems in buildings* in 2020, overseen by Dr Gina Barney, group chair. First issued in 1993, this document has been revised on a five-year cycle to cover the latest developments in the design, installation and safe use of mechanical transportation in buildings.

Also impressive has been the update of *Heat networks: Code of Practice for the UK (CP1)*, carried out with substantive contributions by the CHP and District Heating Group, with chair Phil Jones as lead author. This thorough revision incorporates much of the latest research and practice in the field, and will be particularly pertinent for local and central government implementation of heat networks, especially in pursuit of net zero.

In many respects, the headlines should belong to the groups that have most contributed to our understanding of the Covid-19 pandemic and the built environment. The Healthcare Group has led the way in informing members and industry practitioners about transmission risks of airborne pathogens, in healthcare premises and other buildings. The publication of an informative note on emergency HVAC measures was welcomed by members, while Health Technical Memorandum 03 has been widely used throughout the pandemic and is currently being revised. Chair Francis Mills has presented the findings of these publications, and Healthcare Group publications have been referenced by government advisory group SAGE.

The Natural Ventilation and HVAC Systems groups, with support from the Facilities Management and Lifts groups, have been responsible for three publications to help the industry navigate the pandemic, producing and updating Covid-19 guidance documents on *Emerging from lockdown: safely reoccupying buildings*, *Recommissioning of lifts and escalators*, and *Ventilation*.

The healthcare sector has also been central to the work of the Heritage Group. CIBSE's oldest group produced a series of newsletters looking at the history of the healthcare system in Britain, celebrating the nurses and doctors who have worked tirelessly throughout the pandemic, while looking at the contributions of engineers in the field. Other substantial pieces of work include the CIBSE Heritage calendar, a study of the Gurney stove by member Paul Yunnice, and the consolidation of the CIBSE Heritage catalogue in Cardiff University library.

Roisin Sweeney, CIBSE head of membership services, thanked the volunteers for their unrelenting efforts: 'The sheer amount of output from the CIBSE Groups is impressive and the quality of the activity is inspiring. We are very proud of our volunteers who make all this possible, especially given the extra challenges faced over the past year. Thank you doesn't come close to the gratitude you deserve - we couldn't do it without you.'

For help locating the resources in this article, email groups@cibse.org Members and non-members can join any CIBSE Group for free through the MyCIBSE portal.

Update to the CIBSE Code of Conduct

By Doug King, on behalf of the CIBSE Professional Conduct Committee

The Professional Conduct Committee (PCC) is the standing committee tasked with supporting professional standards by maintaining the CIBSE Code of Conduct and administering the Institution's disciplinary procedures.

During a recent review of the Code of Conduct, PCC debated one particular clause regarding ethical behaviour when members act on behalf of CIBSE. This clause had been added at a previous review to bring attention to the need for members to segregate their role with the Institution from their employment and other interests. PCC had identified that members should not benefit financially or commercially from their involvement with CIBSE, and should not use their position to gain advantage over any other member.

While the existing clause provided direction regarding conflicts of interest, PCC felt that there were other ethical behaviours that should also be referenced. After some debate, PCC members agreed that, rather than expand the Code of Conduct considerably, reference could simply be made to 'The Seven Principles of Public Life'. Clause Six of the Code of Conduct has, therefore, been revised to read:

'When acting on behalf of the Institution, act in accordance with the Seven Principles of Public Life, accurately represent the views of the Institution, and refrain from promoting their own or their employers' interest.'

The Seven Principles of Public Life were first set out by Lord Nolan in 1995, in the first report of the Committee on Standards in Public Life. The Nolan Principles, as they are now widely known, outline the ethical standards to which those working in the public sector are expected to adhere.

The principles are included in a range of codes of conduct across public life, and are founded on the understanding that all public office holders are both servants of the public and stewards of public resources.

The seven principles are:

1 Selflessness

Holders of public office should act solely in terms of the public interest.

2 Integrity

Holders of public office must avoid placing themselves under any obligation to people or organisations that might try, inappropriately, to influence them in their work. They should not act or take decisions in order to gain financial or other material benefits for themselves, their family, or their friends. They must declare and resolve any interests and relationships.

3 Objectivity

Holders of public office must act and take decisions impartially, fairly and on merit, using the best evidence and without discrimination or bias.

4 Accountability

Holders of public office are accountable to the public for their decisions and actions, and must submit themselves to the scrutiny necessary to ensure this.

5 Openness

Holders of public office should act and take decisions in an open and transparent manner. Information should not be withheld from the public unless there are clear and lawful reasons for so doing.

6 Honesty

Holders of public office should be truthful.

7 Leadership

Holders of public office should exhibit these principles in their own behaviour. They should actively promote and robustly support the principles and be willing to challenge poor behaviour wherever it occurs.

● The new CIBSE Code of Conduct is at www.cibse.org/codeofconduct

What it says on the tin

There is a growing focus on the accuracy of marketing and technical information and access to evidence to support claims about product effectiveness. Hywel Davies explains the challenges facing marketers and manufacturers

Many readers will recall a DIY product advert that said 'it does what it says on the tin'. Everyone wants products that do what the marketing claims, whatever the application. But for safety critical products where real-life performance could be the difference between life and death for a building occupant or an emergency responder, accurate and reliable product information takes on a whole extra dimension.

For some products that is already recognised. Key structural products have had third-party quality assurance schemes for many years, with regular audits of production and random checking of products delivered to projects undertaken to minimise the risks of defective products being used in real projects.

But recent evidence shows that products can be placed on the market that do not meet such stringent requirements. Recently, one such product was found to have been on the market for 15 years, from 2006 onwards, based on fire test results that the manufacturer has now acknowledged were not representative of the product sold. Put another way, the product originally tested in 2005 was, essentially, a different product from that being sold after 2006. Yet, for 15 years, the 'label on the tin' said it was the same product. And designers and installers used it in the mistaken belief that key product data on fire performance was accurate.

Another topical concern is with various products that are now being brought to the market in response to the pandemic. Devices are being presented on the basis of their claimed ability to deactivate the SARS-CoV-2 virus using various technologies. In some cases, laboratory test reports are available that support aspects of the performance of the product. But it is less common to receive evidence that demonstrates the effectiveness of the products in realistic and typical applications.

And, in many cases, it may not be possible to find reliable scientific or engineering evidence to support claims being made, and show that the product does what it says on the website, advert or brochure.

If it was merely a decorative product for home use



"There is no safeguard in place for the many new products being brought to market to 'deal with' SARS-CoV-2"

it might not matter so much. But for devices claiming to treat and purify air to deactivate SARS-CoV-2, it is vital that the effectiveness of the product is clearly and independently verified. Because if they are installed as part of a system to provide a safe indoor environment and they do not work as claimed, then that environment will not be safe. Nor those who occupy it.

Devices that use UVC radiation must not emit radiation into occupied areas, as UVC is harmful to humans. Concentrations of reactive chemical species such as ozone must be controlled below safe exposure levels, especially if other constituents of the local atmosphere may react with the active chemical to form harmful by-products. And it's essential to know the background levels of, for example, ozone, which is generated by copiers and other office machines, and to know that the ventilation provision in the space is sufficient to keep the concentration at safe levels.

A major concern is that both these approaches fail dangerously, whether by just not cleaning the air and not protecting occupants, or by emitting harmful radiation or chemicals because

of the product failure. If they are to be installed, then there needs to be a robust means of alerting the building manager to the failure immediately, so that mitigating measures can be put in place at once to maintain the safety of occupants of the affected space or spaces. And if that failure means harmful materials or radiation are escaping, then that equipment needs to be shut down equally quickly and competent technicians called to repair the problem, and then to test that the device is working safely again.

All of this means that the building managers need to understand how the device works, what safety mechanisms are in place to detect failures, alert the facility managers, and deactivate the device. This is anything but 'fit and forget' or 'plug and play' technology.

Everyone is aware of the requirements for testing medical devices or even vaccines, and the rigour that is applied. Yet there is currently no such safeguard in place for the many new products being brought to market

TWO LEGENDS, TWO CONTINENTS
140 YEARS OF SHARED HISTORY...
TODAY, STRONGER AS ONE

Gerry
Price

Noel
Holyoake



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Introducing Holyoake by Price

Over 65 years ago and 13,000 km apart, both Noel Holyoake and Ernest H. Price laid the foundations for what would become two powerhouses in the HVAC industry, Holyoake Air Management Solutions and Price Industries. Today, we are excited to announce the joining of these two forces; effective March 1, 2021, Price will acquire an interest in Holyoake to form Holyoake by Price.

Holyoake by Price will continue to operate as an independent business. The Price philosophy is sharing over mandating, and providing full access to leverage knowledge, products, and best practices. What makes this partnership so

exciting is the opportunity to work alongside a team that shares a strong focus on taking care of our customers and our people.

To our customers, we are extremely excited for the opportunities this partnership will bring to you. In the coming months, you can expect to hear more details around new products becoming available. We know that by working together as one, we will become the global leader of commercial HVAC products.

For more information, please visit info.priceindustries.com/holyoake

ABOUT HOLYOAKE AIR MANAGEMENT SOLUTIONS

Founded in 1953 by Noel Holyoake, Holyoake Air Management Solutions has grown to become a leading manufacturer of commercial HVAC products for the Australasian market. Just like Price, Holyoake held a manufacturing and sales license for a different manufacturer's product line. When that relationship ended, the company focused their engineering and innovation capabilities to develop their own line of products. Today, Holyoake has built a strong reputation of delivering high quality products backed by first class customer service.

"I have always promoted the idea in our business that whatever we are doing today, we have to do better tomorrow. I see the partnership with Price as being a giant leap for tomorrow and many tomorrows to follow." - Noel Holyoake, Founder Holyoake Air Management Solutions

ABOUT PRICE INDUSTRIES

For more than 70 years, Price has remained a privately held business with corporate headquarters in Winnipeg, Manitoba, Canada and US operations headquartered in Atlanta, Georgia. The founding principles of Price have never changed – business integrity, first class service, innovation and a commitment to people. It is these principles which have allowed Price to become the commercial HVAC leader in North America.

"Our job, as partners with Holyoake, is to enable Holyoake's success. We trust the leaders there like we trust our own leaders. Our goal is to be a forever company, and the only way to be a forever company, is to grow." - Gerry Price, Price Industries Chairman and CEO

» to 'deal with' SARS-CoV-2. And, as shown by recent revelations, there is also real concern over the accuracy and relevance of product test data for various fire-safety products. Not only that, but concern that manufacturers have been partial in their disclosure of test results to product-approvals bodies, with the suggestion that poor results have been withheld.

Two initiatives are now under way to address these concerns. The first is the creation of a new safety regulator for construction products with the Office for Product Safety and Standards. This regulator will work alongside the new Building Safety Regulator and have the power to remove unsafe products from the market, and to set minimum levels of testing and evidence of safety and effectiveness to be met.

The second is the Code for Construction Product Information, a new code of practice and conduct for testing, marketing and delivery of product data for all construction products. The Independent Review of Building Regulations and Fire Safety called for radical change in the regulation and marketing of construction products, and challenged industry to improve the communication of construction product information.

The draft code has been developed by the Construction Products Association (CPA), but is designed for all who make products to be installed

in buildings or civil engineering works. The code will require manufacturers to deliver specific information to support claims of compliance with, or achievement of, the requirements of any industry standard or certification scheme, and to provide verifiable information to support any claims about the product. It will also require that the information provided is consistent with the product that is actually supplied to the market.

Under the code, producers of novel products will have to obtain robust evidence of the effectiveness of their product before making claims about it in marketing literature or in advertisements. The code also seeks to drive a change of culture within the construction products sector to focus on reliable and accurate product information. Given recent revelations, this will need to include a culture of openness and transparency with product testing, certification and regulatory bodies.

The draft code, which is being managed by MRA Research for the CPA, is out for consultation until 31 March 2021. You can respond directly at www.buildingsafely.co.uk and CIBSE would also like to hear from readers with comments at technical@cibse.org. We would particularly like to hear from those responsible for product information relating to building services products.

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SMART LIGHTING GUIDE WEBINAR

20 April 2021, 13:00 (BST)

Register here: bit.ly/cibsewebinars



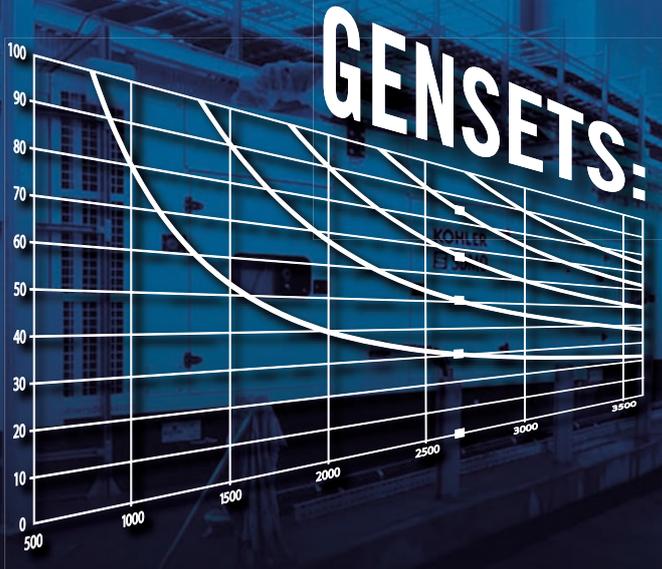

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Our project support service is available to anyone who wants help designing optimal fixing solutions for their project. Whether it's pipe supports, rooftop plant, or fire stopping, our technical advisers can provide advice, designs, calculations, BIM models and more – to make your job easier!

We can help you deal with complex issues like thermal expansion, corrosion or vibration. With our range of quality and often innovative products, we can design solutions that can save you time on site, reduce overall costs and reduce risk. The earlier you engage with us the more likely we can help you design the optimal solution.

The value of smart

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BURO HAPPOLD TAKES BUILDING CHAMPION CROWN

Engineer wins four CIBSE Building Performance Awards, including Public Use Building of the Year and Consultant of the Year (over 300 employees)

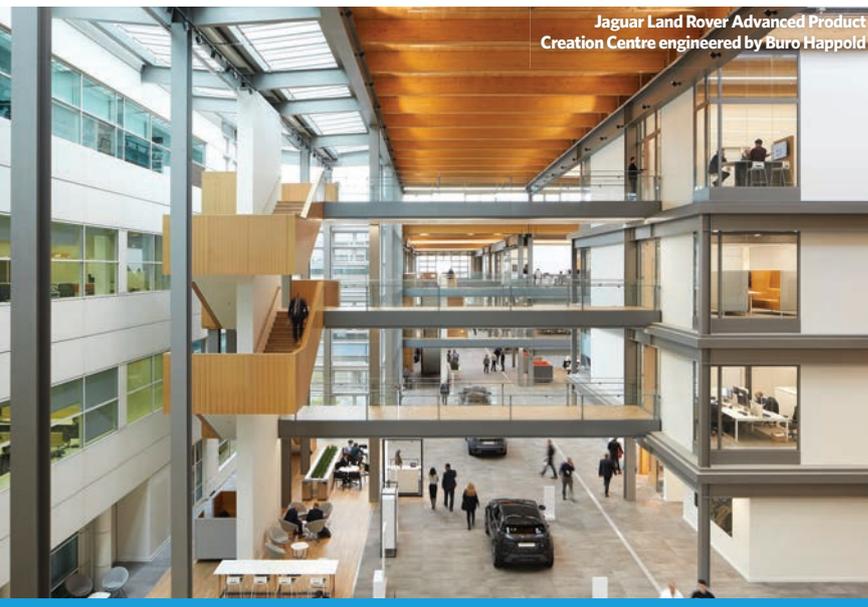
Buro Happold has been named 2021 Building Performance Champion at the CIBSE Building Performance Awards. The awards were held virtually for the first time last month, when the global engineering consultancy went one better than last year by claiming four accolades in total. It was named Consultancy of the Year (over 300 employees) – and was praised by the judges for taking ‘a holistic view of building performance that draws back into wider sustainability views’, and for going ‘beyond the standard engineering offer’. This was evident in The House at Cornell Tech, which won Project of the Year – Public Use. The judges called it an exemplar for future-proofed, multi-family

residential design, and said it ‘delivers Passivhaus on a large scale, which ties in social aspects and lessons learned from the building performance to educate occupants’.

The firm’s staff training and continual development were also acknowledged by the judges, who were impressed by the consultancy’s many collaborations. One such effort, working with UCL on its post-project review guidelines, helped Buro Happold win the Learning and Development Award.

The judges felt that Buro Happold’s willingness to champion sustainability, work with others and learn from projects made it a worthy overall winner. Chair of judges Hywel Davies said: ‘Buro Happold has shown clear leadership and demonstrated how to deliver low carbon buildings at scale and reduce the impact of existing buildings, which remains a huge challenge across the building stock.’ **CJ**

● Watch the event at bit.ly/CJMar21BPA



Building Performance Consultancy of the Year (over 300 employees)

Winner: Buro Happold

The judges hailed Buro Happold as a ‘company our industry should aspire to be’, and praised it for the holistic view that draws back into wider sustainability, reaching beyond the standard engineering offer.

Having declared a climate emergency, the firm encouraged others to do the same by launching its Engineers Declare platforms. In 2020, it published its first global sustainability report, committing its business operations to be net zero by April 2021. It is aiming for all

new buildings to be net zero in operation by 2030, with all projects net zero by 2050.

It is a Pioneering Delivery Partner for the Design for Performance initiative, an early signatory to the World Green Building Council (GBC) Net Zero Carbon Buildings Commitment, and active in the CIBSE Energy Performance Group and Health and Wellbeing Working Group, as well as the new Knowledge Generation Panel. Buro Happold is also a leading contributor to the Society of Façade Engineering and its work on façade safety.

Collaboration is central to the success of its projects, and the firm employs a variety of techniques to promote it. One example is its extensive work with C40 Cities around the world.

The judges praised Buro Happold’s innovative tool development, offered open source to industry, funding of research through its PhD programme, and staff training.

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Project of the Year – Public Use

Winner: The House at Cornell Tech – Buro Happold

The hub of student life at Cornell Tech, The House forms the cornerstone of the university's Roosevelt Island Technology Campus in New York City.

This 26-storey building, which contains 352 apartments for student and faculty housing, won the award with its holistic integration of engineering, social aspects and lessons learned.

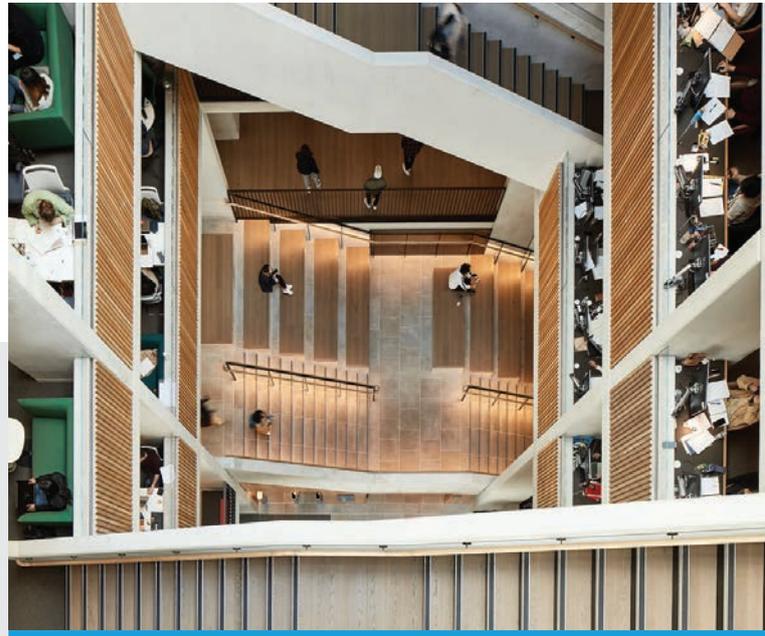
At the time of its design and construction, it became the world's tallest and largest Passivhaus-certified project. By achieving dual certification for Passivhaus and LEED Platinum, the design approach at The House provides an exemplar model for future-proofed, multi-family residential design.

The building is a flat-slab concrete structure with careful attention to thermal breaks at the boundaries. The envelope is a prefabricated metal panel system, with triple-glazed windows inserted and sealed. Fresh air is tempered and delivered via energy-recovery ventilators, with heating and cooling provided by air-cooled VRF in a floor-by-floor design to overcome height and refrigerant charge restrictions.

Judges praised the Buro Happold team for using the annual re-education of new student tenants to improve performance. They were also impressed that future-proofing was built into the building's fabric, not just the technology.



The Passivhaus-certified House at Cornell Tech in New York



UCL's post-project review guidelines ensure learning feeds into existing projects

Learning and Development

Winner: University College London (UCL)
Post-project Review Guidelines and Buro Happold

A client-led, collaborative process, with clear impact and tangible outcomes, was highlighted by the judges, as Buro Happold and UCL's post-project review (PPR) guidelines won this award.

The judges were impressed by a well thought through approach to post-occupancy evaluation (POE), and the standardisation and clear application of a difficult process.

UCL is in year six of a 10-year £1.25bn capital programme, with 14 projects on site, and 177 completed and in operation. With Buro Happold and Alexi Marmot Associates, it launched PPR guidelines to ensure buildings are performing as intended.

For all projects, the PPR includes a project implementation review (PIR), while for projects of more than £10m – or that are business critical – a full POE is also performed. A suite of resources has been created, and there is a central 'lessons learned' tracker, from which UCL's team feeds learning into new and existing projects.

In its first two years, the PIR process has been applied to 10

major projects. The first to complete a PIR and POE was 22 Gordon Street, the £22m refurbishment and extension to UCL's Bartlett School of Architecture. A 60% reduction in operational energy use per m² was demonstrated, despite floor area increasing and greater environmental control throughout the building.

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Project of the Year – Commercial/Industrial

Winner: Amorepacific HQ, Seoul – Arup

The stunning Amorepacific building was praised for its range of features that address local challenges and the global climate agenda. Over 29 storeys and 216,000m², the landmark HQ for South Korea's largest cosmetics firm includes company facilities, a public atrium, museum, auditorium and conference centre.

Arup's brief was to create an exemplar for low energy and sustainability, and this influenced design decisions from the macro scale - volume, height and shape - to the micro scale, with controls, metering and custom luminaires. The result is a building that has the form, materials and systems to provide an excellent working environment that is low energy in use. This is borne out by the operational energy performance, which is 50% below South Korean benchmarks for commercial buildings.

Delicate brise soleil cladding contributes significantly to the aesthetic and environmental performance, while the natural ventilation, shading and underfloor air conditioning are integral to the low carbon approach. It was awarded LEED Gold (Core and Shell 2009) by the USGBC.

The judges commended the project for its contribution to the quality of life for the building's occupants and visitors.

● **Highly commended:** DaiyaGate Ikebukuro – Nikken Sekkei



Project of the Year – Residential

Winner: Camden Mews – Max Fordham

This winning project's design intent of zero heating impressed the judges, who were interested in the range of innovations and how they might be scalable and replicable.

Using the Passivhaus standard, the building was designed so the heat loss on a cold winter's day would be no more than the heat generated by the people within. It was expected that a rooftop PV array could meet the annual energy demands of the house.

With its thermally massive structure, effective window opening

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areas, glossy white external finishes to window shutters, and effective night-time ventilation, the building is also designed to stay comfortable in extremely hot weather (its peak measured internal temperature was 28°C on 25 July 2019, when London reached 38°C). Building a new house on a small infill site in a narrow, cobbled mews brought spatial and planning constraints, however. Planted terraces were needed to reduce overlooking by neighbours, but this meant a bigger thermal envelope and smaller roof area for the PV – ultimately thwarting the zero-heating aspiration.

The judges noted the maximisation of daylight and warm lighting, while inclusivity aspects and separation for ageing occupants also impressed – as did the consideration of embodied energy, well ahead of requirements.



Project of the Year – International

Winner: DaiyaGate Ikebukuro – Nikken Sekkei

Nikken Sekkei's multidimensional approach to building performance was key to the success of DaiyaGate Ikebukuro in Japan. Despite being a very complex project – it is connected to and constructed over Tokyo's busy Ikebukuro Station – the judges said the project was a great example of a 'digital twin'.

With earthquakes a risk in Tokyo, the building had to be capable of providing refuge for up to 85,000 people. The MEP design also had to achieve robust seismic resilience and redundancy, effective and flexible office space, occupant comfort, energy conservation, large floor plates and high environmental performance.

Part of the solution was the development of a new perimeter through-wall-unit, using exhaust heat recovery, for independent cooling/heating and ventilation of each office area. Actual primary energy consumption was reduced by about 50% compared with a baseline building, and the peak power demand of the whole building is very low, at 38W/m².

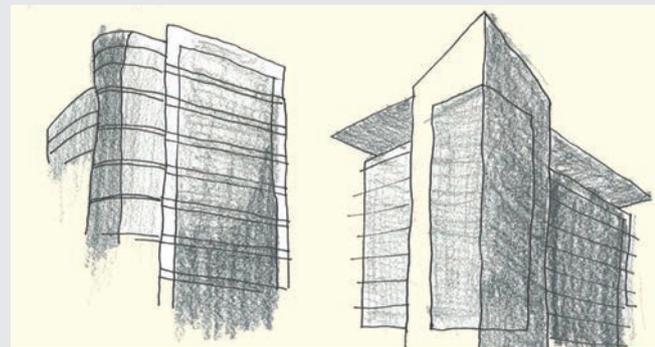
● **Highly Commended:** Monash Gillies Hall – Aecom

Project of the Year – Retrofit

Winner: Abu Dhabi Department of Energy (DOE) Energy Retrofit Pilot Project – GRFN

Realising significant energy savings with minimal intervention helped GRFN land this award. The target was to retrofit eight buildings owned by the Department of Energy (DoE) in Abu Dhabi and the city of Al Ain. It is part of the DOE's strategy to reduce electricity and water consumption in the Emirate's public sector by 22% and 32% respectively by 2030 (compared with 2013).

GRFN retrofitted the building systems, from the plantroom through to the occupied spaces. The judges praised the relatively light-touch approach and use of proven technology, which produced significant improvement in performance. The eight buildings saw an average baseline energy use index of 470kWh·m⁻² per year reduced to 293kWh·m⁻² per year – a saving of around 38% over an 11-month implementation period, with less than seven years' payback on investment.



ENGINEER OF THE YEAR

Building Performance Engineer of the Year

Winner: Aleksandra (Sasha) Krstanovic – mstep (formerly of Aecom)

Sasha Krstanovic has been named Building Performance Engineer of the Year after impressing the judges with her enthusiasm for inspiring the next generation of engineers to take an active role in building performance. The judges described her proactive approach to informal post-occupancy evaluation as unique, allowing her to discover and ameliorate issues, particularly in innovative systems. They felt Krstanovic's passion for the role of engineers in mitigating climate change makes her a great ambassador for CIBSE.

'Sasha's view that the challenges we face as an industry must be tackled not only with our skills, but also with a completely different mindset is very refreshing and inspiring,' the judges said.

In an industry with few female role models in leadership positions, the director, chartered engineer and Fellow of CIBSE has broken the mould. As an experienced designer, Krstanovic challenges the norm, and has delivered exemplar low energy/carbon projects, including:

- University of Nottingham, Energy Technology Building – world's first zero carbon laboratory
- The Apex, Bury St Edmunds – a music auditorium heated and cooled by an underground lake
- The Turnmill – London's first speculative commercial office to rely solely on ground source heat pumps for heating and cooling.

Krstanovic recently started her own MEP/environmental engineering consultancy mstep. With Aecom, she recently helped transform the UN's headquarters in Geneva, introducing smart working, while using

circular economy principles to bring this historic building into the 21st century.

To produce better multidisciplinary design, Krstanovic created the Better Buildings group at Aecom, which has led to new design standards, to include sustainability and building performance checks in reviews at each stage of a project.

She also tutors at Nottingham University School of Architecture and on the Loughborough University Intelligent Buildings Course, giving monthly talks and workshops for architects, engineers and clients on the practical application of low energy/low carbon solutions. As a CIBSE volunteer mentor, Krstanovic helps women at the mid-stage of their career. She also guides engineers towards chartership.

The nominees in this category were outstanding, the judges said, and inspired them to consider how critical the building services engineer's role is to achieving our ambitions for safe, net-zero buildings.

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HEATING



Sasha Krstanovic

Consultancy of the Year – Up to 50 employees

Winner: Lawler Consulting

Lawler Consulting is 'walking the talk', the judges said, with the FitWell analysis of its head office in Kilkenny, Ireland, which has numerous features that support the wellbeing of its employees. The multidisciplinary consultancy – which also has offices in Dublin, Cork and London – submitted a comprehensive and well-evidenced entry, the judges added, with strong and relevant supporting documentation.

It provided real evidence of work done and achievements with local authorities and commercial firms, including Dublin City Council and Meubles Furniture Store.

The judges were impressed by Lawler's focus on the net-zero carbon agenda, and on occupant and client satisfaction. In particular, they commented on the company making delivery of energy performance a standalone service offering.

An upfront bond is provided to the client and withheld until the intended energy performance is achieved, typically after 12 months' occupancy. This encourages an 'energy in use' approach, which Lawler claims is a much more effective way of delivering actual performance. It has led to greater understanding beyond design and commissioning, it said, and enabled it to see the physical implementation, monitoring and verification, and product total life-cycle costing.

The judges also highlighted Lawler's experience of using the NABERS system for improving building performance.

Consultancy of the Year – 51-300 employees

Winner: Carbon Intelligence

London-based Carbon Intelligence was described by the BPA judges as being 'ahead of its time in its service to clients'. In winning a closely fought category, the sustainability consulting and data company impressed with its specialist building performance knowledge – in particular, its expertise in the net-zero carbon buildings agenda, and occupant and client satisfaction.

Carbon Intelligence provides advanced smart data solutions for monitoring building performance, and works with businesses as a trusted partner and adviser, placing its team within the client team to deliver their expert services. Its ADAPT platform collates, verifies and analyses data, using machine-learning to create performance benchmarks and highlight and even diagnose problems, alerting site teams and engineers to appropriate actions.

During the Covid-19 lockdowns, this approach has helped several clients reduce their energy consumption by more than 70% – well above the average reduction of 16% – resulting in significant cost and carbon savings. It is now being applied to support clients to safely and successfully reopen workplaces. Carbon Intelligence has worked with UK-GBC and others to develop technical guides, and participates in working groups looking at advancing net zero buildings and developing energy performance targets for net-zero carbon offices.



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examples of overcoming the challenges of working within live, densely occupied and ageing city centre buildings. Over the past decade, the FM team has reduced carbon emissions across the campus by 85%. It has also cut water use by around 25 million litres per year.

Among the projects LSBU has implemented is the installation, maintenance and optimisation of a balanced energy network - the first 5th-generation heat network in the UK - which uses high-temperature heat pumps to offset gas use in two of the largest buildings on campus. It also replaced four ageing ground source heat pumps in one building with two reversible heat pumps providing low carbon heating and cooling.

Facilities Management

Winner: London South Bank University Campus - London South Bank University

'A true FM submission that focused on more than just building performance' was one reason cited by the judges for London South Bank University (LSBU) Estates Department winning this award. They also noted the praise of academic stakeholders for the team, while the entry contained excellent instances of knowledge transfer and training of future engineers.

The university hosts more than 17,000 students across 14 campus buildings in central London, and the judges were impressed by the



Product or Innovation of the Year – Thermal Comfort

Winner: VirtuPVT - Naked Energy

Naked Energy's VirtuPVT stood 'head and shoulders above the rest', according to the judges, who said it achieves cleaner integration of renewable technologies in buildings to meet 21st-century energy needs.

VirtuPVT combines thermal and solar PV, and allows buildings to offset gas and electricity consumption. Its unique vacuum-tube PVT design means it can deliver heat up to 70°C, so can contribute to domestic hot water, space heating and process heat, while simultaneously producing electricity for onsite consumption or export.

The tubes can be mounted vertically or horizontally, and are optimised for visual impact and wind loading. Each tube can deliver a maximum of 275kW thermal and 70kW electrical, and - in the UK - typical yield is expected to be around 213kWhth and 60kWhpe per tube.

By adding the 20% efficiency of PV cells to the 60% efficiency of a solar thermal collector, VirtuPVT can achieve total efficiencies of up to 80%, making it the highest energy-density solar technology in the world.



Product or innovation of the Year – Wellbeing

Winner: Productivity mapping; making the business case for wellbeing - Cundall

Cundall has developed a toolkit that makes the case for investing in workplace design by demonstrating how it can increase wellbeing and productivity - and, ultimately, save on overall operating costs. Its productivity mapping tool quantifies elements of the indoor environmental quality, such as temperature, CO₂ levels and daylight, and can be used to measure and optimise employee productivity in existing workplaces, as well as at the design stage of new buildings.



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The company used the latest academic and industry research to produce a bespoke parametric modelling tool that demonstrates where occupant performance metrics are linked with the environmental parameters of thermal comfort, CO₂ and daylighting on an hourly basis.

The data can be used to aggregate the loss of productivity, which - when combined with an organisation's revenue or the salary costs of the occupier - provides an assessment of the financial impact for a range of measures. When linked with the capital costs, it can be used to show the financial return on investment of each intervention.

Praising the mapping tool for the effective way it demonstrates to clients the impact of wellbeing, judges said Cundall had found a novel way to assess wellbeing and link it to productivity.

Collaboration

Winner: Streatham and Clapham High School - OR Consulting Engineers

Extending a busy London high school while keeping it fully operational and adopting a 'green' design strategy was a challenge OR Consulting Engineers met, thanks to close collaborative working with stakeholders.

The Girls' Day School Trust wanted to extend the school to cater for new flexible teaching, a sixth form and dining spaces, but increasing the footprint of site excavation or introducing boreholes was not permitted.

At every step, the team undertook workshops for the client, teachers, pupils and neighbours to ensure all parties understood what was being proposed.

A document-sharing portal was set up, Revit and SketchUp were used to communicate ideas, and simple mock-ups were built to test plans. Judges said the project showed a clear structured and collaborative approach - with an exemplar use of post-occupancy evaluation.





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OUT OF THE ORDINARY

The Covid Achievement Awards recognise those who have responded to the challenge of making people and buildings safe during the pandemic

Four teams involved in the delivery of the Nightingale Hospitals have been recognised in CIBSE's first Covid Achievement Awards. The accolades recognise the remarkable work that building services professionals, with their supply chains, have undertaken to contribute to the nation's efforts to combat the effects of Covid-19. Created for 2021, in association with *CIBSE Journal*, the awards take account of the challenges faced by individuals, teams, organisations and projects, across the full range of built environment activities.

Buro Happold, the 2021 Building Champion in the CIBSE Building Performance Awards,

was also recognised for its use of modelling and analytics in helping universities reopen after the first lockdown.

There were four entries from teams involved in the creation of the UK's Nightingale Hospitals, which were constructed as the UK went into its first lockdown. Such was the achievement of delivering these Covid-19 hospitals in extraordinary circumstances that the judges decided not to single out any one particular entry.

Ed Wealend, head of research and innovation at Cundall, said: 'All the shortlisted entries turned around something pretty incredible in a short period of time. They all deserve the same amount of credit.'

The judges recognised the uniquely challenging circumstances. 'It wasn't just about the design,' said Hywel Davies, chair of the judges. 'It was the long hours, with half the supply chain trying to shut down on them.' They also praised the level of collaboration. 'All of the hierarchical structures that you usually have went away,' said Susan Hone-Brooks, chief engineer for construction at MTC.

The judges believe it is vital the construction industry learns from the NHS Nightingale Hospitals. 'These teams created some incredible outputs,' said Nick Buckingham, UK managing director at Colt International. 'Imagine what we could build if we worked in this way all the time.'

The following teams have been recognised:

Hoare Lea Healthcare team – NHS Nightingale Hospitals, UK

Over two time-critical months, and across seven locations, Hoare Lea provided MEP and fire engineering design, testing, witnessing and validation to support the design and construction of the UK's Nightingale field hospitals.

The first site needed to be delivered in 17 days, so Hoare Lea's teams had less than 12 hours to mobilise. The needs of each site differed – and as more was understood about the Covid-19 virus, the engineers had to evolve the building services. Major procurement challenges resulting from the national lockdown were overcome by a flexible design approach, as the teams delivered around 5,000 intensive care beds and supporting facilities.

Hoare Lea's chartered CIBSE/IHEEM engineers also helped resolve vital issues with ventilation, temperature control, oxygen pipework routing, oxygen concentration calculations, and water quality.



Ridge and Partners – NHS Nightingale Hospital, Bristol

Ridge's brief was to deliver more than 300 intensive care beds in the mothballed University of the West of England Exhibition Centre, in Bristol, within four weeks. By midday the same day, floor tiles were being lifted and services modified to enable critical timescale items to be targeted first.

Ridge compared the potential of the existing MEP infrastructure to the relevant Health Technical Memoranda for intensive care provision. New services that were required were all achieved through intrusive surveys/validations recorded in a matter of days, before moving on to evaluation and adoption/reconfiguration design.

Ridge was based on site 12 hours a day, seven days a week. It modelled the intensive care beds using BIM, to ensure timely approval by NHS clinicians, while keeping the overall design flexible to suit the availability of products.

RSP/BDP – NHS Nightingale Hospital, London

BDP and RSP worked collaboratively to convert the ExCeL London exhibition centre into an emergency Covid-19 hospital with 4,000 intensive care beds, delivering the first 500 in nine days.

Consultants from different practices worked with a huge team of contractors, suppliers, specialists and the Army. BDP's architects took on the role of lead consultant, coordinating the design proposals and providing engineering services, alongside RSP and Eta Projects.

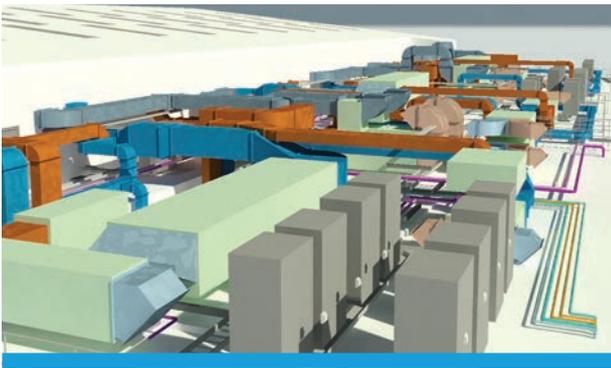
Teams had to make immediate decisions to allow construction to progress in parallel with design. Solutions had to be flexible, rapid to construct, and cope with changing requirements. Where possible, maximum use was made of the ExCeL's existing infrastructure and temporary systems, with existing services upgraded and enhanced where necessary. For more details see 'Rapid response' *CIBSE Journal*, May 2020

Services Design Solution – NHS Nightingale Hybrid Facility, Exeter

A former warehouse, the Nightingale Hospital in Exeter was built to treat Covid-19 patients, but now also offers diagnostic testing so the region's five other hospitals can continue to deliver essential clinical services.

The 116-bed, mini general hospital took less than 57 days to complete, with Services Design Solution (SDS) acting as the building services consulting engineers. Its engineers were based on site, allowing direct communication with the design and construction teams. This was vital because of the speed and changing requirements of the project, including updated official guidance from scientific advisers as the pandemic developed.

A 3D survey of the existing warehouse was carried out by SDS to understand its constraints. This informed the BIM model, produced to deliver a 'right first time' approach.



Buro Happold Analytics team

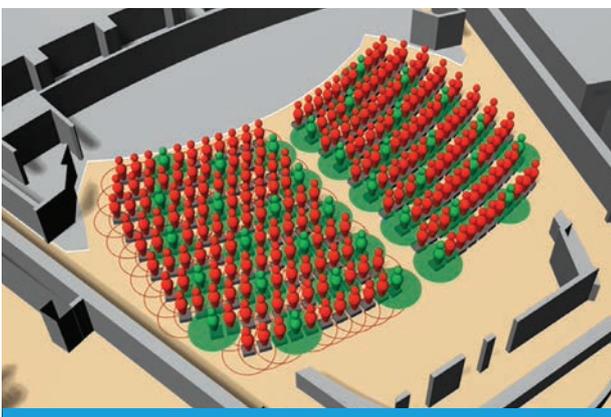
Buro Happold's Analytics team worked with seven UK and Irish universities to help them facilitate social distancing and promote the health and wellbeing of students and staff. The number and complexity of interrelated issues made planning complex, involving a range of stakeholders, from timetabling and estates staff, to department heads and student and staff representatives.

Buro Happold used innovative modelling to optimise the capacity of different teaching spaces and applied this to thousands of spaces to determine the overall capacity of a university's campus.

Real-time analytics and 'what if' modelling enabled collaborative decision-making with stakeholders, while 'day in life' modelling highlighted potential social-distancing hot spots around campus.

Buro Happold also considered the flow of people inside buildings, and then detailed interventions that could improve their circulation and facilitate social distancing.

The judges commended the firm for the big impact its work had on getting the universities open again.



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WATER'S EDGE

Measuring the impact of thousands of gallons of water cascading through a deeply forested shopping centre was difficult enough for Atelier Ten's modelling team, without having to consider trains passing through the building's core. **Andy Pearson** finds out how they used cutting-edge models to meet the challenge at Singapore's Jewel Changi Airport, and won a CIBSE Building Simulation Award in the process

The world's tallest indoor waterfall is the centrepiece of Jewel, at Singapore's Changi Airport. In an otherworldly space, water showers down from an oculus in the centre of the building's 200 metre-diameter, toroidal glass roof.

The waterfall plunges 40m into a valley blanketed by an indoor forest of 1,400 trees; the valley's sides rise up five storeys in a series of terraced gardens. Trails twist up through the terraces, a canopy of activity nets is strung above the tree tops, and a sky bridge provides visitors with a vertical perspective down onto the vegetation.

Beneath this 20,000m² forest garden are five floors of 280 shops, restaurants and a hotel. Designed by Safdie Architects, and located between the airport's existing terminals, the Jewel building is open to the airport and the city. Trains carrying passengers to the airport's terminals pass through this lush space on an elevated track.

The biggest challenge of Jewel Changi Airport was the potential impact of the waterfall on occupant comfort. The main concern was the air movement generated by 23m³ of water falling every minute. There was no precedent for an indoor waterfall of this scale, so environmental engineering consultant Atelier Ten used computer modelling and the

MODELLING DAYLIGHT

Modelling was the key to resolving the competing demands of light and heat for the gardens. Plants need high levels of daylight to thrive, but with high levels of daylight come high levels of solar heat, which could make the space uncomfortable for visitors.

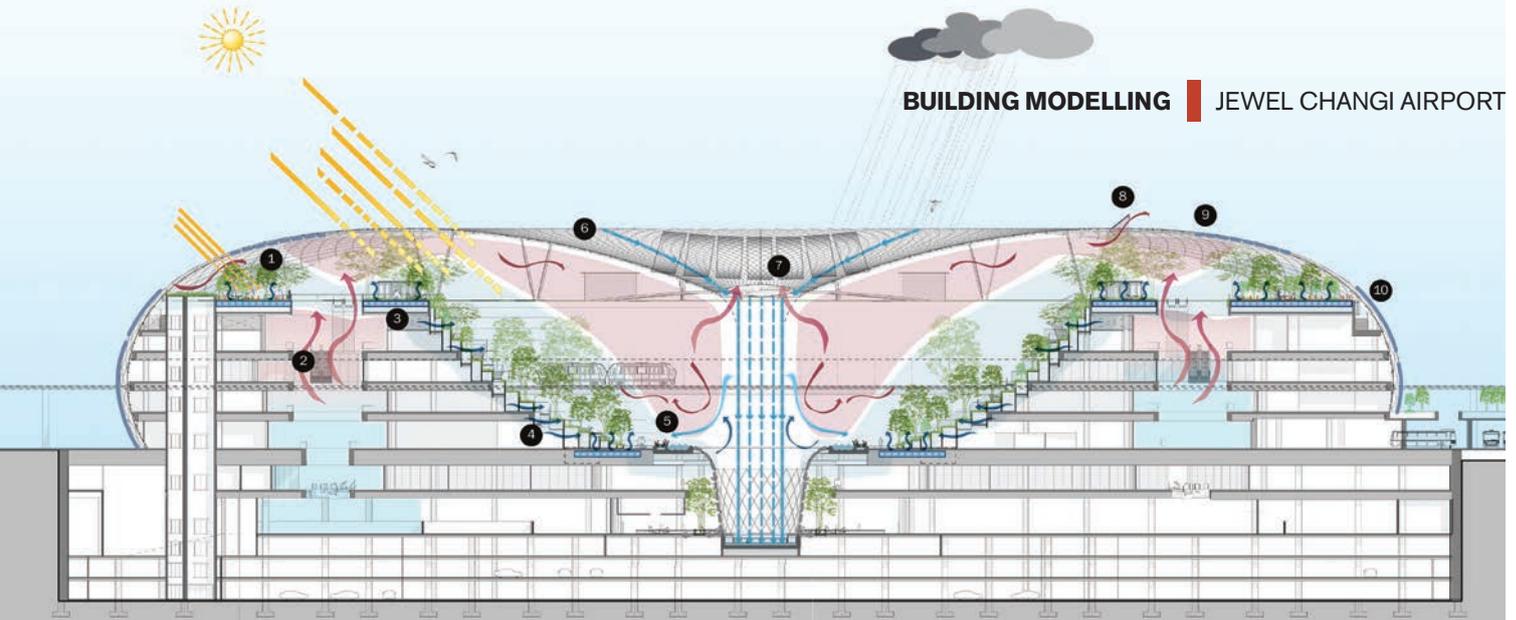
Using a combination of bespoke ray-tracing and illuminance prediction software linked to the architect's 3D BIM model, Atelier Ten modelled the light coming through each triangular glass cell of the grid shell roof (designed by Buro Happold) for each hour of the day over a year, to evaluate different glazing materials and surface coatings in terms of energy demand and use.

The modelling resulted in a glass coating being selected that admits 62% of the sun's energy as visible light while admitting only 33% of that energy as heat. In addition, a frit-pattern was applied to the glass in different densities, to further reduce the solar gains in areas where daylight levels were less critical. The ability to limit solar gain was vital in reducing cooling demand to keep the public spaces comfortable.

Mapping the daylight also gave PWP Landscape Architecture a thorough understanding of the quantity of light available when it came to determining the planting for a particular area to create the lushly landscaped forest valley for a climate-controlled indoor forest. Atelier Ten worked with PWP to adjust the surface properties of the glass to shine more light into areas where plant species required higher light levels.



Jewel Changi Airport, where up to 23m³ of water falls per minute in the world's tallest indoor waterfall



- 1 Tree canopy to provide shading
- 2 Heat stack effect - vertical heat gains draw warm air up vertically
- 3 Radiant slab cooling to absorb heat from solar-beam radiation and provide cooling at occupied levels
- 4 Heat stratification-based ventilation for low-level occupancy cooling
- 5 Localised cooling from central water feature
- 6 Spectrally selective glazing with high visual light transmittance and low solar gains
- 7 Retractable sail shades over event space for localised solar control
- 8 Smoke vents in roof to exhaust hot air collected below the roof
- 9 Fritted glass with varying density of frit to minimise solar gains
- 10 Insulated opaque panels on vertical façades balances transparent glazing on roof



Top: The concrete slabs with embedded cooling act as a giant thermal buffer to absorb the solar heat before it can be radiated into the air

application of fundamental building physics to recreate the environmental impact on the indoor environment.

If modelling the deluge wasn't challenging enough, the design team also had to measure the impact of trains running through the space. Complex software was used to find a way for trains to simultaneously enter and leave without conditioned air escaping the building.

The dependency on modelling for the success of the project meant building physics was at the core of the workflow, says Atelier Ten director Meredith Davey. 'We used it to inform the design development rather than for simply validating our finished design,' he adds.

The Jewel opened last year and, thanks to the extensive modelling, the waterfall and trains have had no adverse affect on plants or visitors. In November, its success was recognised by Atelier Ten winning a CIBSE Building Simulation Award.

A shopping mall like no other

The scheme has similarities with the series of giant air conditioned greenhouses of Singapore's Gardens by the Bay attraction, for which Atelier Ten was also the environmental engineering consultant. At Jewel, the consultant provided strategic environmental design, analytical consultancy and conceptual services engineering.

As with Gardens by the Bay, the challenge was to achieve the delicate balance of providing natural light for the plants and thermal comfort for visitors, while minimising the building's energy demands in Singapore's tropical climate.

Conditioning the volume under the glass roof would have used enormous amounts of energy, so only the occupied zones are conditioned. These are maintained at a temperature of approximately 24°C using a combination of integrated displacement ventilation and hard paved areas with embedded chilled water pipework. 'It worked well at Gardens by the Bay, so we thought it was a good idea to do it again,' says Davey.

Dealing with the solar gains was one issue, but by far the biggest challenge was the potential impact of the waterfall on occupant comfort. 'For Gardens by the Bay, we did >>

» some modelling of the impact of a waterfall on the internal conditions, which, although crude, was broadly right,' says Davey. '[In Jewel] the scale of the waterfall and its central location in the space was so integral to occupant comfort that we had to go way beyond making simple assumptions.'

Designed by WET, the waterfall – or rain vortex as it is termed – is an impressive piece of engineering. Rain falling on the inner slope of the toroidal roof flows down to a slot opening forming the perimeter of the oculus.

From this opening, a vortex of water plunges down eight storeys, the final three of which are contained within a giant, transparent, acrylic tube as it passes through basement retail. At the foot of the fall, water is collected and pumped back up to the roof, to ensure a constant flow of 4.5m³ per minute. The spectacle is enhanced for 20 minutes in every hour, when pumps ramp up to deliver water at up to 23m³ per minute.

The intent was to model, in detail, the impact of the waterfall on the space. While the cascading water will naturally cool the air through adiabatic evaporation, its impact on the huge volume was, Davey says, 'relatively minor'. Of much more concern was the air movement generated by the huge volume of falling water.

When it came to modelling this, the engineer found very little information. Davey says the modellers spoke to an academic who had modelled airflow in a shower to find out



The toroidal roof of the Jewel makes an impressive addition to Singapore

why the shower curtain is drawn into the cubical when the shower is in use. 'That was the nearest approximation we could find to modelling air movement around a waterfall,' he says. The design team corresponded with him to outline its proposed methodology, which he endorsed as appearing to be 'on the right track'.

The reason it was so difficult to model the impact of the waterfall on the surrounding air is because it is a series of interacting elements. As each drop of water falls through the air it creates a comet's tail of drag behind it that accelerates the surrounding air. Then the team modelled what happens when two water droplets next to each other fall through the air: 'There is some drag, but there is also interference, so it is not a perfect teardrop,' Davey explains.

The more droplets modelled, the more complex the model. For example, they wanted to know what the impact would be of a droplet

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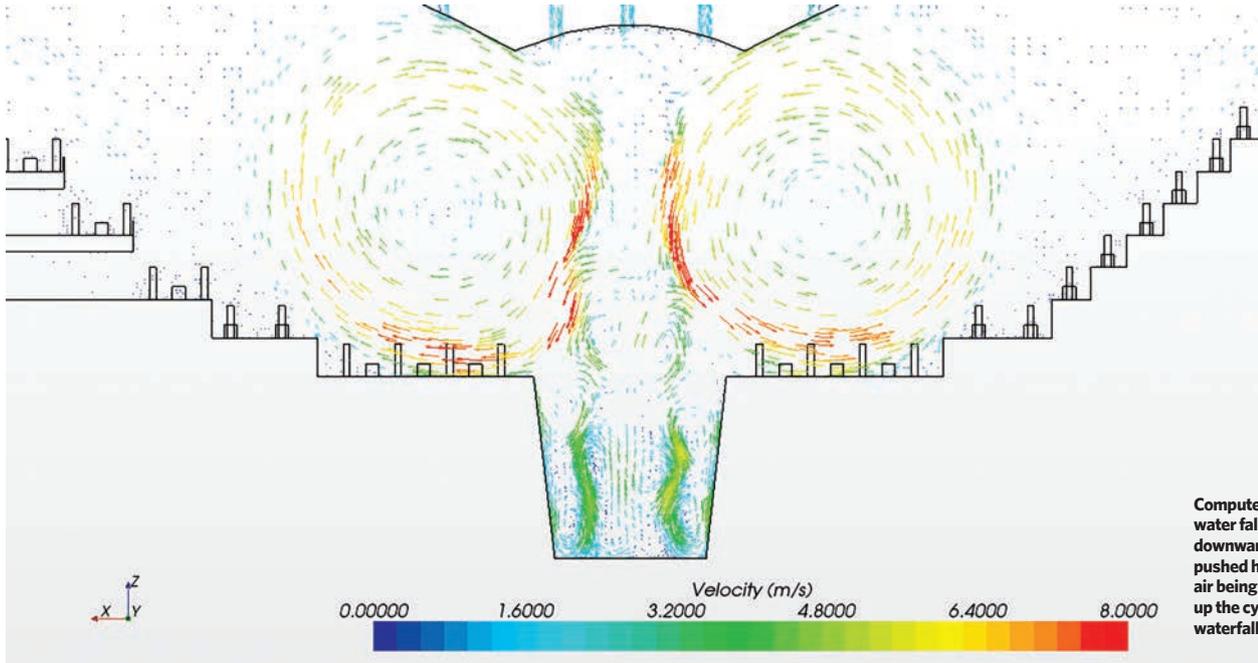


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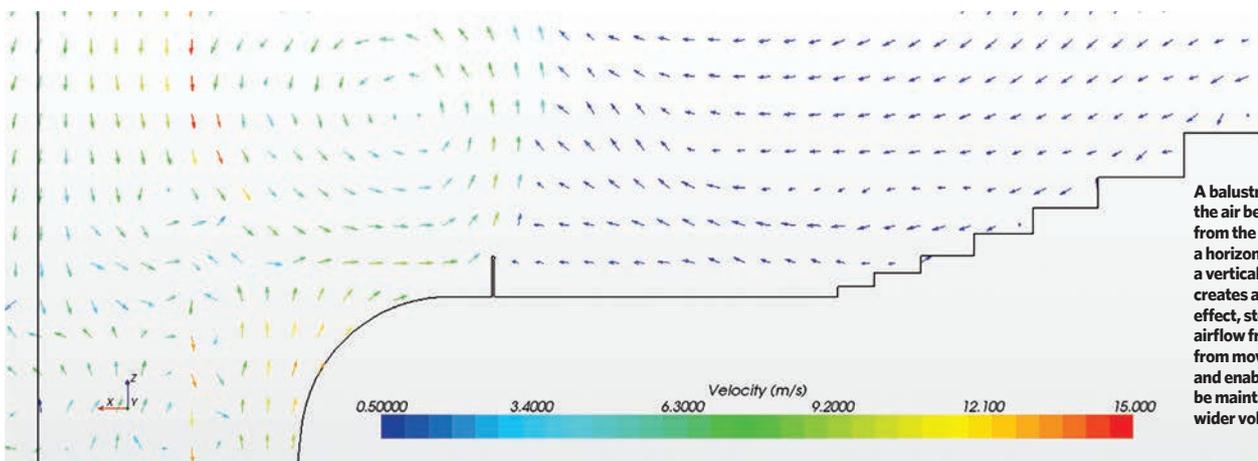
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Computer model showing water fall dragging hot air downwards before being pushed horizontally by air being forced back up the cylinder at the waterfall base



A balustrade deflects the air being pushed up from the cylinder from a horizontal pattern to a vertical pattern. This creates an air curtain-like effect, stopping the airflow from the waterfall from moving laterally, and enables comfort to be maintained inside the wider volume

falling in the middle of 30 million droplets. In this case, the air around the droplet will already have been accelerated, but the droplet will still be accelerating because of gravity, Davey says. 'In very fast air, the droplet will be pulled apart to become smaller droplets, so the model very rapidly goes from what sounded like a simple challenge to a hugely complex task to define what is actually going on.'

Their solution was to approach the modelling from both a macro- and micro-scale. 'We were doing macro modelling analytically from first principles, using engineering and fluid dynamic equations, to establish what this mass of water might do to the surrounding air; then we were doing stochastic modelling around droplet size and distribution,' Davey says.

To test the effectiveness of the computer model, various full-height, part-width, mock-ups were built. As a result of modelling, they were able to illustrate that the waterfall would entrain a significant quantity of the surrounding air. The model showed that this mass of moving air would drag down hot air from high within the space, which would then be pushed out across the valley floor, making conditions uncomfortable for visitors.

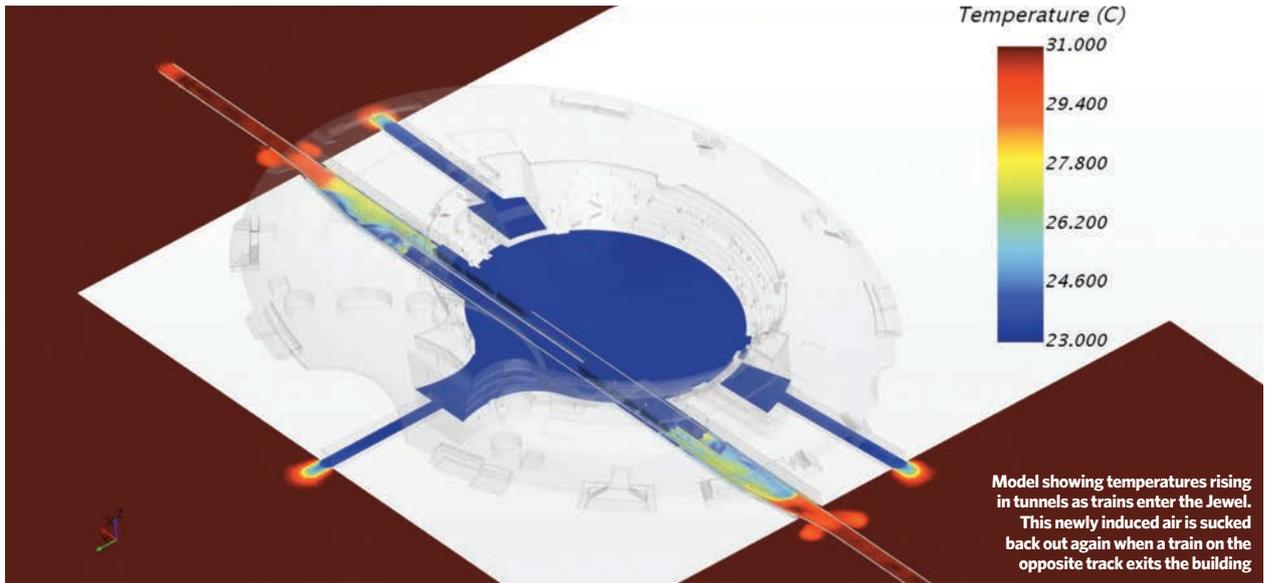
It also showed the problem occurred at the point where falling water passes through the opening in the valley floor. Air, entrained by the falling vortex of water, was being dragged down into the acrylic cylinder at the waterfall base and colliding with the air being forced

back out from the cylinder. As a consequence, the mass of entrained air was being driven horizontally across the main pedestrian plaza. 'We found that the shape of the funnel was causing the air to come down and bounce back out again, to be forced out laterally at the top of the funnel,' says Davey.

At the point where the waterfall passes through the valley floor, the architect has placed a disc-shaped reflection pool, intended to act as a barrier to prevent visitors from walking too close to the opening. The modelling showed that the addition of a simple glass balustrade around the perimeter of the reflecting pool was sufficient to prevent the lateral flow of air and keep the space comfortable. 'Adding a glass balustrade meant the lateral flow of air was forced upwards,' Davey says [see models above].

The inside track

In addition to the waterfall, another major challenge were the openings that allow trains to pass through the valley on an existing line to link terminals 1 and 3. There are two trains on the elevated track. They travel in opposite directions, but pass each other at speed at the mid-point of >>



» the forest valley, where there is a crossing loop.

Initially the plan was to encase the track in a glass tunnel. However, this approach was abandoned because of concerns that the tunnel would be impossible to keep clean. ‘The challenge we then had to overcome was how to keep the building operational with the tunnel removed,’ says Davey.

The challenge was to resolve how to seal the train entrance and exit portals to prevent conditioned air from inside the positively pressurised glazed torus escaping outside. One solution was what Davey describes as ‘a system of meaty air curtains’. This involved installing two air curtains at the entrance and exit portals. One air curtain would operate continuously under normal conditions and, when the wind speeds increased, a second high-powered air curtain – which Davey describes as like ‘an electric-powered jet engine’ – would kick into action. ‘They weren’t quiet is all I’ll say,’ laughs Davey.

A solution based on spring-loaded doors that would flip open the second the train bumped into them was also investigated, but this was abandoned after the train operator’s liability insurers refused to allow anything to touch the train. In the end, a system of fast-acting roller-doors, of the type used to allow forklift trucks to enter industrial refrigerated warehouses, was selected. To enter and exit the forest valley, the tracks pass through concrete tunnels. A roller door is located close to where the train enters and exits each tunnel, forming a rudimentary airlock.

The problem with this vestibule arrangement was that

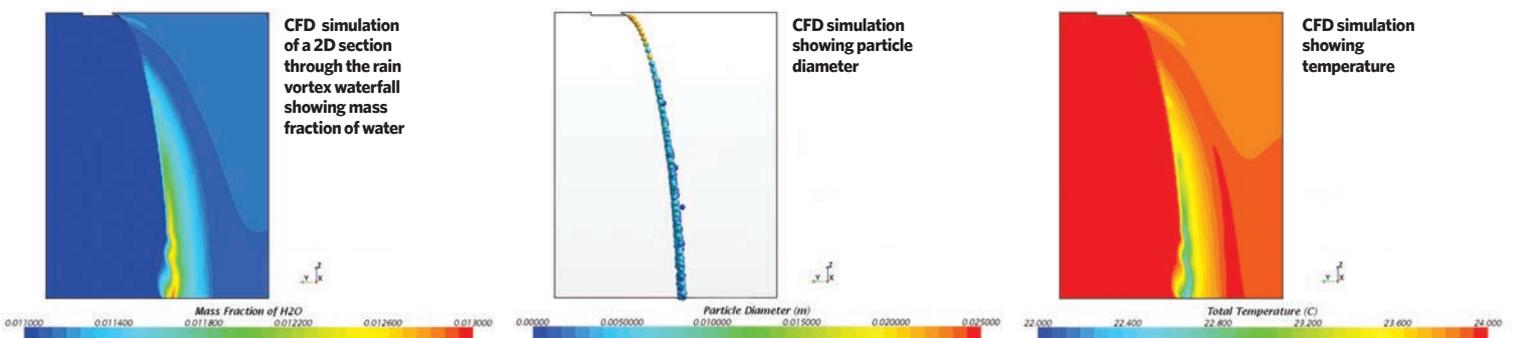
the roller-door mechanism did not work fast enough to cope with the speed of the train. ‘Basically, the inside door would begin to open before the outside one had fully closed,’ says Davey. The Building Construction Authority of Singapore – Singapore’s building control – was concerned about this arrangement, so the design team had to evaluate the volume of infiltration air, to prove it was relatively insignificant. ‘We were worried that, as the train drives into the building, you’d get a piston of air pushed ahead of the train and a vortex trailing behind it,’ says Davey.

Atelier Ten developed a means of modelling the air movement, but had to work with its CFD software suppliers, Siemens CD-adapco, to use its supercomputers, because the CFD model was so complex that their inhouse computers ‘did not have enough horsepower’, says Davey.

As a result of this complex modelling, they were able to show that having the trains pass each other inside the dome was advantageous. ‘What we found was that, as a train entered, we were getting some air bleeding into the space, mainly because of the vortex wake,’ explains Davey. Fortunately, as the second train left through the same set of doors, the model showed that it sucked most of the newly induced air back out again.

‘Because the trains pass each other in the building, each train acts to counter the airflow of the other,’ Davey says. The net result was a small amount of infiltration, which was easily dealt with by the displacement ventilation system.

The system modelling has clearly been effective. ‘A key objective was that people had to be comfortable inside this space for it to be successful,’ says Davey. The building has now been open for six months and has had more than 50 million visitors, which was the total number of visitors expected for an entire year. ‘It has been much more successful than had been anticipated,’ says Davey. □



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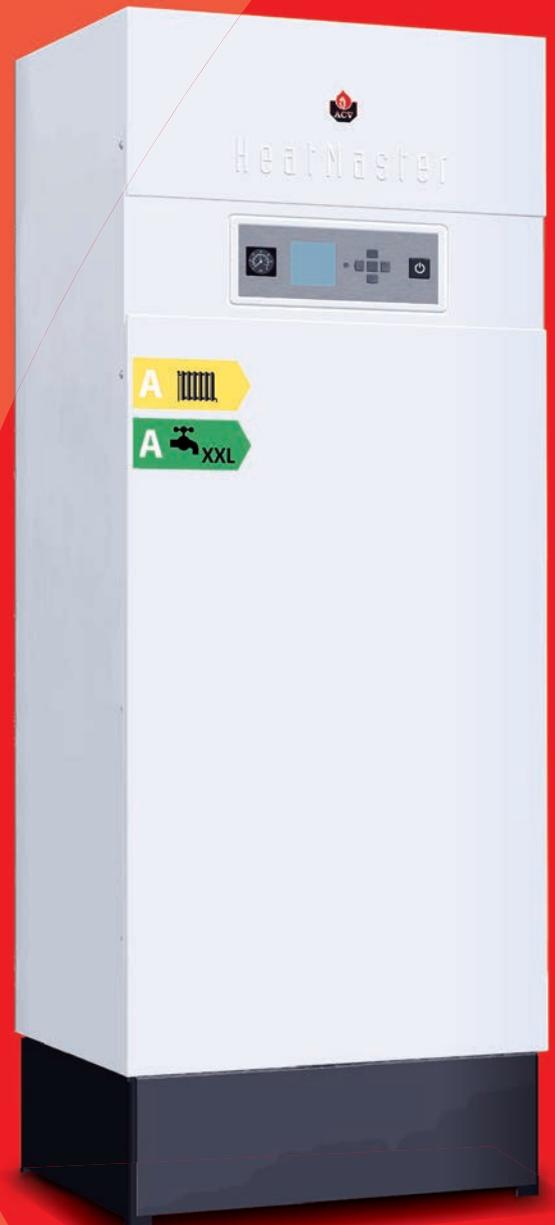
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TM63 includes a case study of Keynsham Civic Centre where design and operation stage data was compared to identify performance gaps

REALITY CHECK

CIBSE's TM63: *Operational performance: building performance modelling* helps identify a building's performance gap by evaluating its in-use performance to provide a benchmark that reflects real-life operating conditions. Authors **Esfand Burman** and **Nishesh Jain** discuss the benefits of a calibration approach

Energy performance calculations carried out to comply with the approved associated parts of the building regulations, such as Part L in England or Wales, Part F in Northern Ireland, or Section 6 of Building Standards in Scotland, are based on default or standardised operating conditions. These often do not accurately reflect actual operating conditions of a given building, such as number of occupants, occupancy hours, temperature set points, and schedules of operation of HVAC systems.

Furthermore, regulatory calculations do not report energy use related to equipment (plug loads). Comparing actual energy use of a building with the outcome of regulatory calculations is not an appropriate method for evaluating in-use energy performance.

These regulatory calculations are intended to be simple and suitable for performance evaluations at design stage, and to demonstrate compliance with the requirements after completion. However, the purpose of these compliance checks is not always understood, and outcomes of these regulatory performance calculations are often mistaken for some form of prediction of energy performance for a particular building, which they are not.

To address this, CIBSE TM54 (2013) set out a framework, employing

a dynamic simulation method, to provide estimates of the likely operational energy performance of buildings at the design stage. The CIBSE TM54 framework allows designers to tailor the operating conditions based on the client's brief and expected performance, and accounts for all energy end-uses, including equipment loads.

CIBSE TM54 is intended to be used during design and construction stages, and the tailoring of the calculations for expected operating conditions creates a more realistic design baseline for buildings. This calculation can also be used as a more appropriate baseline for estimating the magnitude of the energy performance gap in use.

The guide also acknowledges the limitations of deterministic energy performance calculations, and provides practical suggestions for uncertainty and sensitivity analysis, to evaluate the sensitivity of outputs to uncertainty in input data that is often inevitable – for example, seasonal efficiency of boilers and chillers.

Once the building is in use, evaluation of the actual energy performance falls into the domain of measurement and verification (M&V). In addition to identifying potential

discrepancies between actual operating conditions and design assumptions – for example, changes to occupancy hours of a building – performance evaluations often uncover several technical issues (such as incorrect or inefficient configuration of boilers) that compromise performance in use.

In the absence of a robust M&V framework, however, it is not certain that the technical issues uncovered in a building reflect all, or most, of the key causes of the performance gap. It is likely that one or two key issues are identified during investigations, while other potential issues are not covered. A robust energy performance M&V framework for buildings in use must be able to identify all important issues and separate the following:

- Deviations of the operating conditions from design assumptions that are primarily driven by a building’s function and its actual occupancy, (for example, changes in occupancy numbers and hours, heating and cooling setpoints, and functional use of the spaces)
- Technical issues that cause a performance gap between design intent and actual operation (for example, thermal bypass in the envelope because of missing insulation, inefficient operation of boilers, and lack of detailed commissioning compromising automated lighting control).

An effective M&V framework for evaluation of the performance gap should, therefore, identify deviations in operating conditions and enable users to identify technical issues effectively and comprehensively. CIBSE TM63: *Operational performance: building performance modelling*, published earlier this year, provides a framework to evaluate the performance in use. The framework proposed in CIBSE TM63 is based on the following principles:

- (1) Use of a systematic method of data collection to identify various discrepancies in operating conditions and potential technical problems when compared against design assumptions and intents.
- (2) Use of a dynamic thermal simulation model of the building, calibrated with actual operation, to drive the process of ensuring that the uncovered issues can explain the actual performance with reasonable accuracy.
- (3) Through the calibration process, two sets of simulation model input data relating to the discrepancies in building performance should be identified and separated:
 - a) Actual operating conditions required for the building to perform its function in practice,
 - b) Technical problems related to construction, system installation, commissioning, control, and so on.
- (4) Once the building performance model is calibrated, a new in-use baseline can be defined for performance that reflects actual operating conditions (adjusted for 3(a) above), but assumes the original design intents are met (issues identified in 3(b) above are addressed in the model to revert to design intents).

“In the absence of a robust M&V framework it is not certain that the technical issues uncovered in a building reflect all, or most, of the key causes of the performance gap”

(5) The technical energy performance gap is the difference between actual energy use and the new in-use baseline, defined in Step 4. This process enables users to define the energy performance gap with reasonable accuracy and avoid the confusions that may arise when performance in use is compared against regulatory calculations, or calculations that do not reflect the actual operating conditions and requirements.

The process also provides a systematic method for building performance evaluation and helps users identify causes for the performance gap.

The International Performance Measurement and Verification Protocol (IPMVP) can be used for calibration of the building performance models (Step 2, above) – see panel, ‘Using the Performance Measurement and Verification Protocol’.

While the IPMVP and ASHRAE Guideline 14 are structured around calculating savings related to energy conservation measures (ECMs), and to reduce uncertainty in assessing their performance, these M&V >>

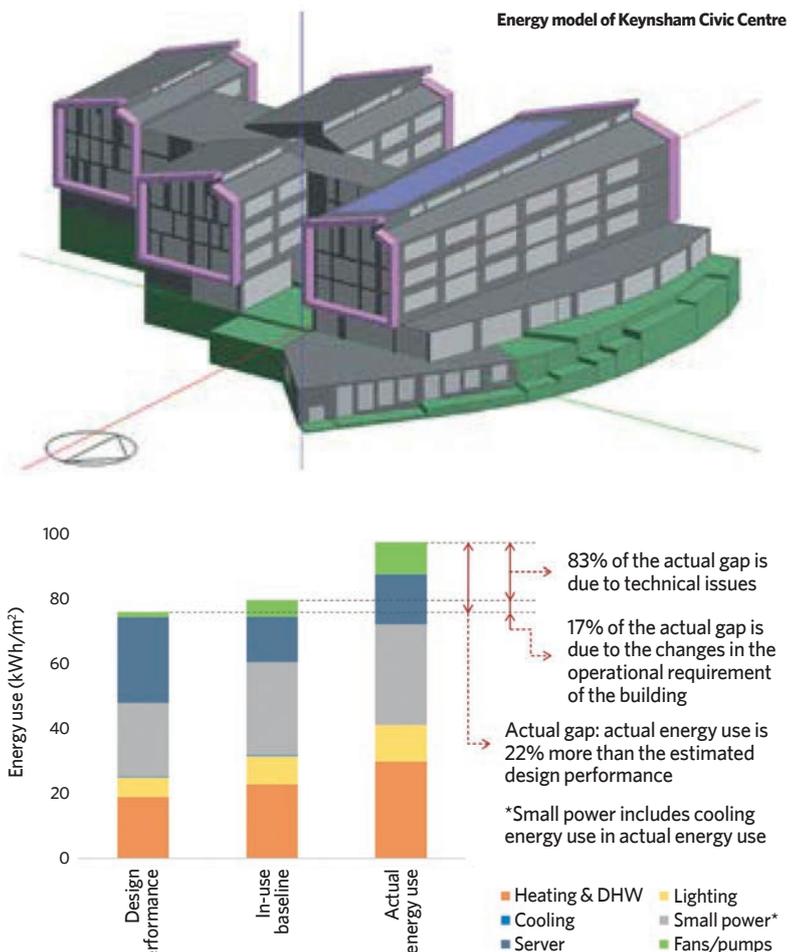


Figure 1: Projection of operational energy use at design stage (TM54), in-use baseline (TM63) and actual energy use for a case study

» protocols can also be followed for other purposes – such as establishing a baseline for performance in use, and monitoring and targeting strategies to improve performance. CIBSE TM63 provides a step-by-step guide to how such a baseline can be developed to evaluate energy performance in use. It complements CIBSE TM54, which is used at design stage to project operational energy use. The benefits of following a calibration-based approach to evaluate the actual performance of a building and derive a baseline for performance in use are twofold:

- 1) The calibration process provides a systematic approach to building diagnostics and identification of causes of any performance gap.
- 2) The calibration process can help improve the confidence in building performance models, and address potential modelling errors and uncertainties that are often inevitable at design stage. A baseline derived from a calibrated model can, therefore, be a more robust and practical operational target for a building. **CJ**

■ **ESFAND BURMAN**, UCL Institute for Environmental Design and Engineering, and **NISHESH JAIN**, DesignBuilder Software.

“TM63 enables users to avoid the confusions that may arise when performance in use is compared against calculations that do not reflect actual operating conditions”

Table 1: Calibration criteria for energy performance, defined in ASHRAE Guideline 14-2014

Statistical Index	Calibration method	Calibration criteria
NMBE	Monthly	±5%
CVRMSE	Monthly	15%
CVRMSE	Hourly	±10%
CVRMSE	Hourly	30%

NMBE: normalised mean bias error
CVRMSE: coefficient of variation of the root mean square error

USING THE PERFORMANCE MEASUREMENT AND VERIFICATION PROTOCOL

The IPMVP is a framework created for measuring and ascertaining performance using best-practice techniques in verification of energy conservation measures (ECMs).

The IPMVP provides guidance on measurement boundary, measurement period, and ways to calculate impact (savings) and undertake operational verification.

Depending on the type of ECM and its relationship with other building performance input or output parameters, the IPMVP provides four options for calculating an ECM's impact:

- Option A: retrofit isolation, key parameter measurement
- Option B: retrofit isolation, all parameter measurement
- Option C: whole-facility
- Option D: calibrated simulation.

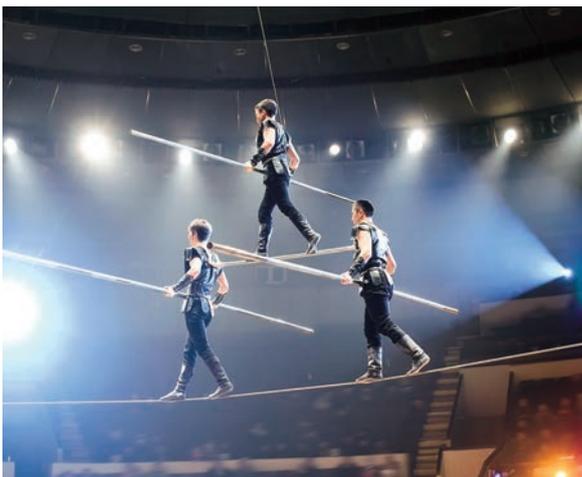
While the first two options look at isolating the assessment and analysis to one or few building systems that are affected by the

ECM, the other two are done at a whole-building level. For each of the options, the IPMVP explains the data required and monitoring and measurement protocols. It also suggests ways to undertake accurate calculations and validate results, linking to other relevant standards and protocols.

IPMVP Option D, calibrated simulation, suggests using building performance modelling tools for energy consumption and demand simulation, calibrated with hourly or monthly energy data.

The IPMVP framework provides a step-by-step method to fine-tune the model to reflect the building and its operating conditions accurately. It is underpinned by ASHRAE Guideline 14 (*Measurement of Energy, Demand and Water Savings*), which provides the criteria to check calibration accuracy either at hourly or monthly intervals.

Detailed operational information should be collected during site surveys and by measurements to calibrate the model.



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AMBIENT LIGHTING MANIFESTO: THE RESPONSE

In December, *CIBSE Journal* published an 'ambient lighting manifesto', written by four highly respected lighting academics who are calling for a paradigm shift in lighting practice. Here, we print a summary of reactions to the document from leading members of the profession, whose responses can be read in full on our website



Heatherwick Studio, Maggie's, Leeds
Left: The manifesto is published in the December edition of the *Journal*



Barrie Wilde, retired lighting consultant, teacher, and former Society of Light and Lighting (SLL) president:
Having retired recently, after 60 years as a lighting designer, these claims do not register with my own experience, or with that of the profession. Quite the reverse. The considerable number of highly successful, independent lighting-design consultancies – including specialist lighting units in building services, design and architectural practices – already operate an enlightened

design ethos of 'ambient, task, display'. Of course, there are still lighting designs based on spraying a horizontal surface with an abundance of luminous flux, but surely this is a case for education, not a wholesale change in the metrics?
The SLL president's address of 2005, by lighting academic and researcher Geoff Cook, was titled *Mind the gap*, and addressed the widening gap between research and design. This manifesto perhaps indicates that there is still a disconnect between the two and, if a paradigm shift is really necessary, it should be to close this gap, not to produce yet another set of metrics.



Iain Carlile, senior associate dpa lighting consultants and former SLL president

Too many people are fixated on the quantum and uniformity of light hitting a surface, be that a floor, desk or imaginary task. Task illuminance and

uniformity is only a small part of the story; the whole visual environment – and the needs of the person within – have to be considered if a lighting design is to be successful.

While industry guidance gives good recommendations on how to illuminate a space considering the whole visual field, too many turn straight to the tables of illuminance and uniformity, ignoring the rest of the recommendations. This results in well-lit working planes, but, potentially, dull and uninspiring spaces.

Further, many of the illuminance recommendations are based on outmoded working practices, technology and equipment, and are in need of review.

The change to an ambient illuminance approach seems sensible, with the proposed method allowing the lighting designer creative freedom to consider the whole visual environment.

I welcome this proposal to shake up lighting calculation methods, subject to suitable research and with care not to be too restrictive in recommendations.



Linda Salamoun, senior communicator, PSLab

With moving times and changing functional requirements, it has become apparent that a shift in approach to the standards is required. Designers are already trying to review functional lighting requirements based

on best practice, considering current standards, but in the light of the latest research about brightness, contrast and what creates visual comfort. However, adherence to standards often forces the concept towards a design that might compromise the focus and/or comfort.

“There are still lighting designs based on spraying a horizontal surface with an abundance of luminous flux, but surely this is a case for education, not a wholesale change in the metrics”

– Barrie Wilde

We should be embracing the developments made in technology that allow us to use light more easily in ways that really support a space. If the standards produced by the authoritative bodies can change in a way that would support the way most lighting designers are already thinking, this is a positive.



Jeff Shaw, associate director of Arup and former SLL president

When two past SLL presidents and recipients of the SLL Lighting Award, and a CIBSE Gold Medal prepare a manifesto together, we should listen.

This manifesto has a sound basis – the ‘working plane illuminance’ approach was developed in a different era. We know much more than we did in the past about

the relationships between how we light a space and health, wellbeing and visual comfort.

I appreciate the risk of our profession becoming commoditised – I have recently seen a generative algorithm automating the process of ‘optimising’ the lighting layout for a simple space, based on horizontal illuminance, cost and efficiency. However, could the proposed LiDOs solution not also be exploited to ‘automate’ lighting design, albeit with different inputs and processes?

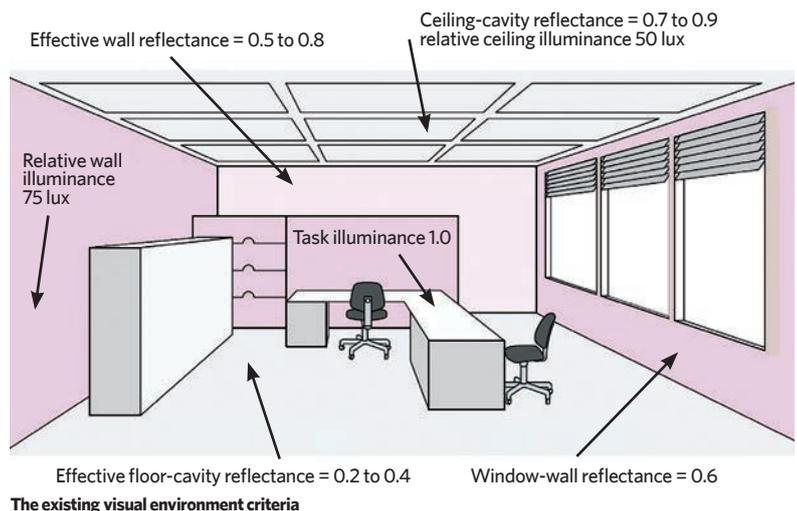
Horizontal illuminance is too often seen as ‘the one lighting metric to rule them all’, and it is not. I’d fully support a metric that could better encompass a wider range of our experience of the lit environment. As with any lighting design, that’s where any new metric must start – with the people who will occupy and use the space.



Paul Ruffles, lighting consultant, former SLL president, and editor of the SLL Lighting Handbook 2018

If those carrying out a lighting calculation would just aim to comply with the relatively simple existing visual environment criteria – see diagram (below) – it would go a long way to meeting the aims of the lighting manifesto. While experienced and thoughtful designers have always

considered the whole visual environment in their designs, too many who think they can light interiors have only bothered to do quick, blanket, ‘lux on the working plane’ calculations.



“The problem is, and has always been, that we are trying to classify light objectively, when human responses to it are subjective and can vary greatly”

– Jonathan Rush

»



Jonathan Rush, partner, Hoare Lea

That lux or illuminance is an irrelevant metric in need of a replacement is not in doubt. Anyone with a basic understanding of human responses to light and space knows that measuring the amount of light on a horizontal plane – without considering the reflectance of materials, illuminance of the surrounding surfaces, or light on the human face – is a poor way to describe quality. Given what we now know about the physiological effects of light on humans, it is also an appalling way of defining ‘compliance’.

‘Lux’ gives a simple answer to a complex question, and the lighting industry’s continued championing of the term has given it ubiquity, and reinforced the idea that lighting is easy. Change is necessary, but to address the complexity of the question properly, we cannot replace lux with another simple metric. Ultimately, good lighting design is not going to be summed up by a metric value – and trying to do so is perhaps not going to provide the change we want to see.



Mark Ridler, head of lighting, BDP

Four eminent lighting experts, who command my immense respect, have come together to try to achieve an admirable beneficial change in lighting practice internationally. I broadly support the aims as set out. There are trends in workplace lighting that the Covid-19 pandemic is accelerating; among these are an emphasis on biophilia (read circadian)

and a move away from some tasks to an emphasis on face-to-face communication. All of this supports a shift from horizontal task to better

facial recognition – in other words, ambient illumination.

However, we need to be clear about who we design codes for and whose design practice this is going to change. Lighting designers? Unlikely. They tend not to design to code, are guided by experience, and are judged on their portfolio. Engineers? Quite possibly. They will understand the maths and have access to the tools to design to the code. Contractors, manufacturers? Probably not if the mathematics or concepts are too complex to grasp easily.

There are risks in this approach, too. ‘Ambient illuminance is defined as the average flux density of the indirect flux field within the volume of a space’ is much harder for a client to understand than ‘how much light is here’. If it is not intelligible or verifiable, it will founder.



Alan Tulla, independent lighting consultant and former SLL president

I remember my first boss, at the GEC Hirst Research Centre, saying to me: ‘Alan, never forget the vertical illuminance; it’s so people can see people.’ Even 40 years ago, illuminating engineers, as

we were called then, were emphasising the importance of lighting the space, rather than just the desktop.

One reason horizontal illuminance has been around so long is that it has the great advantage of being easily understandable and verifiable. In his 2005 address, *Mind the gap*, then SLL president Geoff Cook spoke of how little people made of research in their daily professional practice. This is my concern about ambient illuminance. It is defined as ‘the average flux density of the indirect flux field within the volume of a space’. I reckon this may be a step too far from where we are now.

Might I suggest that, with the amount of Zooming and Teaming we are all doing nowadays, maximum vertical illuminance (E_v) at face height should be the interim transitional standard? It would also be a useful stepping stone to the manifesto’s goals. **C**

■ To read the full responses to the Ambient Lighting Manifesto, visit cibsejournal.com

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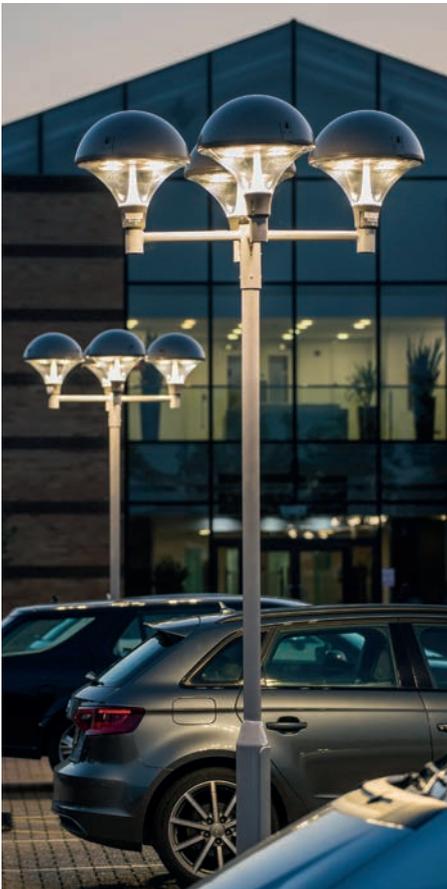
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Biden backs refrigerant phase-down

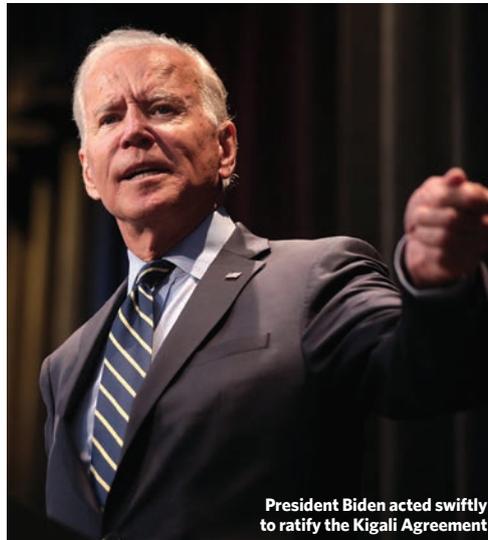
President ratifies Kigali Amendment after the US rejoins the Paris Agreement

Within days of taking office, US President Joe Biden issued an executive order to ratify the Kigali Amendment that aims to phase down HFC refrigerants worldwide.

It came only a few days after the new president took the US back into the Paris Agreement on climate change, and forms part of his ambition to 'put the climate crisis at the centre of US foreign policy and national security'.

A White House statement said the world had 'a narrow moment to pursue action at home and abroad in order to avoid the most catastrophic impacts of that crisis and to seize the opportunity that tackling climate change presents'.

The Kigali Amendment to the Montreal Protocol has already been ratified by 112 other countries and sets a timetable for the gradual removal of HFC gases



President Biden acted swiftly to ratify the Kigali Agreement

from air conditioning and refrigeration equipment. It has yet to be ratified by China and India, which – along with the US – make up the three largest HFC users.

Trane upgrades scroll compressor portfolio with low-GWP refrigerant

Trane is introducing low global warming potential (GWP) R-454B refrigerant across its portfolio of scroll compressor chillers, heat pumps, multi-pipe units and rooftops.

The Conquest CGAX chillers and CXAX heat pumps for comfort and process applications are the first of the upcoming units featuring the next-generation, low-GWP refrigerant.

R-454B has a GWP of 466, the lowest – the manufacturer said – among the refrigerants available today for scroll compressor technology. It is a 76% reduction in direct GWP impact against R-410A, and a 30% reduction against R-32.

Trane now offers HVAC systems with low and ultra-low GWP refrigerants across its product ranges. All units with the new R-454B refrigerant will be tested in the manufacturer's testing facility, which functions as a validation centre for new product development, enabling the simulation of all operating conditions encountered during the life of HVAC equipment.



CIBSE hosts live learning for air conditioning

CIBSE is hosting two online events on air conditioning this spring. On 9 March, from 10am-4pm, there is a live event, *Air conditioning and cooling systems*, while on 6 May (10am-4pm), Kevin Noyce will host *Air*

conditioning inspection for buildings. CIBSE's South Australian chapter is organising a visit to see the Myer Centre, Adelaide, chilled water plant upgrade on 18 March at 7.45pm. Details at www.cibse.org/events

Carrier introduces latest generation of VRF systems

The latest generation of Carrier's variable refrigerant flow (VRF) technology, XCT7, has been launched in Europe.

It includes features such as: an outdoor condenser with black-coated fin technology for enhanced corrosion resistance; anti-liquid shock technology of the compressor, to reduce liquid shock failure rate; improved refrigerant distribution balance as a result of the centrifugal oil separator; and smooth supply of lubricant because of the 10-stage oil-return technology.

Up to four outdoor units can be combined to reach 104 horsepower, with up to 64 indoor units per outdoor system.

Didier Genois, vice-president and general manager, HVAC Europe, at Carrier, said: 'We are expanding our offering to match our customers' expectations. We are launching it simultaneously in six countries and have made significant investments in related digital technology, training centres and a dedicated sales force to better serve our customers.'

Toshiba system has designs on the home

In a move to redefine residential air conditioning aesthetics, Toshiba has developed a unit that can become part of the furnishings. The Haori features a textile cover, available in a range of colours, offering customers infinite customisation possibilities. They can peel and stick the desired fabric to the curved front panel so the unit blends in or becomes a stand-out feature.

As well as triple-A efficiency, the unit uses R32 refrigerant for minimal environmental impact, and the system is rated 8.6 for seasonal energy efficiency ratio, and 5.1 for seasonal coefficient of performance.

It also features a PM2.5 filter, which, the manufacturer claims, captures up to 94% of fine particulate matter with a diameter of more than 2.5 micrometres, while its plasma ioniser catches and neutralises micron-contaminated particles.



Musical revival for abandoned retail units

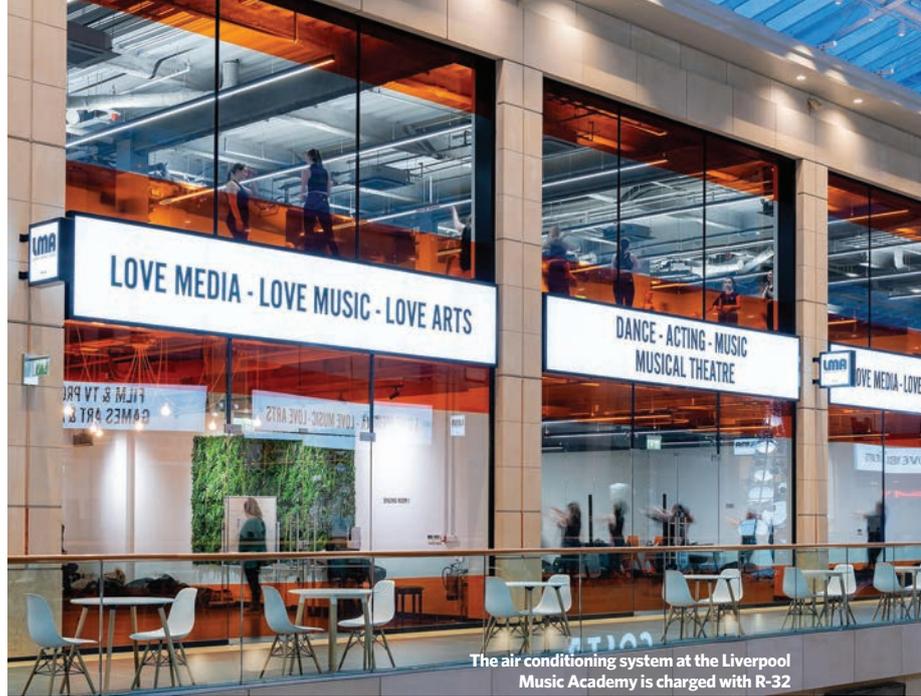
Liverpool Music Academy moves into shopping centre with new air conditioning system

A £15m conversion project has transformed disused retail space at Liverpool's Metquarter shopping centre into education facilities for the Liverpool Music Academy (LMA).

The project involved the conversion of empty retail units and communal space, on the upper floors of the complex, into a new 4,645m² learning facility for the LMA, which offers courses in music, musical theatre, film and television, games animation, acting and dance. The new campus, which LMA moved into in September 2020, has classrooms, recording studios, rehearsal rooms, and dance and performance spaces.

An R-32-based air conditioning solution from Toshiba was installed as part of the project, while air conditioning specialist Select Air Services was commissioned to carry out a full dilapidation report on the empty retail units. This revealed that individual units had been air conditioned with ad hoc systems – mainly based on R-407C and R-410A refrigerants – installed by tenants over many years. Some dated back to the opening of the shopping centre in 2006, and were well past their operational life, according to Select Air Services.

The company proposed installing a new cooling and heating system using Toshiba heat pump cassettes and heat-recovery VN ventilation units, while removing and decommissioning legacy systems according to F-Gas requirements. As a result, the LMA campus now features an air conditioning system installed by Select Air Services



The air conditioning system at the Liverpool Music Academy is charged with R-32

and supplied by Cool Design. It is based on Toshiba Super Digital Inverter and Digital Inverter split systems, using inverter controlled variable speed compressors. The system is charged with R-32 that has a GWP of 675, two-thirds that of R-410A, which it replaces.

R-32 not only has a lower GWP, but can deliver an equal capacity to R-410a, with a 30% smaller refrigerant charge.

Indoor units are ceiling-suspended cassettes, which were considered to be ideal for the application because they leave floors and walls unobstructed. Classrooms and studios are served by either one or two cassettes and a fresh air, heat-recovery ventilation system under the control of remote controllers with onboard energy monitoring.

To further improve efficiency, the system employs matched exhaust air heat-recovery systems. In winter, the heat-recovery systems operate in combination with the heat pump-based air conditioning, warming incoming air to maintain comfort conditions and energy efficiency. In total, 95 ceiling suspended cassettes were used – in a combination of single, double and triple split systems – along with 30 heat-recovery ventilation units.

EU regulations governing HFCs now under UK law

Regulations that address the production and use of chemical substances such as HFCs used in refrigerants have been brought into UK law following Brexit.

The EU Registration, Evaluation, Authorisation and Restriction of Chemicals (Reach) Regulation has been brought into UK law under the European Union (Withdrawal) Act 2018, following the UK's withdrawal from the EU.

As of 1 January 2021, the UK Reach and the EU Reach regulations operate independently from each other. Under the Northern Ireland Protocol, the EU Reach Regulation continues to apply to Northern Ireland, while UK Reach will regulate the access of substances to the Great Britain market.

Companies that supply and purchase substances and mixtures to – and from – the EU/EEA/Northern Ireland and Great Britain (England, Scotland and Wales) will need to ensure relevant duties are met under both pieces of legislation.

Firms are required to identify and manage the risks presented by substances they manufacture and market in Great Britain. They must be able to demonstrate how the substance can be used safely and communicate risk management measures to users.

To be compliant, companies need to consider how to use chemicals and what their obligations may be. UK Reach covers all sectors that manufacture, import, distribute or use chemicals as raw materials or finished products. Reach UK requires everyone in the supply chain to communicate information on the safe use of chemicals.

Samsung adds PM1.0 filter to air con unit

A new wall-mounted air conditioner with an electrostatic PM1.0 filter for air purification has been launched for the residential market by Samsung.

According to the manufacturer, WindFree Pure 1.0 can filter dust particles up to 0.3µm and sterilise microorganisms using an electrostatic charger.

Its brush discharger generates negative ions, which give the dust particles, and certain bacteria, a negative charge, so they attach to the ground electrode because of the electrostatic force of the collector.

The 'freeze wash' function also removes certain types of bacteria. The indoor unit's heat exchanger is cooled to -15°C to cover it with frost. When put into defrost mode, the melting ice removes up to 90% of certain bacteria within the heat exchanger.



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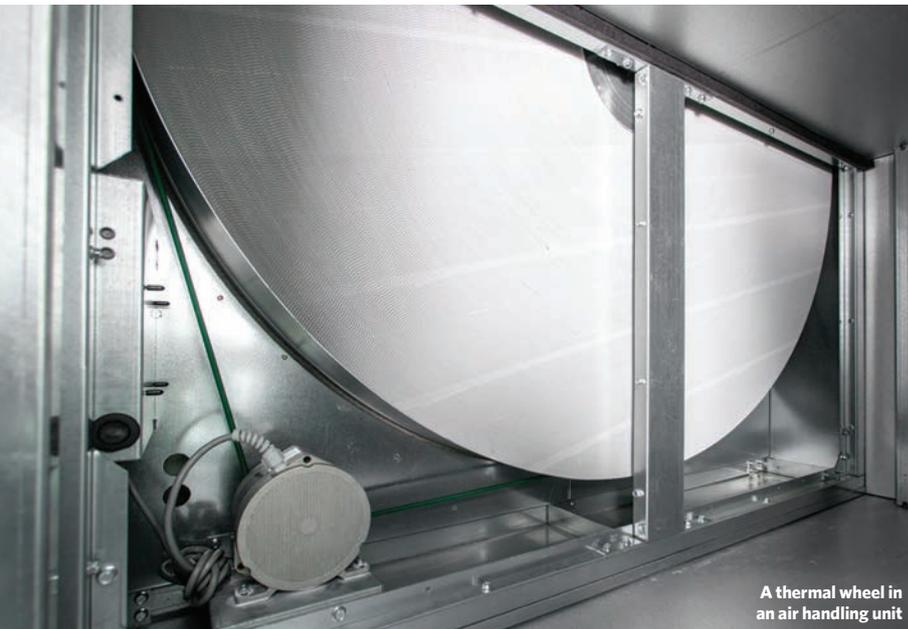
D-AHU Modular L

0.07 m³/s
up to 0.7 m³/s



HANDLING COVID RISK IN THERMAL WHEELS

To minimise the risk of Covid-19 transmission in thermal wheels, designers should choose a configuration that minimises recirculation of contaminated air. FläktGroup's David Black explains the options and how AHU purge sectors can cut the risk further



A thermal wheel in an air handling unit

Ever since scientists discovered that Covid-19 is an airborne virus, ventilation systems have been a focus of attention during the pandemic. The European Centre for Disease Prevention and Control (ECDC) has stated that the risk of human infection with SARS-CoV-2 caused by air distributed through the ducts of HVAC systems is rated very low,¹ but it is prudent to review existing or future installations.

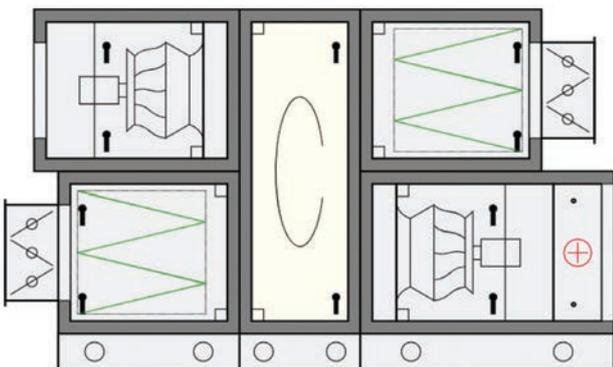
CIBSE has produced excellent guidance² that identifies the three principal types of air handling units (AHU) – run-around coils (RAC), plate heat exchangers and thermal wheels – and the associated risks of recirculating contaminated air. Section 4.2.2.1 of the CIBSE guide states that RAC and plate heat exchange units keep the supply air and

the extract airstreams separate. While this is true for RAC, there is always a risk of slight leakage from plate heat exchangers. A plate can comply with EN308³ with an internal leakage of up to 3%, though this is reduced to 0.5% for a Eurovent-certified unit.

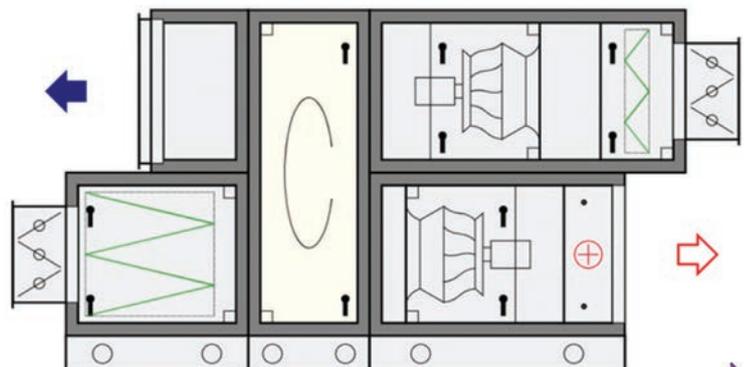
The supply and extract airstreams of an AHU with a thermal wheel can never be sealed completely and some degree of leakage between airstreams is inevitable. This leakage occurs even when the rotor is switched off, so there is no benefit in deactivating the rotor if the fans are kept running for ventilation. The amount of leakage is dependent on: the location of the fans relative to the rotor; if the rotor is fitted with a purge sector; and the static pressures in the ductwork.

REHVA's Covid-19 advice says that 'the purge sector is a device that can practically eliminate the leakage resulting from the rotation of wheel [carry-over]. Its location and setting [angle] must be arranged according to manufacturer guidance depending on the configuration of fans and pressure relations'.⁴ There is however, a standard for the amount of exhaust air that is transferred into the supply airstream. EN 16798-3⁵ defines the exhaust air transfer ratio (EATR) as the 'level of carry-over of extract air to the supply air'. Reducing the EATR reduces the amount of contaminated material that can be recirculated.

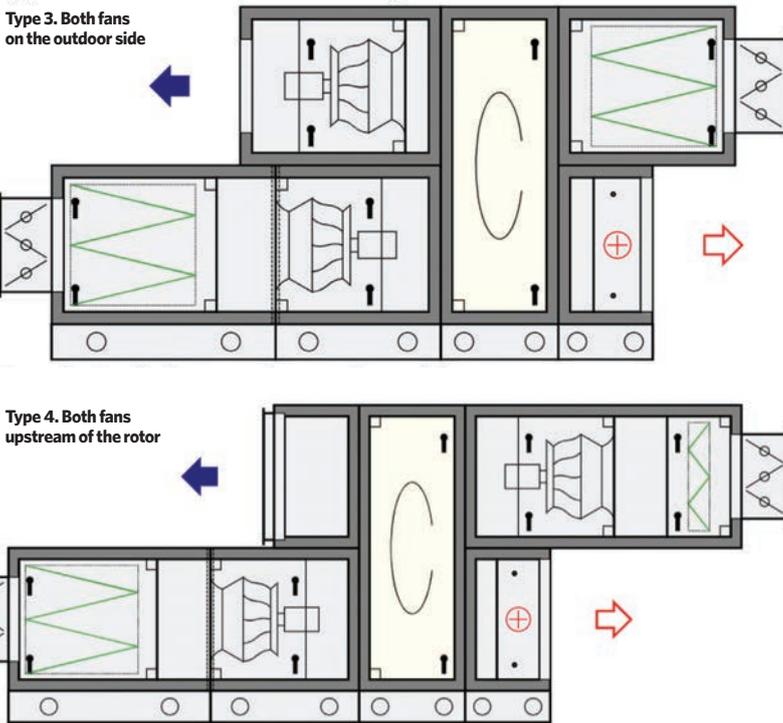
Eurovent has produced a guide to air leakage in AHUs.⁶ It identifies the four possible fan configurations of AHUs with thermal wheels and gives the typical EATR with and without a purge sector for given external and internal pressure



Type 1. Both fans after the rotor



Type 2. Both fans on the building side



Type	EATR without purge	EATR with purge	Note
1	EATR < 3%	EATR < 1%	Dependent on external pressures. See Eurovent 6/15
2	10% < EATR < 20%		Purge does not function in this configuration
3	EATR < 1%	EATR = 0%	
4	EATR < 3%	EATR < 1%	

Table 1: Exhaust air transfer ratio of the four AHU configurations with and without purge

Type	Eurovent	Additional comment
1	This configuration is most recommended to minimise internal leakages	The most common configuration on the market
2	Price-driven solution. Very high internal leakage rates and should be avoided	
3	Very high supply air leakage to exhaust	Supply air leakage lowers unit efficiency
4	Higher internal static pressure	Very uncommon solution

Table 2: Eurovent guidance on the four AHU configurations

Type	REHVA guidance	Comment
1	Adjust the throttle in the extract air so p11 will become at least p22 - 20 Pa	The damper could be in the ductwork or at the AHU
2	There is no possibility to use throttling in this case	Purge does not function in this configuration
3	There is no need to use throttling in this case	
4	Adjust the throttle in the extract air so p11 will become at least p22 - 20 Pa	The damper could be in the ductwork or at the AHU

Table 3: REHVA guidance for the four configuration types

regimes. Table 1 gives the EATR based on normal Part L-compliant external static pressures. Eurovent also gives guidance for each individual configuration (Table 2) and I have added an additional comment if applicable. As can be seen in Table 2, the Eurovent-recommended configuration Type 1 – the most common – has an EATR equivalent to, or lower than, an EN308-compliant plate heat exchanger (EATR < 3%).

There is an additional measure than can lower the EATR even further. REHVA's document⁴ *Limiting internal air leakages across the rotary heat exchanger* states that the 'next step to eliminate a leakage is to set the correct relation between pressures p22 and p11 [see Figure 1]'. This pressure can be achieved by regulating the exhaust damper (A) correctly positioned on the system side of the exhaust airstream (Figure 1). If the correct pressure is achieved for the recommended configuration, the EATR can be considered virtually zero.

In conclusion, AHUs with rotors can have an EATR equivalent to, or lower than, plate heat exchangers if the fans are in the recommended configuration, and the unit is fitted with a purge sector. Many existing installations could be put back into operation safely, but a competent engineer should ensure the recommended configuration and presence of a purge sector. For additional security, add pressure control.

Specifying AHUs with all of these in place will ensure new installations reduce the already very low potential risk to a minimum, while delivering the highest efficiency and lowest life-cycle costs. **C**

DAVID BLACK is global product marketing manager – modular AHU at FläktGroup

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- 2 CIBSE Covid-19 Ventilation Guidance, v4, October 2020
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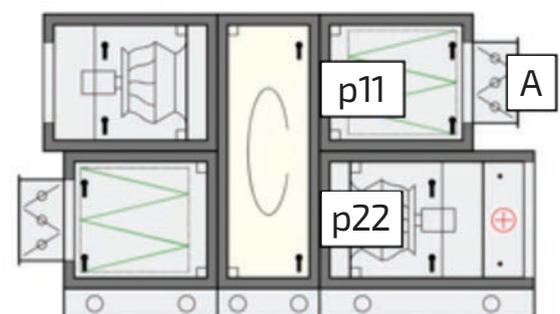


Figure 1: Stopping leakage by regulating damper (A) to correct pressures

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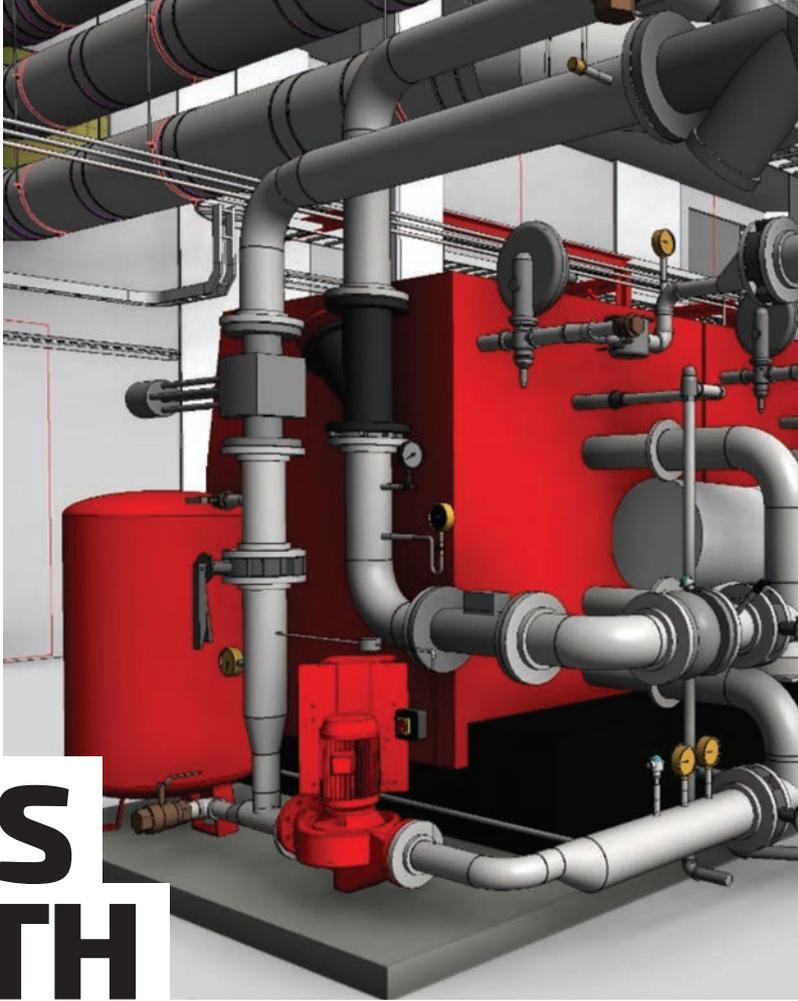
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Adopting a digital way of working may be daunting for SMEs with a fraction of the budget of big rivals, but Atkins' **Ben Roberts MCIBSE** says in-house digital advocates, training and freely available tools can get firms up to speed quickly



PLATFORMS FOR GROWTH

Digital engineering is becoming business as usual for some, but for small businesses with limited experience, stepping into this arena can feel daunting.

Start-up costs are a major barrier, and simply knowing where to start is daunting. There is much talk about optimising building forms, faster feedback on design decisions, and modelling scenarios for live spaces, but most of the value can be driven from simply automating routine tasks and defining efficient grassroots workflows.

According to data from Bizdaq, the UK construction industry includes almost 350,000 small and medium-sized enterprises (SMEs) – 20% of all SMEs in the UK. For the industry to move forward into the digital era, it is essential that SMEs are able to transition; large companies

cannot change the industry on their own. There is a lot of pressure on small businesses to adopt digital working, but a lot of opportunities, too.

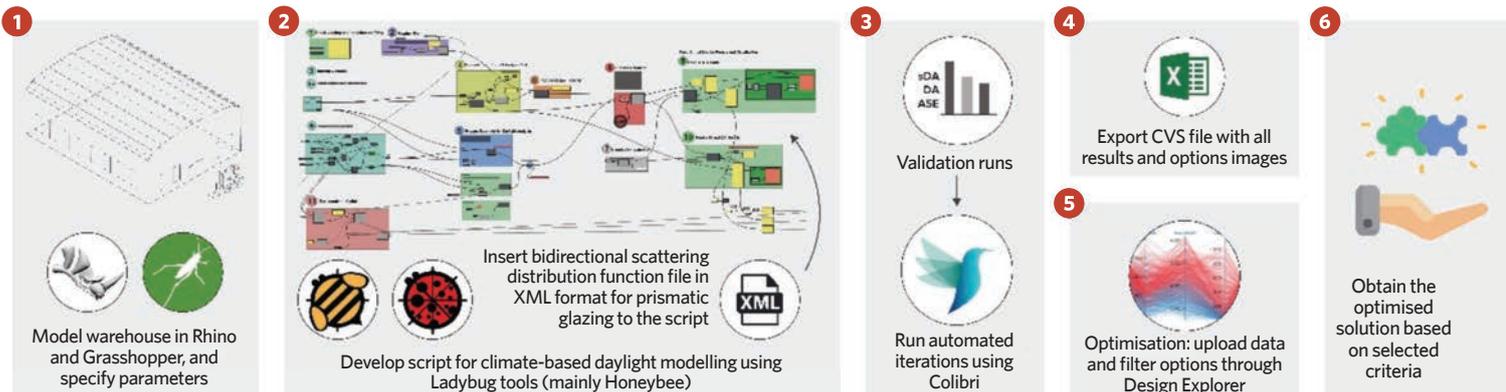
So how challenging is it for companies to make the transition to digital? In this article SME building services consultants Method and XCO2 share their experience and explain why a culture of collaboration and knowledge sharing is the key to success. We also speak to two BIM consultants about how they are helping others to transform.

Direction of growth

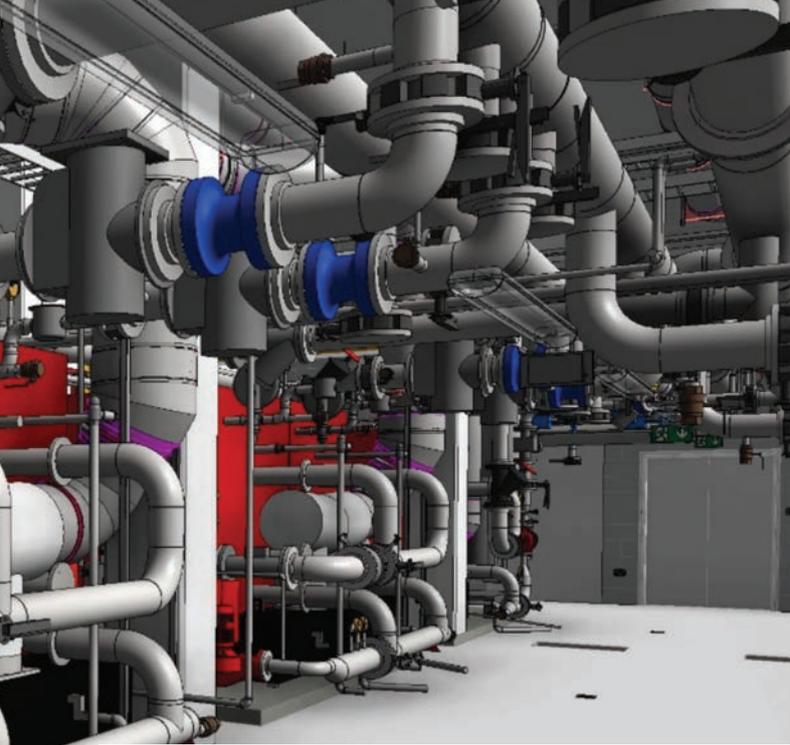
Alex Mason, senior BIM manager and engineer at Method Consulting, says there are good business reasons to embrace digital working – and major risks if it is ignored. ‘We made the conscious shift to digital because we knew we needed to stay relevant in the industry,’ he says.

Mason believes the move will help his company win more work, develop its reputation, and allow Method to engage as ‘part of a modern design team’.

While digital technology can seem daunting to those who have spent their career working without it, the process and people aspects are actually more important, and often easier to understand. ‘It’s all about



XCO2's process for optimising rooflight arrangements for maximum daylighting was carried out using a number of free tools, such as Grasshopper, Ladybug and Honeybee¹



Left: Image taken from one of Cadan Design's Revit models of an energy centre project. The model included enough detail and data to be used for offsite prefabrication, quantity take-offs and client walkthroughs for approval

TIPS FOR SUCCESS

- Define your ideal processes first, then apply the tools
- Include BIM and digital knowledge in strategic business planning, not just as a delivery resource
- Upskill your people with continuous internal knowledge sharing
- Encourage collaboration between technicians and designers, and across the whole design team
- Use free and low-cost tools to harness the power of data and boost your capability beyond 3D modelling
- Use BSRIA BG6 as a guide for the right level of detail, especially at concept design stage.

process', says Mason. 'Define what you want to achieve, then apply relevant tools to address the challenges.'

It is tempting to stick with traditional processes, with engineers marking up 2D layouts and technicians translating them into a 3D model. But this will be expensive and won't help improve your operational performance. Engineers and technicians have specific skill sets, whether that be knowing how to route services, understanding pipe-sizing calculations, or managing coordinate systems and view templates. So they need to collaborate to develop the model together. A quality design model needs input from everyone, and everyone needs to share and learn each other's processes.

Focusing on collaboration and sharing knowledge is also strongly supported by another small engineering consultancy, London-based XCO2. 'The most important thing for us was to foster a culture of knowledge sharing; we hired someone with digital experience so that they could transfer their expertise. We didn't want to pile all the digital tasks onto that person,' says XCO2 director Tom Kordel.

The company's new digital lead, Aidan Kelly, came from a large business to join the firm. His motive was to get close to the technical design and 'enhance his skill set beyond digital'.

A perception of BIM and digital tools is that they are only beneficial for large projects, and not really suitable for the small-scale work that SMEs typically undertake. Kelly has a different view, however. 'Small projects with a shorter timeline are easier to learn on and spatially coordinate, and enable faster repeatability from one project to the next. Large-scale models bring many challenges for working digitally that aren't there on small models.'

XCO2 has had a similar adoption journey to Method, in needing to respond to client requests for BIM and digital. 'We worked with a BIM consultancy to deliver our first project, which was really helpful,' says Kordel. 'Once we got involved with the process, we quickly realised that

it's not rocket science and that we could easily take on most of the work ourselves.'

When working in environmental design, some of the cutting-edge parametric design tools are not standalone pieces of software, but free, open-source plug-ins developed by academics and professionals. These are then regularly tested and improved by a global network of users, posting their own 'how to' videos or helping other people in forums.

'Graduates coming out of university are an excellent addition to the company, as they have often spent years learning and applying these novel parametric tools during their course' says Kordel. 'With free licences for students, this trend can only accelerate.'

BIM specialists

The bigger challenge is often helping existing staff to get a first foothold in this new way of working. External training courses can be really helpful, but can also be expensive if not used properly, suggests Daven Masri, from Wave BIM consultancy.

'Classroom training is useful for the basic introductions of how to use software, but the real learning comes from project experience,' says Masri, who believes the best way to acquire knowledge from a third party is for them to guide you through a real project.

'Line up one project for a trial, and then another to build momentum,' he says. 'The terminology can be alienating at first, but don't worry about that; just focus on getting the job done'.

Masri recommends setting a simple task, such as creating a grille schedule from a model, and applying an engineering mindset to work out how to achieve it. This will provide an opportunity to >>

DIGITAL TOOLS

To really drive value from the model, there is a wide choice of free and low-cost add-ins and platforms.

Visual scripting tools such as Dynamo and Grasshopper are essential for automating simple tasks and linking together software, and the online communities are always quick to share knowledge and scripts.

Add-ins such as CTC BIM manager, Case, Rushforth RF Tools, or PyRevit all offer free and simple functionality to enhance your digital toolset. Here are some of the most commonly used, and free, open-source platforms:

- Speckle - open-source data platform for AEC, speckle.systems
- Topologic - represent models in a logical data structure, topologic.app
- Ladybug - environmental design tools, ladybug.tools
- BlenderBIM - parametric modelling and IFC data tool, blenderbim.org
- Buro Happold's Buildings and Habitats object model, bhom.xyz
- SAM - link Revit to thermal analysis, github.com/HoareLea/SAM_Deploy
- FreeCAD - 3D parametric modeller, freecadweb.org

» learn about parameter naming and data handling within a familiar context.

In construction and operation stages, there is merit on focusing on the data and what you really need, to avoid inheriting a complex model that you can't use. Daniel Mofakham, of Cadan Design, works closely with constructors during installation and retrofit, and recommends being clear up front about the data and formats required. 'Understand the Level of Information (LOI), as this is where you will get most value,' he says.

At these stages, Mofakham says the biggest wins are using the model for quantity take-offs: 'They are much easier than you think they'll be.'

For quick and simple virtual walkarounds, check out tools such as Enscape, Lumion or Twinmotion. Although people and process are key areas on which to focus, all of these companies offered similar advice for technology products.

If you're a designer, you will need to have access to an authoring tool, such as Revit (it's advisable to get a network licence so that everyone can use it). There are also free model viewers, such as Navisworks Freedom or Solibri, that anyone can use to get into the 3D environment and review what's going on in the model.

“Classroom training is useful for the basic introductions of how to use software, but the real learning comes from project experience”

To really drive value from your model, however, get into the world of free, open-source add-ins and platforms that will help you customise the tools to suit your workflows, automate the low-value tasks, and add easy wins to augment your capabilities (see panel, 'Digital tools'). [CJ](#)

BEN ROBERTS is digital strategy lead for Atkins

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DIGITAL GUIDANCE

CIBSE's Society of Digital Engineering has created some useful bite-sized guidance material for getting started with basic automation and simple digital processes. You can find a selection of videos and written examples in the Knowledge section of the CIBSE website: cibse.org/knowledge/digital-tools

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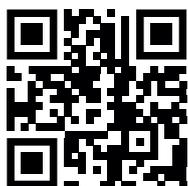
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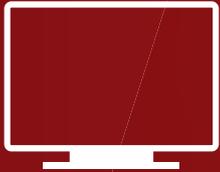
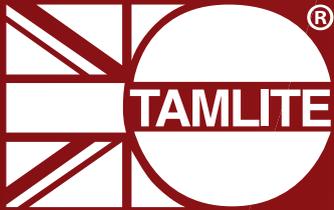


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LED luminaire optical control for office and educational applications

This module considers the technical demands and challenges in selecting appropriate LED luminaire diffusers in office and educational lighting applications

Optics are a fundamental part of luminaire performance that may not be fully considered when the focus is on LED lifetime and efficacy as indicators of a luminaire's suitability for a particular application. This CPD explores some of the technical demands and challenges when selecting appropriate LED luminaire diffusers as part of a general lighting scheme for office and educational applications.

As noted in the December 2020 CPD (module 173), manufacturers, consultants and contractors might limit their focus on LED lifetime and efficacy as indicators of a luminaire's suitability for a particular application. While these are important factors, it is the design of the luminaire that will impact performance and suitability for a project. This is particularly the case in office and educational applications – such as universities, colleges and schools – where lighting standards concentrate on the illumination of a working space. CIBSE TM40¹ reports that, in a recent large-scale review of productivity studies, lighting was rated among the most important physical indoor environment parameters (beyond furniture and spatial arrangements), with an average estimated effect on task performance of around 10%. BRE FP374 *Lighting and Health*² indicates that poor lighting, particularly lighting that causes glare, can create visual discomfort that may result in sore eyes, headaches, and aches and pains associated with poor body posture. These issues can largely be avoided by careful lighting design that meets the recommendations of codes and standards, with suitable shielding against high luminance parts of the lighting installation.

Optical control is crucial for luminaires in all applications. The selection and design of optics will vary for different environments, particularly those with specialised requirements, to achieve a desired performance. The correct optical control should suit the specific building, its purpose and its users, to reduce opportunities for discomfort and visual distraction, and so improve wellbeing and productivity.

Employing optics to direct the required quality of light to specific zones can realise significant energy savings, particularly when applied with 'smart' lighting

controls – using less energy to achieve the same useful lighting levels. Appropriate directional control can also allow buildings to be used more effectively, potentially reducing the requirement for real estate. Although the benefits of energy and space utilisation are important, the key benefit is likely to be that employees, and other building users, can deliver the most effective results by operating in a healthy, comfortable, and productive environment.

The optics of the luminaire – which result from the combination of reflectors, lenses and diffusers – will impact the performance of a LED luminaire, and this is typically measured and recorded with a standardised set of photometric data. These are discussed and illustrated in CIBSE SLL *Code for Lighting*³ chapter 12.

As noted in CIBSE SLL LG7: *Lighting Guide for Office Lighting*,⁴ applications such as offices fitted with 'traditional' bare batten-type fluorescent luminaires may represent a glare source that results in eye strain, and contrast unfavourably with luminaires fitted with a properly designed optical control that is likely to include a diffuser. Diffusers are the most common form of optical control in offices and >>

» education applications, positioned in front of the light source to prevent glare and, in many cases, enhance directional control. Common lighting luminaires in general lighting applications typically employ opalescent (opal) or 'frosted' materials as diffusers. These are low-cost, but robust, smooth-surfaced, polymer materials, such as polycarbonate or acrylic (otherwise known as 'PMMA' – a highly transparent thermoplastic polymer), which are manufactured to provide good light transmission while also delivering physical and aesthetic benefits. Opalescent plastics are created by added pigmentation to the clear base polymer to mask the light source. Frosted light diffusers are manufactured by using a blend of two polymers that have different refractive indices, thereby providing diffusion of the light source.⁷

Electroluminescence creates light from the LED package, which will typically include one or more semiconductor chips mounted on a heat-conducting material, encapsulated in a protective material that may incorporate a primary optical lens. These are typically grouped together to make up an LED light source, and will produce highly directional, high-intensity light. The optics that are required to provide the best performance from such an electronic lamp are likely to be different from those of more traditional technologies, but still have a primary need to

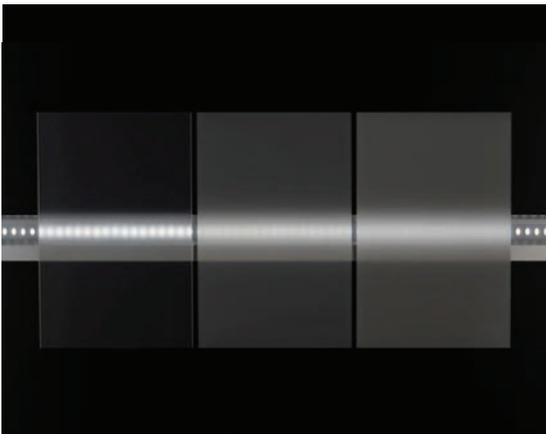


Figure 1: Example of acrylic luminaire diffuser designed to eliminate LED 'hot spots' (Source: Covestro AG)



Figure 2: Luminaire with opalescent diffuser (Source: TamLite)

SELECTED LUMINAIRE PERFORMANCE TERMINOLOGY

- **Luminous intensity** measures the illuminating power of a luminaire in a specific direction, measured in candelas (cd, lumens per steradian, $\text{lm}\cdot\text{sr}^{-1}$), normally presented in tabular form. Polar curves also provide an opportunity to illustrate luminous intensity and distribution on a single chart – typically shown as two curves, indicating the two major axes of the luminaire (as employed in Figure 3 and Figure 5)
- **Disability glare** impairs the ability to see detail without necessarily causing discomfort, and can be produced directly or by reflection
- **Discomfort glare** causes discomfort without necessarily impairing the vision of objects, and can be produced directly or by reflection
- **Unified glare rating (UGR)** is an index used to evaluate discomfort glare in interior workplaces. The equation used to evaluate UGR is from CIE 117.⁵ The calculation method determines a logarithm of the ratio of the luminaire luminance that can be seen by the observer, to the observer's relative, angular position, and the background luminance as seen by the observer. A representative calculation is typically undertaken for a proposed installation (or tabular approximations employed) to ensure that the UGR is no greater than 19. Although some manufacturers market 'UGR19' luminaires, the true UGR cannot be properly evaluated without details of the application. The CIBSE SLL Code for Lighting³ provides examples of how to calculate the UGR, but the actual calculation may be more readily undertaken using software such as Dialux.⁶ As noted by CIBSE TM40,¹ UGR has been developed for conventional offices and is not suited to all environments.
- **Lambertian distribution** (as described by Johann Heinrich Lambert in the 18th century) is where emitted radiance is independent of the direction of the observer, and the luminous intensity varies with the cosine of the angle between the normal to the surface and the observer. (An example is the distribution illustrated in Figure 3.)

reduce glare. Traditional opalescent diffusers are unsuitable for LED technology, as they are unlikely to mask bright spots from the individual LED emitters, and offer insufficient directional control. Initially, frosted polymers were often employed, because their ability to mask the LED was good; however, this was at the expense of light output. Specialised acrylic diffusers – such as those illustrated in the examples in Figure 1 and Figure 2 – are now widely available with various performance characteristics, and provide a near Lambertian distribution of light (see boxout, 'Selected luminaire performance terminology').

The choice for optical control in LEDs for such environments is limited principally to two options – an opalescent diffuser (such as in Figure 2), or one that contains lenses in a micro-prismatic diffuser (often abbreviated to 'microprism diffuser').

Simple opal diffusers will effectively scatter the light by refracting it as the light passes through the opal diffuser to produce a Lambertian distribution (as shown in the polar diagram in Figure 3), which ensures a more even, dispersed light distribution, enhancing uniformity and reducing shadowing. An opal diffuser would, for example, be a reasonable application for a flow area in a work building, providing a wide spread of light so people can see clearly as they move through the communal space.

LED luminaires employing microprism diffusers have seen increased application in architectural lighting where the prisms (lenses) are designed to control the emitted light into a specific distribution. The pattern of the light distribution can be finely adjusted through the specific design of the prismatic elements, which need to be manufactured from good-quality material that will not discolour or distort over time. Such diffusers are usually made of acrylic, polycarbonate or silicone resin, depending on the qualities required. This microprism diffuser increases the downward proportion of light, reducing horizontal emission and the opportunity for unwanted glare, so can be used to achieve improved values of UGR.

A 'multicell optic', such as that shown in Figure 4, can provide optimum spacing, but also maintain a controlled lower angle to satisfy UGR needs. The recessed light source also reduces discomfort glare, as there is no direct illumination experienced by occupants in adjacent workplaces. The aesthetic appeal of such luminaires may be debatable for some; however, they can provide benefits in terms of occupant wellbeing, space utilisation and energy savings. The polar curve for an example multicell luminaire employing a microprism diffuser is shown in Figure 5. A luminaire with correctly directed light is likely to have a greater overall efficiency in application compared with a fitting with an opalescent diffuser.

Office and educational working environments have evolved swiftly in recent years, as they shift away from plain, light-coloured walls to more complex surface

finishes and colourings. Increasing use of ‘agile’ workspaces provides flexibility and tends to allow occupants to locate themselves where they feel most comfortable. At the same time, technology has evolved – employing less-reflective screens that are often portable and used in a multitude of positions and angles. This increases the challenge of maintaining a satisfactory UGR while delivering the required visual intensity of the light for all occupants.

A microprism diffuser provides a much tighter control of light, directing it to where it is needed. This ensures that the luminaire, in an appropriate lighting design, can readily achieve the required UGR in open-plan spaces. Occupants who are not immediately adjacent to the luminaire – for example, on the other side of the room – can view the luminaire and not suffer from discomfort glare, as the light has been directed downwards with reduced sideways component, unlike an opalescent diffuser. CIBSE TM40¹ indicates that the design should also consider veiling reflections (high-luminance reflections that overlay the detail of the task) and reflected glare. The received luminous intensity is crucial to understanding how it may impact a person’s comfort. Considering the polar curve of Figure 5, for example, anyone stationed directly below a fixture with a microprism diffuser could receive a harsher light than somebody stationed below an opal diffuser. The light can then reflect off desks, paper or reflective screens, such as tablets.

This provides a challenge for lighting designers when specifying luminaires for office and educational environments: identifying the balance between technical glare through the room itself (the UGR), and the discomfort, or even disability, glare that will actually affect those working.

CIBSE SLL LG7⁴ recommends consulting the client as early as possible, so that designers can understand how the workspace is used, and how best to tailor the lighting design to the needs of those in the space, while still achieving the necessary glare and uniformity standards. An option to minimise this discomfort glare in workplaces, while still achieving the required illuminance on desks and working planes, is to combine an opal diffuser with a microprism. This attenuates the light before it leaves the luminaire, but also directs the light downwards, tightening the angle of illumination to enhance UGR compliance in lighting designs. This does impose a slight reduction in luminaire efficacy; however, it satisfies the most important element of any office or education environment: the occupants.

As noted in CIBSE TM40, the balance of diffuse and direct lighting is also important in task areas, with sufficient directional lighting to reveal details and increase their visibility, but without harsh shadows that could interfere with the task. Lighting in offices and education environments can suffer from the so called ‘cavern effect’, where a relatively dark ceiling and upper walls are unnatural and uncomfortable to the human eye. This occurs when the lighting is solely directed downwards, with no upward illumination. Opal diffusers, providing a near Lambertian distribution, can partly solve this problem, but this can make it challenging to maintain an acceptable UGR. A potential solution is to use suspended luminaires with a built-in uplighter function, delivering illumination up to the ceiling as well as downwards. This would probably be achieved by employing additional upward-facing LEDs in the luminaire, with opalescent diffusers. This achieves

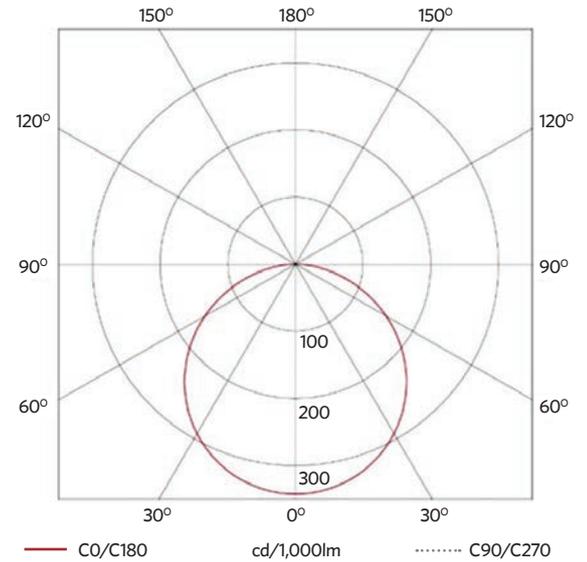


Figure 3: Example polar diagram of luminaire (in cd per 1,000lm of total luminaire output) with simple opalescent diffuser to provide practically Lambertian distribution when viewed both in the transverse (C0/C180) and longitudinal (C90/C270) axes (in this case, both axes provide the same profile). (Source: TamLite)

the necessary angle to lower UGR, while providing total illumination on the ceiling for a brighter, more appealing workplace.

The selection of an appropriate luminaire is key to the success of a lighting design. The detail of the required optical performance for the luminaire must carry through the supply chain, so that the installation properly reflects the design intent. An inappropriate lighting scheme is likely to have a significantly adverse impact on productivity, health and operational costs that reach far beyond any ‘savings’ that may have been made in the design, procurement and installation of a generic scheme.

© Tim Dwyer, 2021.

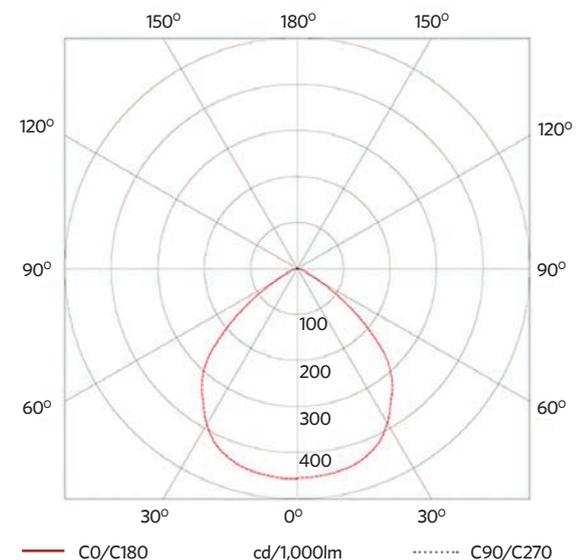


Figure 5: Example polar diagram of luminaire (in cd per 1,000lm of total luminaire output) with microprism diffuser (in this case both axes provide practically the same profile). (Source: TamLite)

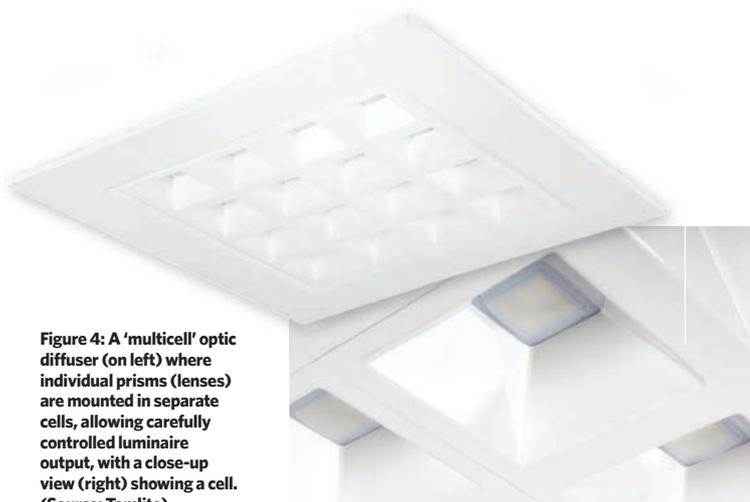


Figure 4: A ‘multicell’ optic diffuser (on left) where individual prisms (lenses) are mounted in separate cells, allowing carefully controlled luminaire output, with a close-up view (right) showing a cell. (Source: TamLite)

Module 176

March 2021

» **1. What potential impact is lighting reported to have on the performance of tasks in the indoor environment?**

- A Almost none
- B Around 5%
- C Around 10%
- D Around 15%
- E Around 20%

2. Which of these is most likely to be true for UGR?

- A If the luminaire luminance is doubled, the UGR will be doubled
- B Most external public spaces using LED lighting can apply UGR
- C The UGR may only be estimated using software
- D UGR can be usefully applied directly to all internal occupied spaces
- E Without knowing the specific application, UGR cannot be evaluated

3. For a 1,000lm output luminaire with the near Lambertian distribution in Figure 3, what is the approximate luminous intensity when viewed at 45° from the normal to the luminaire?

- A 100cd
- B 150cd
- C 200cd
- D 250cd
- E 300cd

4. Which of these is least likely to be true for a luminaire with a microprism diffuser?

- A It gives tighter control of light compared with opalescent diffuser
- B It always prevents veiling reflections and reflected glare
- C It will be manufactured from acrylic, polycarbonate or silicone resin
- D Viewers from more distant parts of the room are unlikely to suffer from discomfort glare
- E When applied appropriately in an office workspace, it may well have a greater overall efficiency compared with a luminaire with simple opalescent diffuser

5. Which CIBSE SLL lighting guide is likely to be most appropriate when specifically considering a lighting design for an office?

- A LG7
- B LG12
- C LG15
- D LG17
- E LG19

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Further reading:

The CIBSE SLL publications *Code for lighting (2012)* and *Lighting Guide 7: Office lighting (2015)* are excellent resources.

There is a useful article on LEDs at www.manufacturer.lighting/info/223/

References:

- 1 CIBSE TM40 *Health and wellbeing in building services*, CIBSE 2020.
- 2 BRE FP374 *Lighting and health*, BRE 2015.
- 3 CIBSE SLL *Code for lighting*, CIBSE 2012.
- 4 CIBSE SLL *Lighting Guide 7: Office lighting*, 2015.
- 5 CIE 117-1995 *Discomfort glare in interior lighting*, CIE 1995.
- 6 Dialux lighting design software www.dialux.com/en-GB/ - accessed 4 February 2021.
- 7 *Shedding some light on LED diffusers and lenses*, Condale Plastics, bit.ly/CJMar21CPD01 - accessed 4 February 2021.

› Products of the month

Rinnai expands its London team

Woodward is regional manager for London and South East as firm also adds support staff

Rinnai, a specialist in limitless, temperature-controlled hot water on demand, has appointed Darren Woodward as regional manager for the London and South East area. This new senior appointment is in addition to more support staff and resources at the company's office in Hayes, west London.

Woodward has held senior sales-management positions with several prominent manufacturing concerns and been active on major projects, such as Shangri-La Hotel at The Shard, the Francis Crick Institute in London, and Pembury Hospital in Kent. He has also worked with major consultancies, mechanical and electrical contractors, and subcontractors. He holds a City & Guilds certificate in plumbing.

Tony Gittings, Rinnai UK managing director, said: 'Rinnai is now positioned in London and the South East as the information hub for all



"Rinnai is positioned as the information hub for systems for sites of every size"

questions concerning the delivery of on-demand, temperature-controlled hot-water units and systems for sites of every size.

'We are also able to offer a comprehensive range of fully accredited CPDs on the topic of hot-water, precision temperature-controlled delivery

to all commercial, industrial and institutional sites via Teams or Zoom, so consultants can bring themselves up to date with the developments in hot-water continuous flow technology.

Gittings said Rinnai has a full technical sales-support service and product offering for London and the South East, which are the areas of most commercial activity. 'We have seen a commensurate rise in installations and enquiries. This senior appointment is a demonstration of our commitment,' he said.

One recent installation at Transport for London's Ashfield House featured hot-water heating units in a range of sizes and outputs. The solution included: Nexus electrolytic limescale inhibitor; remote monitoring solutions; flexible flue configurations, including valve packs and unvented systems to support secondary return systems for G3 compliance and ACOP L8 best practice; and multiple 'in direct' storage vessels to support peak-hour applications.

■ **Call 01928 531870, email sales@rinnaiuk.com or engineer@rinnaiuk.com or visit www.rinnaiuk.com**

Viega valves make installation easier

German-engineered valves ensure maintenance and servicing are also simple to do

Made with a non-alloyed steel and zinc-nickel coating, Viega's Megapress Easytop ball valves are designed for thick-walled steel-tube piping systems. The valve is available in two variants; from 0.5in up to 4in, the sealing element is ethylene propylene diene monomer (EPDM) rubber for temperatures up to 110°C. In the XL sizes of 2.5in up to 4in, the valve features a fluoroelastomer (FKM) seal, for higher-temperature applications up to 140°C.

The German-engineered press-connection valves are quick, simple and clean to install. The internal design of the valves and easy-to-operate actuating lever ensure smooth and accurate control. The structure of the fitting ensures that maintenance and servicing is simple; the main valve section can be dismantled for cleaning or replacement without the need to modify the pipework. The valves can be used for applications such as industrial and plant engineering, closed heating and



"We are continually looking for solutions to make the installation process easier and more efficient"

cooling circuits, compressed air systems, and systems for technical gases.

The extensive range of Viega Easytop system fittings includes products for use on copper, stainless-steel and multilayer composite systems in a range of pipe sizes, including XL dimensions. The product portfolio also features adapters suitable for threaded and soldered connections.

'The Megapress Easytop valves offer a high-quality solution that works well for a number of systems, including stainless-steel and multilayer composite,' said Scott James, director at Viega. 'When we design our products, we are continually looking for solutions that will make the installation process easier and more efficient for building service contractors.'

■ **Visit www.viega.co.uk/valves**

Products of the month

New Micronics Portaflow range

Portable, clamp-on, ultrasonic flow instruments retain the key feature of simple operation

Micronics has launched a new Portaflow range, featuring the latest ultrasonic flow-measurement technology, hydronic-liquid flow-energy measurement, and a comprehensive data-logging facility.

Building on its considerable experience and success with the former PF330 and 220 ranges, Micronics has developed a new range of portable, clamp-on, ultrasonic flow instruments, incorporating the latest technology while retaining the key feature of simple operation.

The Portaflow PF333 offers the user quick and accurate flow and energy measurement. With its easy-to-follow menu and simple set-up, results can be achieved within minutes of opening the case.

The range continues to bring simplicity to the non-invasive measurement of liquid flow, and now has the addition of hydronic-liquid flow-energy measurement for hot and chilled water applications.

The PF333 uses the latest cross-correlation



“With its simple set-up and easy-to-follow menu, results can be achieved in minutes”

ultrasound flow-measurement system to measure flowrate, and clamp-on PT100 temperature sensors to measure flow and return temperatures.

Heat or cooling load is calculated from a combination of the flowrate and the flow and return temperature difference, to comply with EN1434 section 6.

The integral data logging has a capacity of 100 million data points with 12 named sites, and can be downloaded via USB to CSV files and exported to Excel.

Compact and reliable, the Portaflow range has been designed to provide sustained performance in industrial environments, with the new cross-correlation flow-measurement system providing improved accuracy for flow and measurement audits of old – and often challenging – pipework in existing installations.

■ Call 01628 810456 or visit www.micronicsflowmeters.com



Elco enhances its commercial water-heating offering

Elco has expanded its range of hot-water products, which now comprises more than 60 direct, indirect and storage models, ensuring building service engineers and consultants can easily specify a product for any commercial project. This has been bolstered by the launch of a brochure showcasing the comprehensive portfolio of products on offer.

A stand-out performer is the Trigon XL WH direct gas water heater, which boasts an advanced burner design, and is one of the most technologically advanced and best-performing units on the market.

■ Visit www.elco.co.uk

Jung Pumpen creates virtual learning zone

Jung Pumpen's new Pump Technology virtual showroom and media room features a full range of the company's equipment, helping public health engineers keep their pumping knowledge up to date.

By connecting via Teams, engineers can view all aspects of pump-system design and learn how to match the correct pump system to each application.

Presentations are tailored to each company's or individual's requirements.

■ Call David Johnson, marketing and business development manager, on 0118 9821 555, email davidj@pumptechnology.co.uk, or visit www.pumptechnology.co.uk and www.jung-pumps.co.uk





^ Evoqua's new filter for aquatics venues

Evoqua's new Defender FP-Series regenerative media filter has been designed to meet the needs of swim schools, health clubs and other small- to medium-sized commercial aquatics venues.

Its unique PowerBump System means the Defender FP filter produces up to 90% less wastewater than a traditional sand filter - saving water and energy in a footprint 75% smaller. It achieves filtration to 1µm - a factor of 20 better than sand filters, meaning coagulant dosing is not required and operators can benefit from up to a 30% reduction in chemicals.

The Defender FP filter is fabricated from corrosion resistant, lightweight, glass-fibre reinforced plastic for ease of installation and maintenance. When used in conjunction with the Evoqua Wafer UV generator, the Defender FP filter gives chemical-free, enhanced pathogen inactivation and provides cleaner, safer water for an enhanced swimmer experience.

■ Call 01732 771777 or visit www.evoqua.com/en-GB

A helping hand from the Grundfos Product Centre ✓

We could all do with a helping hand at various times in our working day, so it is good to know that the Grundfos Product Centre (GPC) is always on standby and ready to assist you to make the right pump choice.

This bespoke online search and sizing tool will help you opt for the right pump to meet your needs, whether you are looking for a solution for a new or replacement project, or if you just want to find out more information about the pumps you already have. Covering a wide range of building services applications and solutions, this hub has become a destination of choice for commercial building specialists.

The platform is available whenever it is needed, and you can use it for a variety of things, such as browsing the Grundfos product catalogue to find appropriate replacement pumps, for finding pumps to handle specific liquids, or simply to select a first-rate pump.

■ Visit www.grundfos.co.uk/gpc



Rinnai's website helps you choose ✓

Rinnai is offering sites, especially those in healthcare, that need to update and improve their hot-water delivery unit or system a 'help me choose' facility via its digital touchpoints.

Now is the ideal time to replace old, inefficient stored-water systems that may be causing emergency breakdowns. There are significant operational expenditure advantages, reduced energy costs and carbon reductions to be had from switching to the hot-water continuous-flow method.

Anyone in the healthcare sector - hospitals of any size, care homes, GP surgeries, day centres and health centres - can visit Rinnai's website for instant assistance on choosing the right products to deliver limitless hot water, and provide fuel, energy and environmental efficiencies.

Rinnai is also offering free surveys and a complete cost-comparison report, customised to any site. In addition, it is offering full services for essential works support to NHS facilities and care homes during the lockdown.

■ Visit www.rinnaiuk.com and use the smart online contact points 'Help me choose' or 'Ask us a question'



◀ Toshiba Carrier launches new air conditioning controller

The latest generation of Toshiba Carrier UK's award-winning Mini TouchScreen air conditioning controller offers enhanced capabilities that extend its application to offices and commercial buildings.

Originally developed for use with Toshiba air conditioning in hotels, the Mini Touchscreen has an intuitive touch-sensitive interface, similar to a high-end smartphone. It is designed to be easy to use, and quick and simple to install.

The latest version, Series 2, now includes a full-function, seven-day timer, enabling users to programme up to eight events a day across the week. The Mini TouchScreen uses the same two-wire connectivity as a standard wall controller, enabling it to be quickly installed without adding an external power supply on new projects, and as an upgrade on existing systems.

'The Series 2 adds significant functionality while retaining all the user benefits of the original, enabling mainstream application in offices and commercial buildings that require a more sophisticated scheduling across the week,' said Fraser Hymas, TCUK's controls system manager.

■ Visit www.toshiba-aircon.co.uk/product/rbc-mtsc1-mini-touch-screen-controller

✓ **ATAG's boiler provides heating for school**

A new boiler from ATAG Commercial has been installed at Monmouth School for Girls in Wales. The 180kW XL-F floor-standing unit has been supplied with an integrated plate heat exchanger as a backpack solution, and replaces two antiquated boilers. The project was overseen by Pritchard Services.

Phil Pritchard, sales and technical director at Pritchard Services, said: 'ATAG Commercial boilers are extremely efficient and highly reliable. The new XL-F boiler was perfect for this job, as everything is housed inside a single unit.'

■ Visit www.atagcommercial.co.uk



◀ **Domus Ventilation launches new MVHR systems**

Domus Ventilation, part of the Polypipe group, has launched its next-generation, improved-performance HRXE mechanical ventilation with heat recovery (MVHR) units for a wider range of residential properties than ever before.

HRXE-Hera and HRXE-Aura high-performance MVHR systems combine supply and extract ventilation in one system. They efficiently recover the heat typically lost in waste stale air and use it to temper the fresh air drawn into the building via a heat exchanger, effectively meeting part of the heating load in energy-efficient dwellings.

■ Email vent.info@domusventilation.co.uk or visit www.domusventilation.co.uk

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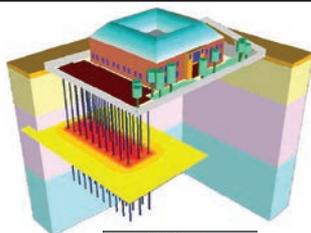
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H₂

We do not have all the infrastructure needed for hydrogen, says Twinn



Chris Twinn

Is H₂ the answer?

Hydrogen might not be viable to heat our homes, says Twinn Sustainability Innovation's Chris Twinn FCIBSE

Hydrogen (H₂) is often touted as a viable solution to meeting UK net-zero carbon targets. However, the London Energy Transformation Initiative (LETI) has published a report that finds it unlikely that zero carbon hydrogen – supplied via a repurposed gas mains network – will be available for the vast majority of buildings in the foreseeable future. We asked the report's lead author Chris Twinn to explain.

Won't H₂ be cheaper than electricity, as we have gas infrastructure?

Unfortunately, we do not have all the infrastructure needed, aside from the local yellow polyethylene distribution network. The large steel, high-pressure primary distribution network is likely to need replacing or upgrading. As hydrogen is a manufactured gas, large-scale manufacturing plant (typically methane reformation) has to be built, with access to the natural gas raw material. Large-scale carbon capture and storage (CCS) is needed to capture the manufacturing carbon emissions. Additional carbon sequestration is also required, because CCS only captures 90% of CO₂ emissions, as is large-scale hydrogen storage. Think those demolished gasometers - only three-times larger in volume.

Won't a switch to H₂ be as simple as the town to natural gas change?

Records show this switch was far from smooth; Hansard details numerous complaints raised by members of parliament on behalf of their constituents. The switchover was beset by poorly trained and insufficient numbers of engineers, and identified many latent defects in existing gas installations and appliances, which building owners had to put right themselves. Consequently, many homes had no heating, hot water or cooking for extended periods. It should also be noted that this was a region-by-region switchover programme, enforced on all building owners/occupiers – so no choice on timing or convenience. With no social media at the time, most personal experiences and the impacts on the more vulnerable have been largely lost in time. What politician would commit to such a national rollout process today?

Doesn't carbon storage solve hydrogen's CO₂ problem?

Currently, this is a fledgling technology with no examples at anything like the scale needed for a national gas grid switchover. Along with all the associated technology needed to make it work, exceptionally large investment would be needed. However, our gas supply has been a low-cost commodity, without large profit margins – or,

indeed, the electricity 'green crap' levy – to pay for this level of investment. To put this in perspective, the suggested investment needed is in the order of magnitude of NHS spending for 20 years.

Won't hydrogen be cheaper?

Hydrogen is a manufactured gas expected to be made from natural gas. So, it costs what natural gas does, plus the added cost of manufacture. Adding, say, 50% to the wholesale gas price would add about 25% to the consumer price. This does not include the switchover and new infrastructure costs. Amortising the suggested total switchover cost would increase the gas price by something like 300%. A heat pump has the potential to deliver the same heat using one-third of the quantity of delivered energy.

What about hard-to-heat stock that's not easy to insulate for heat pumps?

The switch to heat pumps will be challenging for certain building types. However, there are many heat pump variants, heating system adaptations, and insulation intervention combinations available. New complementary technologies are also emerging – for example, phase-change thermal stores of a size that can replace a combi boiler. As a nation, we are new to heat pumps and there is much we should be learning from others who have already built up their experience, such as Japan. Regarding the hard-to-heat driving us to a full hydrogen switchover: who is prepared to pay the large switchover costs just to benefit a sub-sector of the market?

Is there any future for hydrogen in decarbonising energy supply?

Probably, as a more limited-use, higher-cost premium fuel, pitched at a level to pay for more modest switchover costs. There is talk of localised hydrogen hubs for certain industries that need high-temperature heat. Off-grid buildings may use it as a substitute for propane or oil, and there is interest for serving long-haul aviation. Long-distance road haulage appears to be going cool on it, because of a lack of refuelling infrastructure. There is testing for remote rail lines, but with the proviso that the infrastructure costs are less than electrification. Perhaps most importantly for our sector, harnessing hydrogen's seasonal storage abilities seems plausible, created using future summertime excess wind-turbine capacity and this fuelling power stations to boost winter electricity peak capacity.

EVENTS

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



ONLINE APPLICATION WORKSHOP

These online 'bite-sized' sessions are designed to help you prepare to apply for MCIBSE. CIBSE interviewers will offer advice on getting the application started, over four live sessions:

- 22 March
- 25 March
- 30 March
- 1 April



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High voltage (11kV) distribution and protection
2 March

Building services explained
3-5 March

Electrical distribution design
5 March

Air conditioning and cooling systems
9 March

Energy Efficiency Building Regulations Part L2 2020
9 March

Low carbon consultant
10-11 March



CIBSE JOURNAL WEBINARS

CIBSE Journal hosts regular, sponsored webinars covering a wide range of building services-related topics. All webinars are available on demand on the Journal website at www.cibsejournal.com/cpd/webinars

Last month's webinar, sponsored by Kohler Uninterruptible Power, was on standby generator sets.

Other recent webinars include:

- Staying in control of design to value pumping solutions, sponsored by Grundfos
- R32 VRF and F-Gas phase down, sponsored by Dakin
- A case for change: setting new UK standards for high-rise drainage, sponsored by Geberit.

Introduction to combined heat and power (CHP)
12 March

Mechanical services explained
22-24 March

Emergency lighting to comply with fire-safety requirements
21 April

Electrical services explained
21 April

The importance of energy-efficient buildings
23 April

Low carbon consultant design
27 April

Designing water-efficient hot and cold supplies
28 April

Successful design management
29 April

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



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

The series includes two separate webinars - with session 1 covering routes to membership, and session 2 focusing on how to write the Engineering Practice Report.

Upcoming webinars:

- 9 and 23 March

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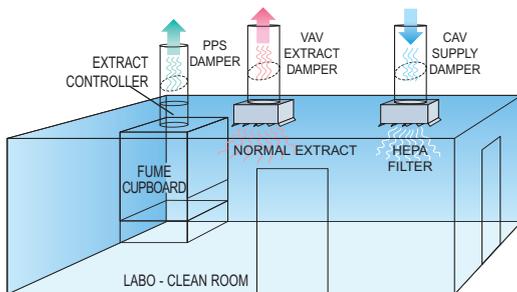


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