

CIBSE **JOURNAL**

#Build2Perform

January 2019

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New year, new rules



Christmas may be the most wonderful time of the year, but it can also be an extremely busy period for those trying to squeeze four weeks' work into three before the start of the holidays. You sense government departments were particularly busy, as they published a number of hefty key documents ahead of the festive break.

These included the government's response to *Building a Safer Future*, Dame Judith Hackitt's review of Building Regulations and fire safety. Its *Implementation Plan* fully supports her report, and includes the creation of a regulatory and accountability framework to oversee the industry,

and the introduction of clearer standards and guidance. There will also be a new Standards Committee to advise on construction product and system standards and regulations (see page 14).

The government will also establish the Joint Regulators' Group to trial elements of a new regulatory system ahead of any proposed legislation. In addition, it has announced a full review of fire safety guidance within building regulations (Approved Document B); the call for evidence is open until 1 March 2019.

An amendment was also made to the current Approved Document B last month. Guidance has been updated to restrict the use of assessments in lieu of tests or 'desktop studies'. It states that an assessment should not be regarded as a way to avoid undertaking a test where one is necessary. The amended guidance will come into force on 21 January. Another change to Approved Document B came into force before Christmas – a ban on the installation of combustible materials on the external walls of all new buildings containing housing and more than 18m high.

It's a relief to hear that Brexit is not the only thing occupying the minds of ministers and civil servants. There appears to be a real commitment to overhaul the construction industry to ensure Grenfell never happens again – and it's encouraging to read that the government has pledged to help create a culture change and a more responsible building industry, 'from design, through to construction and management'.

At Build2Perform Live in November, we also learned that the building regulation governing energy efficiency – Approved Document L – will be published in the spring and will address overheating. Clearly, this year will be a pivotal one for construction as major changes in technical guidance and construction processes look set to be mandated by government. Let's hope it manages to stay on course, whatever happens on 29 March.

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What are the implications for the industry of the government's response to the Hackitt Review?



Gary Wilde

Why it's key that M&E consultants ensure packaged plant systems – not just components – are CE Marked



Liza Young

Talks to five supply chain stakeholders about what they need to ensure a building performs



Tim Dwyer

This month's CPD is on pressure-independent control valves in variable volume heating and cooling



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CAMBRIDGE UNIVERSITY INSTALLS 384KWP OF SOLAR



Photon Energy has installed 384kWp of solar photovoltaic (PV) panels in nine apartment blocks at the North West Cambridge development, funded by the University of Cambridge. They generate 262,355kWh of electricity each year and save 136 tonnes of CO₂ emissions.

It took two years to install the 1,175 PV modules, which were fixed to a mounting system suited for flat roofs before being

connected to inverters. The apartments have been built to the Code for Sustainable Homes Level 5, and contain triple layers of insulation, brown roofs and a district heating system.

The PV arrays were designed to fit in with various elements on the roofs, including areas covered with soil and sections that were laid with pebbles, to ease flooding and to improve insulation.

Tougher regulations for building safety introduced

No hiding place for those who flout the new rules, say MPs

The government has committed to taking forward all the recommendations in Dame Judith Hackitt's review of building regulations and fire safety published after the Grenfell Tower fire.

In its implementation plan, the government has said it will: impose tougher sanctions on those who disregard residents' safety; create more rigorous standards and guidance for those undertaking building work; and give a stronger voice to residents.

Secretary of State for Communities James Brokenshire said the government was committed to a programme of reform over the coming years that will introduce clearer standards and guidance. This includes establishing a new Standards Committee to advise on construction product and system standards and regulations, and to help create a more responsible building industry - from design, through to construction and management.

A new Joint Regulators' Group - comprising local authority building control, the National Fire Chiefs Council,

the Health & Safety Executive, and the Local Government Association, including fire and rescue authorities - will work with developers and building owners. It will also seek input from residents, to develop and test new approaches that may later feature in legislation.

A Building Regulations safety guidance review of Fire Safety: Approved Document B has also been launched to gather expert advice so guidance can be revised.

■ The Implementation Plan is available at bit.ly/CJJan19plan

■ Read Hywel Davies' views on page 14.



Combustibles banned on new buildings

A ban on the installation of combustible materials on external walls of new buildings containing housing, and more than 18m high, came into effect just before Christmas.

Housing Secretary James Brokenshire confirmed that the ban also applies to new hospitals, residential care premises, dormitories in boarding schools and student accommodation more than 18m high.

Only products achieving a European fire-resistance classification A1 or A2 will be allowed on areas 'located within any space forming part of the wall' and on any decoration or finishes applied to external surfaces. The ban also applies to windows or doors, roofs pitched at an angle of more than 70 degrees, and balconies, as well as devices for deflecting sunlight and solar panels.

The new regulations, developed by the Ministry of Housing, give local authorities the power to remove potentially dangerous cladding from all high-rise buildings. They will receive funding from central government for the work, to avoid controversy caused by building owners passing on the costs of removing unsafe cladding to leaseholders.

Last month, an amendment was also made to the current Fire Safety: Approved Document B to restrict the use of assessments in lieu of tests (commonly known as desktop studies). It states that an assessment should not be regarded as a way to avoid undertaking a test where one is necessary.

■ Read CIBSE's technical note on the cladding ban at bit.ly/CJJan19News7

IN BRIEF

Small firms unsure about apprenticeships

The number of apprenticeships in construction-related fields fell by 24% in the 2017/18 academic year, according to figures released by the Department for Education.

According to a survey commissioned by the training firm JTL and carried out with The Enterprise Trust, small businesses remain unsure about the benefits of taking on apprentices and find the application process confusing. It found that 92% of sole traders had never employed an apprentice – and while 47% of respondents working in building services engineering had hired apprentices in the past, only 23% were currently doing so.

Leti working on zero carbon guidance

The London Energy Transformation Initiative (Leti) has set up nine working groups to produce guidance on delivering zero carbon buildings by 2030.

The groups will cover areas such as whole life carbon, demand management, benchmarks and energy metrics, and will offer guidance on targets around energy fabric efficiency targets, peak demand shifting and kWh/m².

'To ensure we're going in the right direction, we're considering all aspects of the built environment. What is key is that we come up with a technical definition of what a building needs to be to achieve climate change goals,' said Clara Bagenal George, Elementa Consulting environmental design engineer, who helped initiate Leti.

Double win for Arup at SFE Façade of the Year

Arup Façade Engineering has picked up two awards at the SFE Façade of the Year Competition 2018. Alongside Sir Robert McAlpine, Arup won Innovation Category of the Year for Maggie's Bart, and it also won the refurbishment category for the University of Leicester engineering building.

Buro Happold Façade Engineering won the New Build Category with Louvre Abu Dhabi.

The winners were announced at the Glass Supper 2018. For more details, see next month's *CIBSE Journal*.

Audits aim to reduce impact of air pollution on London pupils

Five schools to trial new air-filtration systems to reduce indoor pollution levels

Schools in London are to be given 'filtration toolkits' to try to reduce the impact of soaring outdoor pollution on children and staff. Consultancy WSP is also leading a programme of air-quality audits. This will focus on sources of pollution around 20 nursery schools in particularly polluted areas of the capital. Five will trial new air-filtration systems aimed at reducing indoor levels of NO₂, PM10 and PM2.5, which are linked to lung disease and asthma.

This is the second phase of a programme that has already audited 50 primary schools, resulting in several new measures being adopted, including upgraded heating equipment. The audits will also review methods to reduce pollution outside nurseries,

including restricting vehicle access and moving playgrounds away from congested roads.

Classrooms were revealed as particularly vulnerable to indoor air pollution in a study carried out by University College London and the University of Cambridge, funded by the Mayor of London's Office.

The age of school buildings, problems with poorly maintained ventilation, the positioning of windows, and carpeting were identified as contributory factors. Most of the classrooms studied were found to be suffering from higher exposure to small particles than World Health Organization guidelines recommended.

'It is high time the government delivered a new Clean Air and Environment Act and introduced the scrappage scheme we need to remove the dirtiest vehicles off our streets,' said London mayor Sadiq Khan.



Poor productivity linked to CO₂ levels

High concentrations of carbon dioxide (CO₂) inside buildings have a direct impact on productivity, a two-year research project has claimed.

The indoor air quality study, carried out by Oxford Brookes University and LCMB Building Performance, with support from government agency InnovateUK, is the first time researchers have tried to link the UK's poor productivity to 'environmental factors'.

It said office workers are able to work up to 60% faster when the concentration of CO₂ is lower. High concentrations lead to poor decision-making, slower reaction times and increased tiredness, said the report.

The research, which was also supported by facilities management firm Emcor, also said CO₂ levels are rarely measured in offices and poor working conditions were usually put down to fluctuating temperatures and 'stuffiness'.

Several workplaces were assessed using Internet of Things-enabled sensors, while employees were sent a series of tests up to three times a day and their performance correlated with the CO₂ readings. When levels were lower, their results improved by as much as 12%, the research said.

The study also concluded that, because modern buildings are sealed for energy efficiency purposes – and the opening of windows is controlled – air quality depended on air conditioning. In many instances, the buildings did meet ventilation standards, but CO₂ levels were still high.

IN BRIEF

RIBA makes ethics commitment

RIBA has said it will place public interest, social purpose, ethics and sustainable development at the heart of its activities.

At its council meeting last month, RIBA said it would develop a plan of action aligned with the UN's 2030 Sustainable Development Goals, and would collaborate with others – including government clients and other professions – to advance this work.

RIBA was following the recommendations of its Ethics and Sustainable Development Commission, which was launched in March 2018.

RIBA Council also agreed revisions to the Code of Professional Conduct, which align with the commission's recommendations.

Part L consultation to include overheating

Overheating will be included in the upcoming consultation for Conservation of Fuel and Power: Approved Document L, the government has confirmed.

Peter Rankin, principal building services engineer at the Ministry of Housing, Communities and Local Government, told delegates at Build2Perform Live that the document would be published in the spring. A document laying out possible future pathways for Approved Document L and F (Ventilation) will also be published.

Liverpool firm hunts down hotel contract

Steven Hunt & Associates has been appointed as the mechanical and electrical engineering designer for a hotel development in Liverpool's upcoming Knowledge Quarter.

The £35m project features an 18-storey development that will include a 160-bedroom Novotel and a 60-bedroom 'aparthotel' as part of Liverpool City Council's £1bn Paddington Village scheme.

The Liverpool-based firm will design air conditioning to all bedrooms using heat from the site-wide energy centre; full mechanical ventilation and air conditioning to the multi-purpose conference and event facilities, on-site bar, restaurant, fitness suite and meeting rooms.

BEIS prepares to canvas views on heat networks market

Customers require greater consumer protection, says CMA study

The government is to launch a consultation this summer into the legislation needed to support district heating systems and plans to set up a regulatory framework for the sector.

Almost half a million end users are already being supplied by around 14,000 heat networks, but consumer protection is in its infancy. The Department for Business, Energy and Industrial Strategy (BEIS) is keen to hear the views of stakeholders 'as we develop the heat networks market framework'.

A *Heat Networks Market Study*, produced last year by the Competition and Markets Authority (CMA), concluded that domestic and non-domestic customers required greater protection.

'To ensure growth is sustained – and that we fully realise the potential carbon savings – we

must put in place a market framework that provides the right signals to investors, while also ensuring that consumers are protected,' said Claire Perry, Minister of State for Energy and Clean Growth.

The Association for Decentralised Energy (ADE) said consumers and industry stood to benefit from the introduction of regulation in the sector.

'The heat network market is very different from the electricity and gas markets, and we hope that government continues to bear this in mind as it develops the regulatory framework over the coming year,' said ADE director Dr Tim Rotheray.

'Government has recognised that creating a market that protects customers and reduces investment risk are two sides of the same coin, and that a well-considered regulatory framework can support the creation of such a market,' he added.

Hydrogen could replace natural gas in parts of future energy system

Hydrogen can play a major role in helping the UK to decarbonise its energy supplies and heat networks, according to a report from the parliamentary Committee on Climate Change (CCC).

The *Hydrogen in a low-carbon economy* report said it should be a key part of the long-term strategy, along with energy efficiency, electric vehicles and heat pumps. Hydrogen could replace natural gas in parts of the energy system where electrification is not feasible or is prohibitively expensive, and provide heating during peak winter demand periods.

However, the report claims it would only achieve its potential if the government developed a low carbon heat strategy within the next three years to encourage commercial investment.

The committee said hydrogen should be produced for applications that require no major infrastructure changes, such as power generation and injection into the gas network to replace natural gas. But it concluded that switching the gas grid to 100% hydrogen was impractical.



EU exit uncertainty hits housing market

The chaos around Brexit is slowing down the housing market, with prices set to fall over the next three months, according to the Royal Institution of Chartered Surveyors (RICS).

The average time taken for a sale has now reached four months – the slowest period since 2016 – and the number of sales is expected to fall in 2019, according to RICS' latest survey of members.

'The ongoing uncertainties surrounding how the Brexit process will play out is taking its toll on the housing market,' said RICS chief economist Simon Rubinsohn. 'I can't recall a previous survey when a single issue has been highlighted by quite so many contributors.'

The Governor of the Bank of England, Mark Carney, has stated that house prices could fall by as much as 30% in the event of a 'no deal' Brexit.

Hinkley C has plan B

The construction team building the Hinkley Point C nuclear power station is stockpiling materials and looking to source more products locally to reduce the possible impact of a 'no deal' Brexit.

Nigel Cann, delivery director for end client EDF, said that 'sensible decisions' had been taken based on the likelihood of a considerable 'period of uncertainty'. However, he claimed the project was still 'on track' to be finished in 2025.

Cann said about 80% of procurement was complete, but that there were still 30 equipment contracts to place. EDF intends to employ 'an alliance of contractors' to deliver around £2bn worth of mechanical, electrical, and heating and ventilation works.

British business horrified by prospect of 'no deal' Brexit

Government prepares for no deal as date for Britain leaving the EU looms

British firms are horrified by the prospect of the UK leaving the EU without a deal on 29 March, according to a joint statement from business leaders. They said companies had been 'watching in horror as politicians have focused on factional disputes rather than practical steps that business needs to move forward'.

The British Chambers of Commerce, the Confederation of British Industry, manufacturers' organisation EEF, the Federation of Small Businesses and the Institute of

Directors said firms were diverting investment from innovation and jobs into stockpiling goods or materials, diverting cross-border trade, and moving offices, factories, jobs and tax revenues out of the UK. While many firms had prepared for no deal, 'hundreds and thousands' had yet to start, the statement said. 'It is clear there is simply not enough time to prevent severe dislocation and disruption in just 100 days.'

The National Federation of Builders (NFB) said leaving the EU without a deal would be more catastrophic for the construction industry than the 2008 financial crisis, when it lost more than 250,000 skilled workers. '[It] would make life harder for SME housebuilders and regional contractors at a time when the country is suffering from an acute skills shortage and a chronic housing crisis,' it said.

According to the NFB, the situation is being exacerbated by the Immigration White Paper, which proposes that skilled migrants earn at least £30,000 a year. CIBSE technical manager Julie Godefroy said this could have an impact on consultants relying on engineers from the EU. 'Most engineering graduates will earn less than £30,000.'



How Baxi Heating is preparing for a potential no-deal Brexit on 29 March

by Andrew Keating, UK aftersales and marketing director



We've taken a view that 'hard Brexit' is a potential outcome. The risks we can see are physical ones around the security of the supply chain.

We are spending time and money securing warehousing, organisational space, stock levels of finished goods and components, and transport.

A lot of effort has gone on behind the scenes. People will still need products, irrespective of what

happens with Brexit in the coming months.

There are some issues around certification, and we're confident we have the right standards and certification partners to ensure we can take products in and out of the UK.

In terms of exchange rates, the most extreme forecast is predicting pound/euro parity. If that happened, it would have a significant impact on products [in the UK market]. What will happen with tariffs is still unclear.

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ZERO CARBON AND ZERO FUSS WITH MODULAR APPROACH



A factory designed to produce 2,000 prefabricated homes a year, scaling up to 5,000 in five years' time, has opened in Yorkshire.

The 25,000m² Ilke Homes facility will eventually employ 700 people and produce eight modular homes every day. Once on site, six can be installed in a day. Two and three-bedroom homes will set homebuyers back between £65,000 and £79,000 – excluding land-purchase costs – and the company said it had a pipeline of 1,000 new homes to build in 2019.

Former CIBSE Graduate of the Year Nigel Banks, product and marketing director at Ilke Homes, said: 'We have already delivered zero carbon homes to three sites and offer this zero carbon upgrade to clients. We also have a lower embodied carbon content than traditionally built new homes.'

Going off site to deliver £2bn schools programme

Industry experts urged to give feedback on strategy

The Department for Education has unveiled plans for the largest programme of offsite construction, to deliver 100 new school projects a year by 2023.

It will brief potential design for manufacture and assembly (DfMA) partners on 22 January at the Manufacturing Technology Centre in Coventry. The aim is to use standardised components and volume production to reduce costs and speed up delivery of its £2bn programme.

The DfE is also developing a 'GEN 5' standardised design solution for school buildings, based around a BIM model.

Five departments have committed to adopting a new platform approach to design for manufacture and assembly (P-DfMA), which supports the use of standardised and interoperable components or systems in new schools, hospitals and prison buildings, to underpin the government's £600bn project pipeline over the next decade.

The Infrastructure and Projects Authority has asked for feedback in a 'call for evidence' running until 17 February.

CIBSE joins clients on UK-GBC task group

Some of the sector's largest firms have joined forces with professional bodies, including CIBSE, in a task group charged with defining 'net zero carbon' buildings and a framework for delivering them.

The group, convened by the UK Green Building Council, comprises 30 member organisations and 10 other bodies, including CIBSE, RIBA, RICS, BSRIA and the Better Buildings Partnership. It will seek to build industry consensus on what net zero carbon means in practice for building professionals. This can then be used to inform project designs, reporting initiatives, planning requirements and future regulations.

An industry consultation on the task group proposals will start in February, with the final output due to be published in the spring.

World's tallest modular towers take shape

Tide Construction has completed the core structures for the world's tallest modular towers in Croydon. Its offsite company, Vision Modular, will install the fully fitted modules – manufactured at its Bedford factory – around the concrete cores.

The two towers at 101 George Street will be the tallest structures to be built off site using modular construction methods, reaching heights of 44 and 38 storeys, and offering 546 rental homes.

The system has also resulted in 80% less waste and construction traffic, fewer onsite workers, and greater certainty on costs and time.

MPs call for law on late payments

A key committee in the Department for Business, Energy and Industrial Strategy (BEIS) has savaged large companies for withholding money from subcontractors and called for new legislation to punish the worst offenders.

The BEIS Select Committee published a strongly worded report after its review of productivity and small business, which identified poor cash flow as a serious impediment for SMEs involved in construction projects. It advised introducing a statutory 30-day limit for payments to supply chains and urged the abolition of 'early repayment schemes', whereby subcontractors pay a fee to receive payments on time.

The committee also recommended retentions be replaced by project bank accounts and called for a ban on subcontractors being obliged to offer 'discounts' to be treated fairly by larger firms.

Awards single out excellence in digital engineering

Leaders in digital engineering were recognised at the Society of Digital Engineering (SDE) awards, held at Build2Perform Live in November.

The awards recognise innovation, leadership and best practice in the discipline of digital engineering.

SLC Lavalin Atkins was the overall Digital Engineering Champion for its consistent application of high-quality digital design. This was also recognised in the Best Process and Application category, for its Digital Blueprint technology.

Buro Happold took the award in the Innovation category, which looked for groundbreaking ideas, for its Single Analysis Model. The firm's Michal Dengusiak was named Best Digital Engineer for his work in exploiting a wide range of data and interpretive tools to help the company streamline its business and reveal insights to drive improved building design.

Rowan Crowley, CIBSE Services MD, said: 'The awards give us the opportunity to single out examples of excellence in this fast-moving sector.'

Visit www.cibse.org/sde for the full list of winners.

CIBSE Ireland celebrates 50th anniversary

Awards also presented for excellence in building services engineering

CIBSE Ireland's 50th anniversary celebration dinner and awards night took place in November, when CIBSE President Stephen Lisk paid tribute to its members for their commitment to the industry.

Three project awards for excellence in building services engineering were also presented on the night:

- The Up to €2m Project award was won by consultants Arup and contractor Airflow Services, for the fit-out of One Albert Quay, Cork – the first Well certified office in Ireland
- The Between €2m and €5m Project

award went to consultants Homan O'Brien Associates and contractor Jones Engineering Group, for the Irish Life Building, Beresford Place, Dublin

- The €5m and over Project award was won by consultants JV Tierney & Co, for the Criminal Courts of Justice, Dublin, which has an active twin-skin façade, night cooling and low-energy displacement ventilation.

CIBSE Ireland presented a cheque for €14,000 to the Capuchin Day centre, a charity set up to offer breakfast and dinner to homeless people in Ireland.

It would like to thank the committee members for their dedication in organising the awards and dinner, as well as all those who attended and for their continued support over the past 50 years.

An annual golf day, sponsored by Grundfos, was also held to mark the anniversary, and took place at Luttrellstown Castle in September. The event attracted a huge turnout, with 25 teams supporting the day.

CIBSE Ireland also held a near zero energy buildings (nZEB) CPD for more than 400 building professionals around the country, led by CIBSE members Orla Coyle, of SEAI, and Eoin Doohan, of Aecom.

CIBSE technical director Hywel Davies also gave a talk on potential changes to the Building Regulations in light of the Grenfell Tower disaster.



From left: Kevin Kelly, CIBSE vice-president; Colin Moynihan, of Airflow Services; Jen Kennedy, of Arup; Mona Holtkötter, CIBSE Ireland vice-chair; Derek Elton, of Wilo; and John Burgess, of Arup, collecting the Up to €2m Project award

Chapman BDSP's China project wins BSG prize

Chapman BDSP was crowned overall winner of the CIBSE Building Simulation Group prize, awarded at Build2Perform Live in November.

There were 26 entries on building simulation and modelling, with six shortlisted for live presentations at the event. The quality was exceptionally high, and the judges awarded two runner-up awards and one overall winner. Head judge Darren Coppins was impressed with the state-of-the-art modelling and simulation tools and techniques used.

ChapmanBDSP presented modelling created for the Shenzhen World Exhibition Conference Centre in China. The judges were particularly impressed by the different forms of modelling on this large project, which challenged the modellers to question methods to achieve the best outcomes. They also used simulation tools to represent graphically the results, to overcome language barriers. ChapmanBDSP's fast-paced and inspiring presentation covered a significant amount of detail, and held the audience's attention.

Shikha Bhardwaj, of ChapmanBDSP, said: 'The CIBSE BSG Award is as an amazing platform to showcase the current ways of using computer simulation tools to inform building design on numerous

scales. Thank you to CIBSE BSG for organising this event and team ChapmanBDSP for all the hard work.'

The runners-up prizes were awarded to Ramboll, for its entry delivered by Santeri Siren, and Hodkinson Consultancy, for its presentation by Vasiliki Kourgiouzou. The shortlisted presentations and winners' blogs are available at www.cibse.org/bsg



From left: Nick Hopper, Monodraught; Niall Gibson, IES; Dave Cocking, DesignBuilder; Alan Jones, EDSL; Darren Woolf, BSG chair; Shikha Bhardwaj and Herman Calleja, winners from ChapmanBDSP; and judges Darren Coppins, Rokia Raslan and Gabriela Costa



IN BRIEF

West Midlands CPD

CIBSE West Midlands Region committee has secured two places at each of the RIBA West Midlands core CPD events in 2019. They are being held at The Bond Company, Birmingham, and details of the subjects can be found at www.architecture.com/CoreCPD

The events are a chance for any West Midlands regional member to collaborate with like-minded professionals – particularly architects – to network and learn.

Visit the events page at www.cibsewm.org or contact jos@cibsewm.org or 07598 288444 to book your place.

Latest technical report published

October 2018's Technical Team update is available online.

The CIBSE Technical Team gives technical contributions, advice and support to various activities across CIBSE, to deliver public benefit, enhance the institution's impact with external bodies, and add value to CIBSE membership.

It also manages CIBSE responses to calls for evidence from government departments, select committees and other public bodies, and interacts with the government and external bodies in policy and technical fields.

The latest update can be found at bit.ly/CJJan19Tech

Revised heat networks CoP

The revised edition of CP1 Heat Networks Code of Practice for the UK is now open for consultation.

CIBSE and the Association of Decentralised Energy (ADE) have an ongoing partnership to enhance the quality of heat networks. This partnership developed CP1 2015, which has introduced minimum standards and has had a significant effect on the procurement of district heating.

CIBSE/ADE, funded by the Department for Business, Energy and Industrial Strategy, are now updating CP1 to help take the sector to the next level. They are seeking feedback on the updated draft and, in particular, on the specific changes that you feel are necessary, and why.

For details and information on how to respond, visit www.cibse.org/current-consultations – the closing date is 20 January.

From left:
Compere
Alun
Cochrane;
SLL
president
Iain Carllie;
Emma
Beadle; and
Lighting
Education
Trust chair
Bob Venning

Emma Beadle crowned Young Lighter of the Year

Presentation on engaging children with lighting impressed judges at LuxLive

WSP's Emma Beadle has been named the Society of Light and Lighting's Young Lighter of the Year 2018 for her paper *Children's Utopian Vision of the City: Co-designing lighting masterplans through play and exploration*.

Using a co-design methodology, Beadle's project aimed to engage students with lighting design at a young age. Adopting tested co-design methods for working with children, the project was formed around ethnography, observation, interviews and workshops.

Beadle, who also won the award for the best written paper, asserted that children should receive an education in lighting design to develop design thinking and problem-solving skills, and to enhance their personal development. She wants to raise awareness of a career in lighting and

attract greater numbers of young people to the industry.

The prize for best presentation was won by Katia Koloveva, of Urban Electrical, for her paper *Light as a Medium to Enhance Communication in Urban Spaces*.

Also in the final were Carla Piatta, of Glamox AS, with her paper *Interactive Lighting in Public Spaces*, and Sanny Yuwono, of Nipek, with her paper *Is there a threshold for the degree of chroma used to allow colour in exterior lighting without making the building incongruous to its surroundings?*

Each finalist delivered their 15-minute presentation in front of judges at LuxLive 2018 in November, with the winner announced that evening, at the Lux Awards.

The Young Lighter of the Year awards test not just the finalists' ability to develop a lighting project, but also their presentation skills – an important soft skill that can make a big difference in communicating and implementing theoretical ideas on a project.

CIBSE Journal has your vote in readership survey

CIBSE Journal has again scored highly in the readership survey, with 92% of respondents rating it as 'excellent' or 'good'.

When respondents were asked to rate specific features in the magazine, case studies and technical articles were rated most highly, with 95% describing them as 'very' or 'quite' useful. This was closely followed by the news and business news, which received 94% of the votes.

When asked what other – less frequently covered – areas people would like to see featured, international case studies scored highest, closely followed by health and wellbeing and electrical engineering projects.

There was also feedback on how long people spend reading each edition; 48% said 30-60 minutes, with 21% taking more than an hour over the monthly magazine.

The *Journal* website also received positive feedback, with 82% of those who visited the site rating it as 'excellent' or 'good'.

Three webinars were hosted by the *Journal* in 2018 and 83% of those who tuned in rated them as 'excellent' or 'good'. They are available on demand on the *Journal* website.

Thank you to the 500 people who responded to the reader survey in November.

Building a safer future

The government has published its implementation plan in response to Dame Judith Hackitt's *Independent Review of Building Regulations and Fire Safety*. Hywel Davies assesses the implications for construction

The government's response to Dame Judith Hackitt's report arrived, as promised, late in the 'autumn'. On 18 December, the Secretary of State for Housing, Communities and Local Government, James Brokenshire, published the implementation plan, with a very heavy emphasis on the safety of residents, in a statement to the House of Commons.

He reiterated Dame Judith's conclusion that the current system is not fit for purpose and that a radical systemic overhaul is required.

While acknowledging this will take time, Brokenshire noted that the recent amendments to the Building Regulations – which came into force on 21 December 2018 (see panel 'Combustible cladding ban') and cover external walls of buildings containing residential units more than 18m high – already go beyond Dame Judith's recommendations.

Reform programme

The Implementation Plan commits the government to take forward all Dame Judith's recommendations. This will require a significant programme of reform that will take years to deliver in full. It is intended to:

- Create a more effective regulatory and accountability framework to give greater oversight of the industry
- Introduce clearer standards and guidance, and a new Standards Committee to advise on construction product and system standards, and regulations
- Put residents at the heart of the new system of building safety, empowering them with more effective routes for engagement and redress
- Help create a culture change and a more responsible building industry, from design through to construction and management.

There is a commitment to work in four specific areas. We are promised a stronger, more effective regulatory and accountability framework – focused on keeping people safe – and a tougher oversight regime with stronger and better-enforced sanctions to prevent and punish wrongdoing. Readers of this column over its



“The plan commits the government to give residents better information, and to empower and engage them”

10-year life will know how much that is needed and how challenging it may prove to be.

The plan promises an early trial of the system soon, through a 'joint regulators group' to help the transition to the new regulatory framework. This appears to take forward Dame Judith's idea of a 'joint competent authority', bringing various regulators together.

There will be a consultation later in the year about extending the scope of this body beyond the original high-rise residential buildings to incorporate other building types and occupancy characteristics.

Clearer standards and guidance are proposed that can be better understood by those carrying out building work, so they can readily identify what is required to make buildings safe. There will also be action to improve the way in which construction products are tested, labelled and marketed.

At the heart of the new system, will be a stronger voice for residents. In the immediate aftermath of the Grenfell Tower fire, it became very obvious that residents' concerns had gone unheard – a complaint echoed extensively by many others in social housing. The plan commits government to give residents better information

and to empower and engage them. Those views have also shaped the government's recently published social housing green paper.¹

The government wants the new system: to drive better communication between residents and those who manage their buildings; to deliver access to appropriate information; and create effective routes for raising concerns and offering a remedy when things go wrong. The plan is clear – there must be properly defined and accountable dutyholders, even if the various legal structures may make this complicated. A further consultation is promised in the spring.

Culture change

The final aspect of the implementation plan sets out how the government intends to work with industry professionals 'to help them lead the required culture change and prioritise public safety'. There is a

commitment to ‘champion those who are doing the right thing, [and] challenge those who have further to go, including by supporting local authorities to take enforcement action’. This is welcome news and, as a professional body, CIBSE has to be committed wholeheartedly to support this.

The plan acknowledges the immediate and ongoing industry response to the call for greater definition and explicit assessments of competence for professionals working on these buildings. It commits the government to look at the outcome of this when it is complete in May, and to consider whether legislation is needed to assure the competence of those carrying out building work.

This has fundamental implications for CIBSE members and, possibly, even greater implications for those who do not belong to a UK professional body.

It is looking increasingly likely that – for those who work on the higher-risk buildings that come within the scope of the new regime – there will be a clear and legally backed regime requiring assessment of competence. Those who are already chartered professionals with UK bodies will probably have a significant start, but there will still be a need to show fitness to work on the buildings that are covered by the new rules.

This implementation plan promises a major programme of work to address these challenges to

the way we build and the way we manage building safety. The government is clear that it is required to ‘rebuild public trust and deliver the meaningful, lasting change that is needed’.

Achieving the systematic overhaul envisaged will require all parties to change and to put residents’ or occupiers’ safety at the heart of the system. As we begin a new year, what better commitment could we all make than to wholeheartedly support this call for change? We owe it to the victims of Grenfell Tower.

References:

- 1 A new deal for social housing green paper, bit.ly/CJJan19social

COMBUSTIBLE CLADDING BAN

The Building (Amendment) Regulations, SI 2018/1230, were published on 29 November and came into force on 21 December 2018. The amendment implements the promised ‘ban on combustible cladding’ by prohibiting the use of combustible materials anywhere in the external walls of high-rise buildings more than 18m above ground level that contain one or more dwellings.

For more information, see CIBSE’s technical note at www.cibsejournal.com

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Pump assemblers must step up to the mark

Mechanical and electrical consultants risk breaking the law unless they ensure packaged plant systems – and not just individual components – are CE Marked, says Gary Wilde, of the British Pump Manufacturers' Association

Non-compliant pumping equipment in packaged plant solutions is a major problem in the UK market. M&E consultants that specify pumping equipment should ensure the complete set is CE Marked and included within the technical tender specification.

However, a growing number of packaged plant suppliers in the UK believe it is acceptable to simply bring together various components – such as pumps, drives, controls, pipework, valves, tanks, baseplates and so on – from different suppliers, and rely on the CE Marking on these individual items as compliance for their packaged set. This is not the case.

CE Marking of the packaged plant system is a legal requirement, so many consultants are breaking the law and risking prosecution, heavy fines, and possibly even imprisonment. They are also, potentially, putting the final user of the unit in breach of health and safety rules. The complete unit is a machine in its own right, so must have a CE Mark affixed and be supported by all the appropriate documentation, including a Declaration of Conformity (DoC).

The British Pump Manufacturers' Association (BPMA) is keen to ensure all assembled equipment, especially those with pumps incorporated within the build, are placed on the market and put into service correctly.

Original pump manufacturers incur large costs ensuring they implement the required legislative programmes correctly, so the products they bring to market meet all appropriate certifications. So the BPMA and its members are calling on consultants, M&E contractors, design and build, distribution and installers to work together to use and install only CE Marked equipment.

Any equipment not meeting this criterion should be rejected, with costs associated with this rejection – plus any negative publicity that might ensue for the company and brand – borne by the contractor.

Existing in its present form since 1985, CE Marking is a certification mark that indicates conformity with health and safety and good environmental protection standards for products sold in the UK and the European Economic Area (EEA). It is not just the manufacturer of pumping



“The complete unit is a machine in its own right, so must have a CE Mark affixed and be supported by all the appropriate documentation”

equipment that is responsible for compliance, but the assemblers, suppliers and installers.

If assemblers market the products under their own brand names, they take over the manufacturers' responsibilities and assume legal responsibility for CE Marking of the products they build.

As a complete set, packaged plant will need its own identification label affixed, with an appropriate CE Mark, and must comply with the correct legislation. The label has to carry a serial number, product type, supply voltage and performance data, along with contact details of the system builder and where the packaged plant was manufactured.

Several environmental and sustainability directives should also be considered, such as Waste Electrical and Electronic Equipment (WEEE), Restriction of Hazardous Substances 2, and Packaging Waste. In addition, local standards – such as the Water Regulations Advisory Scheme (WRAS) and the Water Supply (water fittings) Regulations 1999 – will still apply.

Each assembled system should have a comprehensive instruction manual, as well as a DoC referencing the appropriate legislation and EN standards where applicable. The set assembler will need

to prepare a technical file that includes risk evaluation, product data, product features, production methodology, and health and safety considerations.

In the UK, enforcement or market surveillance is undertaken by Trading Standards, the Health and Safety Executive, and the National Measurement and Regulation Office within the Department for Business, Energy and Industrial Strategy (BEIS).

If a supplier fails to give full details of the CE Marking of their products, it may be obliged to take the product off the market, or face a heavy fine if successfully prosecuted.

Packaged pump system builders must play their part when placing products onto the UK market to comply with the law. So it makes sense to only specify, purchase and install CE Marked equipment.

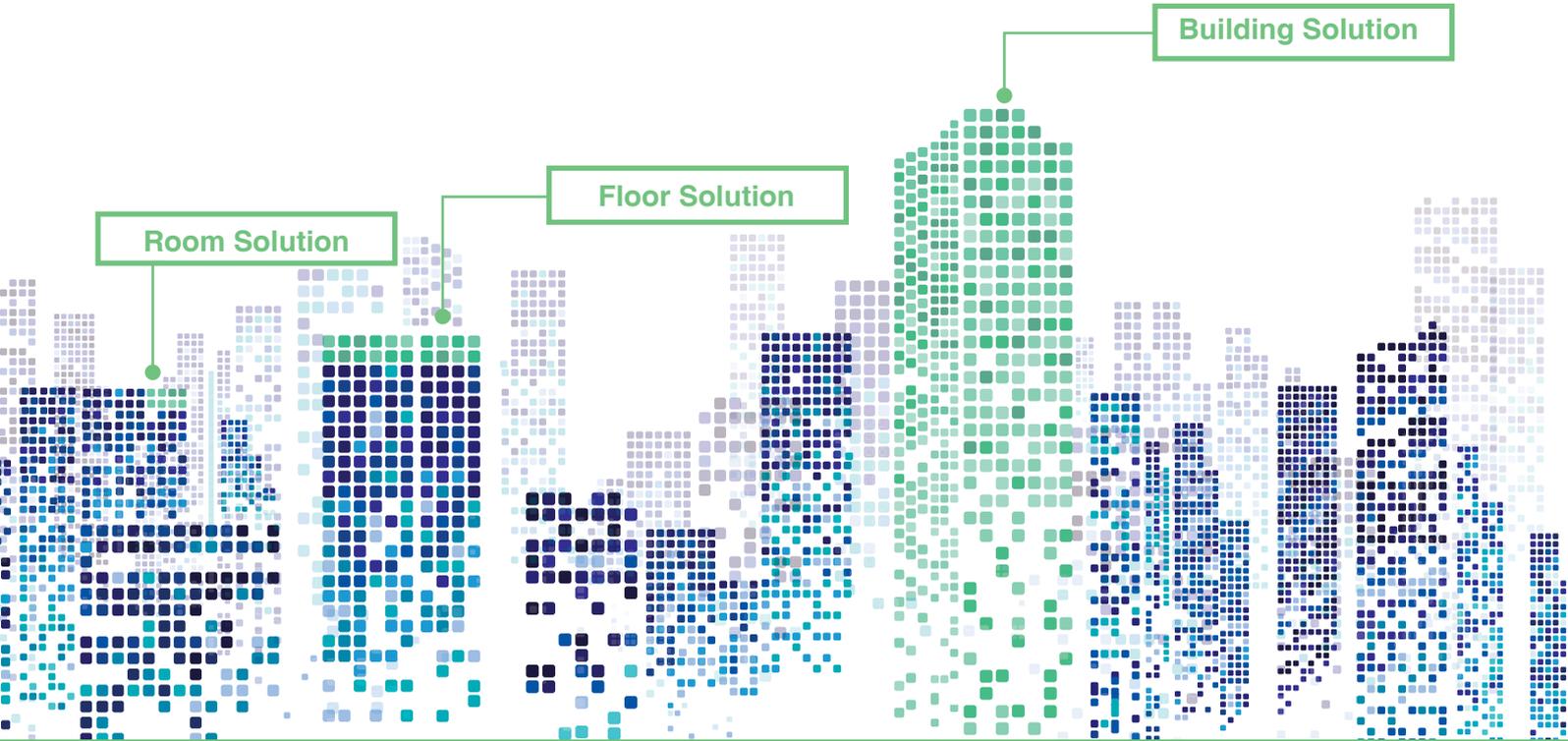
Most CE Marking legislation is already written into UK law, so its obligations will not change in the event of a 'no deal' Brexit.

GARY WILDE
is a technical services
officer at the British
Pump Manufacturers'
Association

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Certified jet-thrust tunnel ventilation performance

Enhanced Norwegian road tunnel safety requirements are driving improved smoke-extract system design, says **Andy Cardy**

At the recent Fire Protection and Safety in Tunnels event (FPST18), Fläkt Woods delivered a presentation sharing our experiences and expertise.

We explained how tunnel topography and different installation practices often adversely impact ventilation and smoke-extract system effectiveness. Our main message, however, was to highlight that tunnel ventilation and smoke-extraction design integrity are very closely linked to jet-thrust fan-performance capabilities, which are best assessed in accordance with recognised test standards to ensure the resultant design solution is robust.

As a major global ventilation company, we have more than 100 years' "onsite" tunnel ventilation experience. In addition, joint research with Southbank University, using a scale model of a two-lane tunnel (with a rectangular section), has allowed us to understand how thrust performance is influenced by fan-jet inclination and proximity (relative to the tunnel liner).

Even though Fläkt Woods fully embraces advanced design techniques, we also recognise that design tools, such as CFD, are best used to support practical engineering and technical experience, rather than being a substitute for them. "Real world" computer models are, after all, only as good as the data and algorithms employed.

For example, one fundamental factor ignored within many CFD tunnel design models is friction related to wall roughness. In addition, fan proximity to the tunnel lining or obstructions, such as signage, are often underestimated. This is a problem because these often have a

significant impact on installation efficiency and delivered thrust. Ultimately, this can have a major impact on ventilation and smoke-extraction effectiveness.

Tunnel designers also face another challenge. Making an accurate assessment of the many available jet-thrust fan products can be problematic, as data is rarely stated consistently. To make this assessment more meaningful, thrust data should, in our opinion, be stated as measured "at source" (at the fan discharge) – as obtained via a recognised standard, such as ISO 13350:2015 – rather than derived from simple airflow or theoretical methods.

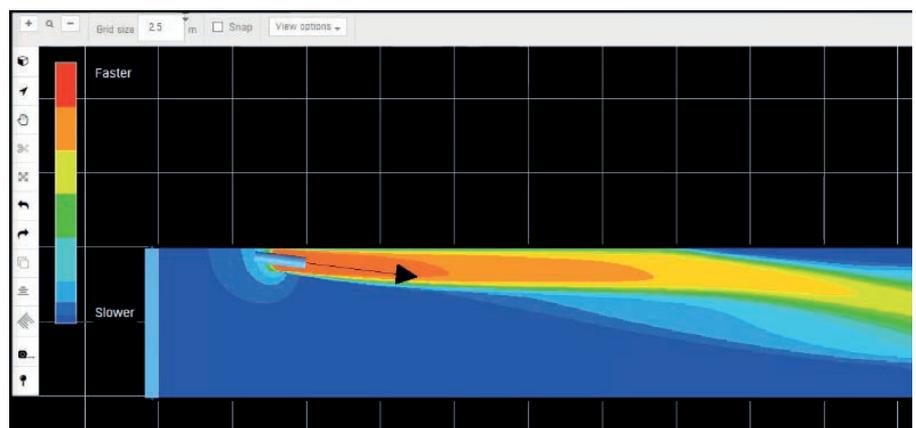
When defining which fan product to use, we believe that both entrained air velocity (effective thrust) and base thrust value (at the fan) should be considered. However, when benchmarking alternatives, base thrust data is the key. Other variables must, of course, be considered, as these will also impact resultant ventilation effectiveness. These include fire size, friction, drag, tunnel length, gradient,

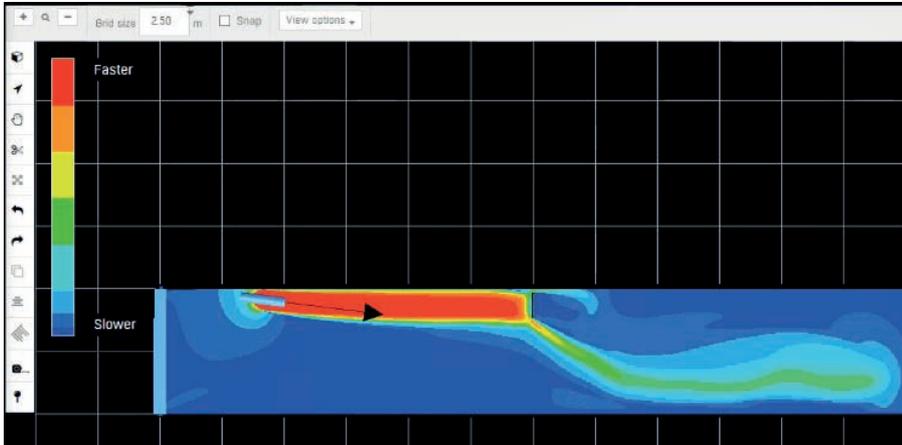
traffic-flow patterns, complex junction geometry and proximity to obstructions.

To determine performance impacts for common installation scenarios, we ran airflow simulations with different starting conditions, using proprietary CFD software and our own AirPark flow simulation tool. All scenarios positioned the fan within 0.75D of the tunnel roof, but jet-inclination angles were varied. Other simulations introduced deflector vanes or obstructions (signage).

As far as installation factors are concerned, our research found that increasing the jet angle beyond 7°, relative to the tunnel roof, reduces installation efficiency by as much as 16%. Fan proximity to the tunnel roof also had a serious impact, reducing installation efficiency by as much as 11% (for minimal fan and tunnel-lining separations – i.e. 0.04D). Study data also suggests that when the fan to tunnel lining separation is greater than 0.75D, there is no real benefit to inclining the air jet.

Installing a fan close to the tunnel roof





and wall (in a corner of a rectangular cross-section tunnel) made the most significant performance impact, as installation efficiency reduced by 21%. Finally, we found that assessing fan-installation efficiency (at a given distance down the tunnel) is very dependent on making accurate onsite air velocity measurements, which isn't always easy in practice.

Another consideration is the Coanda effect. This causes an air jet to "stick" to a nearby surface, which seriously

impacts air-jet development. We found that inclining the jet downwards by 7° made very little difference to "effective jet length" when assessed for a constant timeframe (around 30 seconds), as the Coanda effect very quickly became a major influence. Interestingly, adding a fan-discharge deflector vane (angled at 5°) reduced "effective jet length" by approximately 33%. We also found that thrust-jet development was seriously disrupted by downstream obstructions (signage 10m from the fan), even when

the jet was angled downwards by 7°.

Clearly, this scenario has serious implications, as it could ultimately reduce ventilation and smoke-control performance to the point where there is increased risk for tunnel users. While we are not claiming to have created a definitive set of conclusions, our study certainly indicates that more work is needed to understand how best to deliver fire-safety solutions within road tunnels.

■ Andy Cardy is product manager - Axial Fans at Fläkt Woods Limited UK. For further information, visit www.flaktgroup.com



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MAKING SENSE OF COMPLEXITY

Build2Perform Live tackled the issues that will change the way we design and deliver buildings for the next 30 years as the industry strives for zero carbon. **Alex Smith** reports



Exhibitors at the event

CIBSE's Groups and Societies took centre stage at Build2Perform Live in November. The two-day conference and exhibition featured more than 30 sessions hosted by CIBSE groups and divisions, including one on pollution in urban areas by the new task group on air quality. The variety and depth of knowledge on display indicated the current complexity of the construction industry, as firms and organisations consider how they will meet the government's challenge of building safe, zero carbon buildings by 2030. The destination is set, but how we get there is still unclear.

Rewarding excellence

Build2Perform, at Olympia in west London, hosted two awards ceremonies. SNC-Lavalin Atkins was recognised as the overall Digital Engineering Champion in the Society of Digital Engineering awards, for its consistent application of high-quality digital design. BuroHappold Engineering claimed three awards, including best consultancy and best digital engineer for Michal Dengusiak.

The inaugural Building Simulation Group Prize was presented to Chapman BDSP. Judges were impressed by the engineer's model for the Shenzhen World Exhibition Conference Centre in China and the way it presented results graphically to overcome language barriers. For details, see page 12.

Build2Perform also included a well attended exhibition and two CPD theatres,

featuring 17 presentations on subjects that varied from the circular economy and heat interface units to façade illumination and pressurisation in smoke control.

Updates on regulatory changes and the impact they have on building services design are always an important feature of CIBSE conferences. This year, delegates learned that the government is committed to including overheating in the upcoming consultation on Approved Document L, the building regulation governing energy efficiency.

The document will be published in the spring, according to Peter Rankin, Ministry of Housing Communities and Local Government principal building services engineer, who said another document – laying out possible future pathways for Approved Document L and F (Ventilation) – would also be published.

Heating debates

Decarbonisation of the grid and lower carbon factors for electricity mean the industry is looking hard at gas alternatives, so the future of heat was widely discussed.

Heat pumps are now a viable option, but Paul Ashford and Huw Blackwell, from the Anthesis Group, warned that designers need to consider the impact of new refrigerants in the specification of heat pumps. Clients, they said, need to be made aware of the risks of creating stranded assets when purchasing this equipment. "There is currently no single, clear alternative approach, with refrigeration equipment manufacturers in a state of flux



Panelists at the session on ventilating low carbon buildings for health and wellbeing

"A cultural shift is required alongside the digital shift and industry needs to be prepared for 'business as unusual'"

as they change their commercial line-up to reflect the changing market and its associated costs,' said Blackwell.

New solutions have other constraints and risks that must be accounted for, he added. For example, where 'mildly flammable' refrigerants – such as R32 – are installed, clients may need to do explosive risk assessments under the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR), even though the refrigerants are technically still HFC-based.

It could spell the end for gas-based VRV/VRF approaches, said Blackwell, because of their higher refrigerant volume requirements. Instead, there could be an increase in low-temperature, water-based heat energy distribution between small heat pump units.

Hope for hydrogen

The presenters in the session on hydrogen explained that its role in the future will be, primarily, to store and carry energy. Hydrogen does not exist on Earth as a gas, so must be

manufactured. It is commonly produced from natural gas, but – in future – is likely to be made using electrolysis. This involves passing an electric current through water to separate it into its basic elements – hydrogen and oxygen. Currently an expensive process, it is expected to become cheaper and to use electricity from renewable sources.

Stephen Carr, of the University of South Wales, explained that the advantage of hydrogen is that it could use the existing gas grid for distribution and storage. He expects hydrogen to be used, mainly, to store energy in summer for use in winter. Fuel cells will then convert the chemical energy in the stored hydrogen to electricity, with pure water and heat as the only by-products.

In a session titled Manufacture2Perform, the Bartlett's Dr Eleni Papadonikolaki spoke developing people and businesses to meet the future of the built environment. A cultural shift is required alongside the digital one, she said, and industry needs to be prepared for 'business as unusual' – and be aware that external players could be major disruptors if the industry isn't proactive.

Dale Perini, of Bryden Wood, highlighted the need to focus on design for manufacture and assembly, to take on the construction challenge set by the UK government. Use of platforms can reduce risk and overheads, he said, by – for example – splitting workflows across multiple sites >>



Dr Jennifer Schooling, director at the University of Cambridge Centre for Smart Infrastructure and Construction



CIBSE WOMEN'S BREAKFAST

By Sara Kassam

You are more likely to be a partner in a UK engineering firm if you are called Andrew than if you are female. That was one of the observations made by a panel of women in high-profile engineering roles as they discussed how their industry could attract people from more diverse backgrounds.

The panel included Hurley Palmer Flatt's Annie Marston, Inklings' Dr Claire Das Bhaumik, Arup's Mel Allwood, BuroHappold Engineering's Esther Martinez and Hoare Lea's Eimear Moloney. They agreed more had to be done and concluded that:

- Diversity is critical to being competitive. By not encouraging talent from a wide range of backgrounds, industry risks creating buildings that do not serve all customers
- Encouraging people to be themselves makes them better engineers. More time should be spent promoting creative problem-solving rather than molding people into outdated workplace cultures
- More diverse management structures will result in better strategic decisions and increased profitability
- People with decision-making power must be involved in creating a more inclusive and representative working environment
- There must be people in senior positions with whom people can identify and aspire to be like. 'You cannot be what you cannot see'
- It is essential to recognise subtle prejudice that is socially engrained, and understand that this is unacceptable. For example, derogatory 'wife' jokes or gendered language, such as 'chairman'.

Esther Martinez is BuroHappold UK's diversity and inclusion ambassador (Esther.Martinez@BuroHappold.com) and Annie Marston sits on the CIBSE Inclusion Panel (annie.marston@hurleypalmerflatt.com)

Hurley Palmer Flatt's Annie Marston speaking at the CIBSE Women's Breakfast





Exhibitors at Build2Perform Live



Sessions were well attended at the event

» for standardised construction components.

The Society of Public Health Engineers hosted a seminar on water and flood management in cities. It covered the Loading Unit Normalisation Assessment (LUNA) project – a new framework for sizing domestic hot and cold water systems for residential buildings. Its aim is to reduce oversizing of services and so minimise cost, space and resource wastage.

Ed Barsley, from The Environmental Design Studio, spoke about resilience in urban living, detailing projects such as: Flood Narratives, which creates tools for the communication of flood risk; Retrofitting Resilience, a methodology to assess flood risk

of existing communities; and the Home for All Seasons design, which aims to provide protection in extreme weather conditions.

Air quality

The CIBSE Air Quality task group, chaired by Cundall's Ed Wealand, was launched at Build2Perform. Its focus is on advocating regulatory improvements, offering guidance on monitoring and sharing knowledge.

Kathryn Woolley, an air quality consultant at SLR Consulting, offered tips to building services engineers, including keeping a store of good plant, increasing ventilation rates, and relocating – or increasing – the height of ventilation intakes. She also told specifiers to be aware of the wide variation in NO_x levels generated by different gas-fired boilers.

Ruth Calderwood, air quality manager at the City of London, said the borough had done an audit of very large combined heat and power in the Square Mile, to identify the source of NO_x. They were looking to move to non-combustible forms of energy generation, and Calderwood said 75% of the air pollution in the City came from outside London.

Domestic retrofits

At a session on the renovation of non-domestic stock, chair Professor David Fisk asked panel members what they would do to make retrofit happen. They replied: make sure people understand buildings better; urge building managers to engage with BMS properly; and make retrofit part of all built environment courses and qualifications.

David Pierpoint, chief executive at The Retrofit Academy, said a lack of training had resulted in disastrous refurbishments that had helped kill off the Green Deal. 'It was a very good thing, in retrospect, that the Green Deal didn't deliver a market at scale, because we clearly weren't ready for it,' he said.

Pierpoint gave examples of projects where retrofits had led to widescale damp problems because the focus had been on insulation at the expense of ventilation. He described the role of the retrofit coordinator recommended in the Each Home Counts review. Under a new retrofit standard, PAS2035, domestic projects funded through the Energy Company Obligation will require a retrofit coordinator. Pierpoint said The Retrofit Academy and the Construction Industry Training Board have developed a Level 5 diploma course in retrofit coordination and risk management.

In a session on building performance, Verco's Tom Randall said he had compared a range of clients' predicted and actual building energy use, and found no correlation. There is more pressure now on services engineers to design buildings that perform as predicted, he added, because of energy disclosure initiatives

HISTORIC RETROFITS

In the historic buildings session, Caroline Cattini, senior engineer and energy manager at Historic England, explained how the public body is working with Professor Ian Knight at Cardiff University's Welsh School of Architecture to benchmark the energy use of some buildings for which it is responsible.

Any building dating from before 1919 is classed as historic, and Historic England wants to reduce its resource use and spend, as well as to understand where it uses energy.

'If we take the physical science theory, historic buildings should use more energy than more recently constructed buildings,' said Knight. 'But the data I've got shows this is not a universal truth for buildings in operation; in fact, I can show that – as measured – historic buildings use no more energy than recently constructed ones.'

Knight's findings mean ventilation, thermal mass, occupancy, internal conditions and the control of building services are all much more important in defining the energy use of a historic building than the energy efficiency of the building fabric.

'It is quite reasonable for a building to be efficient in some aspects but not others... it may be that a historic building with tall windows has a low lighting load, which may help offset some of the heating demand – which may be why some of the overall [energy consumption] figures are low.'

Knight's conclusion was that, if you are looking at energy consumption in kWh/m², then historic buildings are no less efficient than modern designs.

As an aside, Knight said the same findings are true for school buildings. He is currently monitoring 250 schools and said that the new ones currently use 50-100% more energy per square metre for heating than the Victorian schools. 'The bottom line is that these findings have big implications for how we address the role of building fabric in moving the whole of the built environment towards low or zero emissions in the future.'

such as Nabers and more credits for energy reporting in Breeam. The implications for engineers were: more modelling, better commissioning and a focus on the usability of buildings. 'The client will get better sized plant and a more efficient building that will dwarf the extra cost of modelling,' said Randall.

In the same session, the Building Controls Industry Association president, Jon Belfield, said someone had to own the process for controls to be integrated and commissioned correctly. 'Unless there is an overarching master systems integrator, [electrical and mechanical] systems are unlikely to connect as required,' he added.

Breathing Buildings' Dr Owen Connick, in a session on acoustics, warned that 'noise concerns can throttle natural ventilation design', and explained strategies for controlling noise while allowing ventilation.

Ze Nunes, of Mach Acoustics, said acoustic modelling had to be considered alongside thermal modelling. He added that there was more data around the acoustic performance of window types, which will allow designers to select components with noise control.

Comments from the floor summed up the challenges consultants face in balancing thermal and acoustic comfort. One said clients do not pay attention to noise, as it is not a requirement in planning or regulations. So the question is, how far can this complex industry travel towards a safer, more comfortable, zero carbon world without government intervening to ensure standards are met? **C**



Aecom's Ant Wilson



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THE GRAND CHALLENGES

As we enter the uncharted waters of 2019, a range of supply chain stakeholders explain what they need for buildings to perform as designed. **Liza Young** reports

The new year will bring uncertainty and turbulence as the construction industry awaits the fallout from Brexit and what the implementation of Dame Judith Hackitt's recommendations in the *Independent Review of Building Regulations and Fire Safety* mean for the sector.

With Hackitt calling for a fundamental change in the construction culture, we have asked representatives from across the project supply chain what they need for the industry to deliver safe, comfortable and low carbon buildings.

Some of the themes that emerge are the prioritising of health and wellbeing – particularly among clients and facilities managers – and some form of soft landings. Another priority was a call for more collaborative working to achieve a well-performing building.

The consultant

Sound technical advice with in-depth knowledge of the sector is needed from manufacturers, says Dave Grzelka, building services engineering manager at consultant and site inspector NPS North West. As the designer's remit is so wide, manufacturers need to cover their niche area comprehensively, have products ready in advance of any regulatory changes, and lead technological advance.

'Manufacturers that are prepared to involve themselves in the commissioning process to enhance warranties are invaluable,' says Grzelka.

Every manufacturer will have the occasional supply or manufacturing blip, and their response to such issues will separate the fully rounded firms from those that are lacking, he adds. 'Installers, or end users, need rapid and thorough responses to site or

in-use issues. A manufacturer's support team, which is able to respond quickly to commissioning or diagnostic problems with minimal delay, is important to achieving a successful project'

From installers, Grzelka says the consultant needs a buy-in to the aims developed with the client, and a professional team ethic to overcome the inevitable site challenges as they occur.

'A willingness to train operatives in new equipment and installation techniques is crucial to having a successful project,' he says. 'Proper planning of commissioning, with its inherent need for sequencing, and the necessity to involve the manufacturer's team for full specialist commissioning are vital to give all available warranties to the client and offer optimum functionality.'

Ashley Bateson, partner and head of sustainability at Hoare Lea, believes advancements in sensing and monitoring technology will be a great driver for improving the quality of the built environment. It will also challenge how the industry procures and manages buildings. Access to data on thermal comfort, air quality and other metrics in the workplace stimulates curiosity among office workers, he adds.



‘We find people are normally more interested to know about internal air quality than energy consumption. This is probably because factors that affect productivity and wellbeing directly are more tangible than the cost of energy paid by an organisation.’

Bateson regards the democratisation of data as positive. ‘In the future, occupants will be asking how their comfort can be improved, with an expectation that employers should do something about it. Recently, we have noticed that teachers are getting more demanding about classroom comfort conditions, with one union suggesting internal conditions should not exceed 28°C, even though we are expecting a warmer climate,’ says Bateson.

Access to good-quality data, however, will mean the industry will need to get better at delivering buildings that are fully tested and commissioned, with calibrated and validated monitoring devices, he adds. A soft landings approach to procurement will help deliver this, with greater attention to aftercare and outcomes.

The manufacturer

The biggest challenge for businesses will be updating their buildings to become more energy efficient, healthy, productive and comfortable, while helping to mitigate the effects of modern life on the planet,

“For buildings to perform, operational teams must know them intimately and understand the design philosophy of elements that influence performance”



REGULATIONS IN 2019

CIBSE technical director Hywel Davies summarises what regulations to look out for in 2019:

- The upcoming consultation for Conservation of Fuel and Power: Approved Document L, which will include overheating, is expected to be published in the spring
- The government is calling for evidence on the future technical guidance contained within Approved Document B (fire safety). The consultation closes at 11.45pm on 1 March 2019
- The government has published its implementation plan in response to Dame Judith Hackitt’s *Independent Review of Building Regulations and Fire Safety*
- The government will have to find a way of implementing the latest revision to the Energy Performance of Buildings Directive, published in June 2018. The deadline for this is 2020.

says Martin Fahey, head of sustainability at Mitsubishi Electric.

Last May, the government introduced *The Grand Challenges* policy paper, which wants the energy use of new buildings to be reduced by at least half by 2030 (see bit.ly/CJJan19grand). ‘That’s a mere 11 years away, but it’s eminently possible, so we need to start acting now,’ says Fahey, adding that legislation should be driving the right outcomes.

‘The burning of fossil fuels in buildings needs to be replaced by electrically driven technologies powered by a grid that is getting cleaner through the generation of renewable energy,’ he says. ‘All of this should, increasingly, be overseen by automated controls that maximise efficiency and reporting, while minimising outgoings.’

Technologies to reduce energy use already exist, and the industry has the design, installation and commissioning skills, and people ready to deliver the solutions, adds Fahey. ‘Our buildings can be the ideal platform for generating their own heat and electricity as we move towards becoming “prosumers” in a smart, intelligent energy system.’

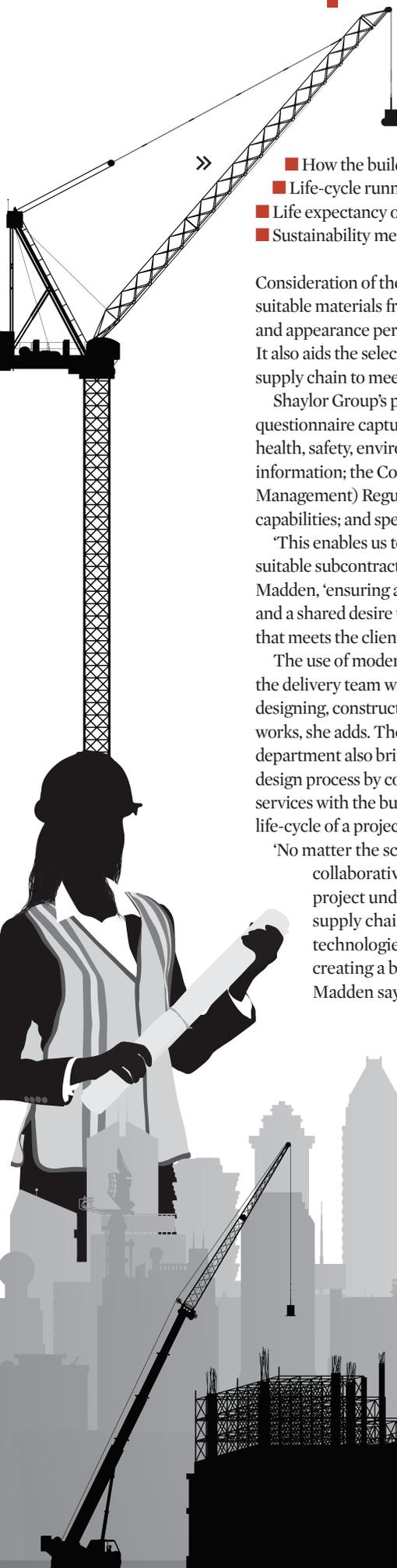
To secure this, Fahey says we need early engagement with stakeholders to ensure systems are installed as designed and to the same level as they were manufactured, and deliver reliable performance and efficiency.

The contractor

Working collaboratively with industry peers and the supply chain is important for successful construction, says Pauline Madden, supply chain coordinator at Shaylor Group. ‘Bringing together dedicated teams with specialist skills and resources ensures the completed project performs to the highest possible standard,’ she adds. For a building to succeed, it is vital to understand:

- The proposed use
- Expected occupancy hours





- How the building will be managed
- Life-cycle running costs
- Life expectancy of the building
- Sustainability measures.

Consideration of these helps identify the most suitable materials from a price, performance and appearance perspective, says Madden. It also aids the selection of an appropriate supply chain to meet building requirements.

Shaylor Group's pre-qualification questionnaire captures: relevant compliance, health, safety, environment and quality information; the Construction (Design and Management) Regulation requirements; capabilities; and specialisms.

'This enables us to determine the most suitable subcontractors for the project,' says Madden, 'ensuring a collaborative approach and a shared desire to produce an end product that meets the client's expectations.'

The use of modern technologies equips the delivery team with a method of planning, designing, constructing and managing the works, she adds. The firm's dedicated BIM department also brings efficiency to the design process by coordinating required services with the building fabric across the life-cycle of a project.

'No matter the scale, location or sector, collaborative working, extensive project understanding, appropriate supply chain selection and new technologies are all factors in creating a building that performs,' Madden says.

The facilities manager (FM)

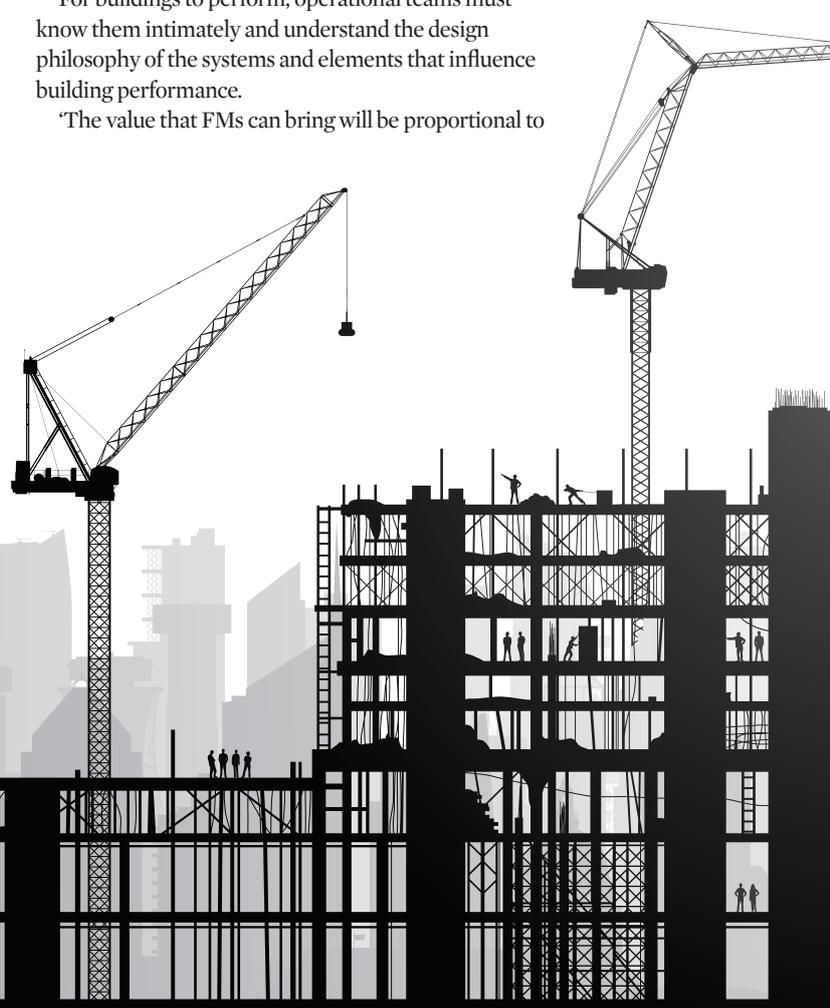
The FM team will have a significant part to play in achieving designed building performance, and the cost of non-performance will have a disproportionate effect considering construction cost, says James Campbell, strategic asset and facilities management partner at Troup Bywaters + Anders, and CIBSE Facilities Management Group committee member. FM teams need to be intrinsic to the construction process, because they will spend longer than anyone maintaining, operating and modifying the building to support the business and its occupants.

However, a significant delay in FM engagement during construction still exists. The BSRIA Soft Landings Framework has raised the profile and benefits of early engagement through to post-occupancy evaluations, but Campbell says soft landings is often considered a commissioning and handover 'activity' rather than the process starting at Stage 0, where it can deliver most benefit.

Although Breeam construction standards have brought management, commissioning, aftercare and health and wellbeing to the fore, activities required to attain some credits – such as seasonal commissioning and post-occupancy evaluations – are done over a number of years, after construction, says Campbell. 'It will again fall to the FMs to deliver these activities, so it seems logical that the later they are engaged in construction, the larger the performance gap will be during operation,' he adds.

For buildings to perform, operational teams must know them intimately and understand the design philosophy of the systems and elements that influence building performance.

'The value that FMs can bring will be proportional to



Julie Godefroy, CIBSE technical manager, says legislation already exists in the UK on energy and carbon, independent from the EU, so – in the short to medium term – there shouldn't be too much impact after Brexit. The Clean Growth Strategy also gives some direction and cooperation will continue, through industry bodies, on things such as BSI and EN standards.

The bigger impact may be felt on staff, expertise and the import of materials, she adds. The white paper on post-Brexit immigration implies that EU workers will be treated in the same way as non-EU ones, so visas will be available for 'skilled workers' with a salary of £30,000 or more. 'But that is not what most engineering graduates will earn,' says Godefroy. This could bring an upward push on salaries – good for workers, maybe less so for employers. Long term, Godefroy says, it might help to address the undervaluing of engineering, encouraging more students to take up the profession. The £30,000 figure will be consulted on.

Supporting visa applications is a difficult and costly process that big firms can absorb, but which can be too much for smaller ones, she adds.

this understanding, but FMs can't be expected to gain this level of understanding if they are only engaged at commissioning – or, even worse, at handover,' says Campbell. He adds that FMs need the support of their construction peers – architects, quantity surveyors, engineers and project managers – to raise the profile and benefits of early engagement and involvement throughout the construction phase to clients.

The skills gap within the FM and building services industries can be reduced by active involvement through the construction phase, where FMs can gain first-hand experience of the technologies and construction methods used, says Campbell. Training and product knowledge can be gained through the support of manufacturers and installers.

'We are all responsible for delivering better-performing buildings, regardless of our role,' he adds. 'This requires all stakeholders to have an understanding of the effect of each other's involvement in a project, and help clients achieve a building to perform as designed.'

The client

As a long-term investor, it is fundamental to carry out post-occupancy analysis on projects, says Nick Lee, development director at property company CEG.

The firm's project Number One, Kirkstall Forge, has been recognised for its emphasis on design and health and wellbeing. 'What we really value is how buildings work for the people within them, and ensuring they create positive working environments. We monitor these continually to see if we can further optimise conditions, focusing on ensuring the environment is healthy and not using power unnecessarily – benefiting the planet and reducing operational costs for occupiers,' says Lee.

He adds that CEG is driven by its ability to demonstrate technically – as well as subjectively – that its buildings are better places. 'Our customers are the occupiers, and their focus is recruiting and retaining the best staff,' says Lee. 'So our driver is to create good working environments that support these business objectives. If the place works well for its people, it is good for everyone involved.' 





A PRINCIPLED APPROACH

Spie applied engineering first principles at a £6.4m refurbishment of student accommodation in London – inspiring similar retrofits that are cutting energy use and making substantial time and cost savings. **Alex Smith** finds out more

The use of data in the services strategy of a large student accommodation block in Borough Market is proving to be as smart as the aspiring graduates who reside there. Design and build contractor Spie was able to significantly reduce the size of the services and energy consumption in a £6.4m M&E refurbishment of Sidney Webb House when data analysis revealed that hot-water use by students could be much less than traditional design standards suggested.

‘We were able to design the system to suit the demand, which led to cost savings for the equipment, and significantly smaller electricity bills for the client,’ says George Adams, director of energy and engineering at Spie.

Adams explains that students used less water after 11.30pm and early in the morning than traditionally would have been allowed for. Existing building standards did not reflect actual use, which could have led to services oversizing, he adds.

‘We wanted to create a design standard for the building that reflected how the students would use the building,’ says Adams. ‘By using a “cut and paste” standard system you may well be covered legally, but it can be over-designed,’ says Adams.

The 454-bedroom building was extensively refurbished. The M&E contract included the design and installation of the electrical works, pipework, 2,400 new LED light fittings, eight air source heat pumps and a data-gathering facility. Spie was responsible for design, procurement and site management, which gave it the chance to design the services with buildability in mind and speak to suppliers at the design stage.

Creating a design standard for the building that reflected reality helped Spie to meet the requirements of a challenging programme –

the client wanted the upgrade on site completed in just 11 weeks to minimise disruption to students. According to Adams, this would have been impossible if it had just used traditional standards.

Instead the company based its design on first principles. ‘It’s about having the engineering skills to create your own methodology and benchmarks, although engineered solutions must be rigorously tested and peer reviewed.’

As well as studying student behaviour, the firm examined the state of the existing services to see whether any systems or components could be reused. Adams says it is committed to increasing the life-cycle of buildings and components.

‘We look at the existing plant and systems that





SPRINKLER SAVINGS

According to Spie, it saved £300,000 in costs and avoided major disruption to students when it used an existing wet-riser system to retrofit sprinklers. 'We took what was there and re-engineered it,' says George Adams. 'It meant we didn't need new pumps, tanks, standby generator, control panels and pipework.'

It took a feed off the wet-riser tank and installed a pressure-reducing valve, as the pressure was higher than that required by sprinklers. A new connection was made to the water main to ensure there was enough water for sprinklers and fire hoses to be used simultaneously. This offered an hour's use, more than the 25 minutes required for local authority approval.

would normally have been thrown away and compare the refurbishment and replacement costs. Sometimes refurbishment is 60-70% less, in which case we overhaul the equipment that might add 10 years or more to its life,' says Adams. At Sidney Webb House, much of the electrical distribution equipment was retained, before being tested and demonstrated to be compliant.

'It's not only about making buildings more energy efficient,' says Adams. 'It's also about avoiding the depletion of natural resources and increasing the life of the building.'

In another student building, the firm used an existing wet-riser system to retrofit a sprinkler network. By repurposing the wet riser, the client avoided having to install pumps, water tanks, control panels, standby generators and pipework. (See panel 'Sprinkler savings'.)

Once the loads and hot-water generation had been calculated, attention turned to the design of the air source heat pumps. 'It was more effective to use electric heat pumps than gas,' says Adams, 'though the actual energy cost might be the similar.'

The decision to build modular plantrooms off site reduced the programme by five weeks. Storage vessels, controls, pumps, and related services were installed off site in shipping containers, which were craned onto the roof. This avoided the costs of building traditional plantrooms and the offsite location on a car park adjacent to Sidney Webb House meant it did not have to use a factory.

'The containers provided a ready-made external

envelope at low cost. We could have used skid mountings in the existing building, but we calculated we saved more than £200,000 by using shipping containers,' Adams explains.

The containers were positioned on the roof to avoid disruption to the building. To spread the plantrooms' load on the structure, structural assessments were carried out and a special pad was placed under the containers.

The lighting installation was also a focus for savings with the procurement of LED lighting from separate suppliers. They were tested for compliance and output, with particular attention to colours, functionality and dimming. Adams estimates that, by procuring the LEDs separately rather than using one supplier, costs were reduced by 60%.

Clients are given the opportunity to analyse building data already available for school projects in Scotland, for example. (See 'Tracking performance', *CIBSE Journal*, January 2018). Attention must be given to the positioning and maintenance of sensors and controls, says Adams. 'You need a budget to replace sensors,' says Adams. 'Not everyone realises that pipework sensors can become calcified and go out of calibration.'

Sidney Webb House was monitored for the first six months of operation and periodic monitoring will be carried out for the foreseeable future. The data is now being used to refine the benchmark for similar student buildings.

Adams says the refurbishment of Sidney Webb House proves that, with collaboration, industry can carry out major refurbishments that save energy, cut costs, and extend building life. But, he adds, it requires an alternative engineered approach to how industry works at the moment. 'There has to be an engineered solution. Following best practice and prescribed standard isn't the answer any more,' he says. **CJ**



COLLABORATIVE CONSTRUCTION

The success of projects are dependent on how the teams are assembled, according to George Adams. He says there is often a loss of ownership of services design as the work, originally done by a designer before it goes to tender, gets picked up by a contractor who had no involvement in the initial design. 'Subcontractors haven't been involved in understanding the client's requirements,' he says. 'The contractor, specialists and suppliers then have to try to understand what the client requires, just by looking at a set of specs and drawings.'

He believes a more intelligent approach is for specialists to be involved at the design stage, with a gradual transfer of responsibility from the design team to the contractor. Designers should have a watching brief during detailed design and construction phases, says Adams, to ensure value engineering does not undermine design intent.

'Constructive Collaboration' is an industry initiative that involves team building, team analysis, and establishing collaborative objectives for the delivery of successful projects. In its earlier stages, CIBSE part funded the development.

CUSTOMISED BPE ON A DIFFERENT LEVEL

Tim Dwyer digests research, led by Rajat Gupta, that investigates the opportunity to develop – and nurture adoption of – building performance evaluation that is of practical use in the booming 'green' building marketplace of India

India has the third-largest economy in the world and is growing rapidly: its energy consumption has almost doubled since 2000. Buildings in India currently account for 41% of the country's final energy consumption, and there is great potential for continued rapid growth and urbanisation – key drivers for energy trends.

The Indian Green Building Council claims India has the second-largest registered green building footprint, with more than 437 million m² and around 4,363 projects registered for green building ratings (as of November 2017). In common with many countries, however, this movement lacks an important link: ensuring that the design intent of such buildings is actually realised.

Research at Oxford Brookes University – led by Rajat Gupta, with colleague Matt Gregg and Sanyogita Manu, Prasad Vaidya and Maaz Dixit, of CEPT University, Ahmedabad – has investigated the feasibility of a customised building performance evaluation (BPE) approach for the Indian sub-continent.

Focusing on the experience and understanding of academic experts (as they are likely to be the lead disseminators of any BPE method) – as well as of industry professionals (architects, engineers and policy-makers) – they looked at the drivers and barriers for implementing BPE-based methods and, particularly, their incorporation into educational curricula.

This revealed that a key challenge to the adoption of BPE is a lack of trained people to teach it. In addition, India's building industry – compared with those of many other countries – has less documentation of design decisions, more freedom during construction, fewer tested and certified products, less formalised building operation, and limited access to the costly equipment required for performance evaluation.

The I-BPE framework consists of the methods and potential delivery

routes for its adoption in education, research and industry. The methods used for performance evaluation of buildings in India were compared, by the researchers, with those commonly used for BPE studies internationally. With input from experts in India, this helped to prioritise methods and indicate which ones may be relevant.

The I-BPE framework (as in Table 1) includes five 'need to know' elements covering technical and non-technical aspects of building performance. These are:

- Review of design intent through design documentation and interviews with the design and construction team
- Technical building survey, covering inspection of the building fabric, energy systems and controls
- Energy assessment using annual energy bills/meter readings, monitoring of utility meters, sub-metering and monitoring of individual plug loads



“Differences between asset and operation may be greater in India because of the variability in the way buildings are operated”

- Measurement of indoor environment, using spot measurements of internal and external temperature and relative humidity (RH), to continuous monitoring of specific variables, such as volatile organic compounds
- Occupant feedback using a questionnaire, diary, interviews and focus groups, to assess occupant comfort, perceptions and experiences of the indoor environment.

Each of the study elements adopts a graduated approach, from Level 1 to 4. Level 1 is the basic method to implement the BPE element and higher levels are added for deeper investigation. This means the I-BPE framework can be readily customised for different buildings, depending on the availability of data and resources.



For example, Level 1 methods alone could be applied to buildings where little information is available about the design intent or actual performance, or where there is limited access. Levels 3 and 4, however, could be deployed in buildings that are more ‘data rich’, with information from automatic meter recording, energy models, and good access to the buildings and occupants. This flexibility is considered important in encouraging market adoption.

Methods such as in situ U value testing, co-heating tests and air-pressure testing have been excluded, as buildings in India are not primarily being designed to rigorous airtightness standards – and it is neither easy nor cheap to access heat flux sensors.

While the I-BPE framework is not significantly different from those used in other countries, the approach is refined through the expert survey and the case-study work. The initial case-study application – the first of several – was intended to test the BPE methods on the ground.

Case-study testing of the I-BPE framework

The five BPE study elements were applied to a real case study ‘green’ building in Jaipur. The graduated approach was used to select suitable methods for evaluating the performance of the building, in line with the availability of the design documentation, the two-week duration of the field study, and access to the building and occupants.

For example, the technical building survey study was carried out through all four levels, covering building services and building fabric testing, but the study elements on ‘review of design intent’, ‘energy assessment’ and ‘occupant feedback’ were implemented through two levels each. ‘Environmental monitoring’ was conducted through Levels 1-3, covering spot measurements and the logging of environmental variables.

Though the case study building could be considered data poor – which is typical of buildings inside and outside India – manual meter readings and access to bills allowed for a basic assessment of energy performance and, in turn, a comparison of the building’s green target versus its actual annual consumption.

The review of design documentation showed that the expected performance goals for the case study building – set by the green rating systems – were primarily focused on asset performance, covering building geometry and system performance, and did not directly address the operational aspects, such as setpoints, mode of operation (mixed mode) and occupancy schedules.

The differences between asset and operation may be of greater significance in the Indian context because of the greater variability in the way buildings are operated. Differentiating between asset and operational performance will help the data to be analysed more effectively, and lead to more appropriate corrective measures.

The energy performance index of the case study building was measured at 26.5 kWh·m⁻² per year, while the annual solar electricity generation was 3% higher than the requirement for a Leed Platinum rating, probably offering a buffer for future loss in building system efficiency. Monitored spaces were found to be thermally comfortable, while most spaces had acceptable noise levels and met the code requirements for lighting; there was 82% occupant satisfaction with the overall lighting.

Fan and lighting controls were perceived to be well designed and easily accessible, but the control interface survey showed that lecture rooms and offices did not have access to thermostat control, which affected the local management of the thermal environment.

Overall, 79% of occupants felt that the design met their needs,



supported by the continuous engagement of the facilities management (FM) team in controlling the operation of the building to meet the design targets.

To improve performance, output from the I-BPE recommendations included the introduction of a properly commissioned building management system to give the FM team real-time environmental and energy data, provide local thermostat controls, and optimise the use of blinds to increase daylight in the building.

Although the case study is not radically different from other buildings that might be studied in India or elsewhere, this I-BPE investigation – together with others – will help develop the methods further. (See panel, ‘Key to successful BPEs’.)

The research concludes that policy, such as energy codes, and market transformation – such as increased employment of ‘green’ rating systems – will be needed for a BPE to succeed in any meaningful application. Further support will be required through a national policy framework that supports, enables and incentivises the study of real performance of buildings.

This mirrors the experiences in other global marketplaces where the outcomes of BPE studies may not naturally filter through to policy-makers. Although the context is different from many other international BPE tools, the challenges appear to be fundamentally the same. **CJ**

■ A full copy of this research paper may be downloaded for free at bit.ly/CJJan19India



Time and expertise required →					
No.	BPE study elements	Level 1	Level 2	Level 3	Level 4
1	Review of design intent	Collection of available design data, metering strategy, details of building and its use	Review of building services and energy systems	Interviews with key stakeholders (for example, designer, owner and developer)	Walkthrough with key stakeholders (for example, designer, owner and developer)
2	Technical building survey	Inspection of build quality and services using photographic/video documentation	Controls interface survey	Review of installation and commissioning of services – performed as walkthrough with (or without) knowledgeable guide (for example, facility/building manager, owner or designer)	Assessment of building fabric using infra-red thermography
3	Energy assessment (consumption and generation)	Meter readings/energy bills for one year	Monitoring of utility meters: analysis of energy-demand profiles	Sub-metering of energy use (for example, energy generation, cooling/heating, hot water, lighting, equipment)	Electricity plug-load monitoring of individual appliances
4	Environmental monitoring	Temperature and RH spot readings (internal and external; coincide with occupant survey)	Temperature and RH loggers/monitoring (internal and external; including weather station data download)	Additional parameters spot read/logged – for example, CO ₂ , lux, noise, wind speed	Additional parameters spot read/logged – for example, carbon monoxide (CO), particulate matter (PM _x), bioaerosols, volatile organic compounds (VOCs) – depending on objectives, such as IAQ studies
5	Occupant feedback	Occupant satisfaction survey (perception of indoor environment and control) – for example, BUS	Semi-structured interview (individual occupants)	Thermal comfort diary (thermal sensation and thermal preference of occupants)	Focus group (collective) with occupants, to discuss common questionnaire findings in more depth

Table 1: I-BPE framework showing the study elements and associated methods and tools

KEY TO SUCCESSFUL BUILDING PERFORMANCE EVALUATIONS

Development of the I-BPE methods and the case study highlighted factors that determine a successful BPE:

- Ensure adequate design documentation is available, including expected energy performance targets – and, where possible, calibrated energy models – with which to compare actual performance.
- As most Indian buildings are mixed mode (air conditioning is limited to extreme conditions), studies must consider naturally ventilated and air-conditioned modes to assess building performance as the outdoor conditions change.
- To properly understand the case study building systems, multiple walkthroughs and meetings with the FM team are required. The monitoring plan must be flexible and account for FM team feedback.
- Onsite data gathering about the operation and control of the energy systems – in the form of written notes, photographs or videos – give valuable context.
- Green rating systems encourage sub-metering, but is not commonly used in green buildings in India, so structured walkthrough surveys and interviews with the building managers are essential.
- Imported questionnaires, such as building use survey (BUS), require modification for climate and cultural considerations. It is vital to inform occupants about the purpose and relevance of the occupant survey in a pre-visit, to ensure a good response rate.
- Researchers will need to wait while respondents complete the survey, to reassure them that the responses are important.
- Occupants need strong encouragement to talk about their personal perception of the building, facilities and indoor environment.

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NORTH NORFOLK LEISURE CENTRE TO SAVE WATER WITH AIR SOURCE HEAT PUMP

Planning permission has been granted for a £10.7m leisure centre in Sheringham, North Norfolk, which will include: a swimming pool; a learner pool with moving floor, to cater for different activities and user groups; a fitness suite; community spaces; studios; and a cafe.

Designed by Cambridge-based Saunders Boston Architects, with M&E engineers Silcock Dawson and Partners, the facility features an air source heat pump (ASHP) and solar thermal panels, which are proposed for the flat roof over the main entrance, and on the south side of the curved roof. The ASHP will be installed as part of a variable refrigerant system with heat recovery.

According to the architect, the building form is a nod to the longshore drift from the North Norfolk coastline.



Solar households to give away power to energy firms

BEIS ending export tariff and preparing replacement

Households that install solar panels in the future will be expected to give away unused clean power for free to energy firms, the government has said.

Ministers were urged not to end the 'export tariff' for solar panels under the Feed-in Tariff (FiT) scheme, which is closing next year. However, the government confirmed that anyone who adds solar from April 2019 will not be paid for any excess electricity they export to the grid.

The change will not affect the 800,000-plus homes that have already fitted solar panels since the FiT scheme launched in 2010.

The Department for Business, Energy and Industrial Strategy (BEIS) said it was ending the export tariff, which offers a guaranteed price for all unused solar electricity to minimise costs to consumers.

A market-based replacement is expected to be announced by the government early in the new year. This will write the rules for how energy

suppliers could buy the excess power, although they will not be mandated to do so. There is expected to be a hiatus between the export tariff's demise at the end of March and any new regime, so new solar households will be giving away power until then.

Around 90% of people who responded to a government consultation opposed the changes, arguing that they were unfair, would set back climate change efforts, and hurt industry.

Chris Hewett, Solar Trade Association chief executive, said: 'At a bare minimum, the government should retain the export tariff until an effective, alternative way to fairly remunerate solar power is implemented.'

A BEIS spokesperson said it will consult on a future framework for small-scale renewable energy generation.

Survey results

A survey by YouGov, commissioned by environment lawyers ClientEarth, found that more than 60% of people said they would like to install solar power.

In total, 345 responses were submitted to BEIS, with 91% of respondents disagreeing with the closure of the export tariff. The Solar Trade Association also sent a letter - now signed by more than 350 organisations - to energy minister Claire Perry in August, requesting the export tariff's continuation.

Beanland takes over the reins at GSHPA

Bean Beanland has been elected chair, and Chris Davidson vice-chair, of the Ground Source Heat Pump Association (GSHPA), after John Findlay stepped down as chair after two years in office.

Beanland, an associate of the Royal College of Science, has an honours degree in physics, and has spent the past 10 years in the industry - initially as an installer and, most recently, as a consultant.

Davidson graduated in theoretical physics and spent several years within the motor industry before entering the renewable energy sector in 2001.

EV 'smart' charger deadline set

Government-funded home charge points for electric vehicles (EVs) must use innovative 'smart' technology from July 2019, under plans announced by the Department for Transport (DfT) in December.

They must be capable of being remotely accessed, as well as of receiving, interpreting and reacting to digital signals.

The government has also confirmed it will maintain grants to install charge points at home and at work at their current level of up to £500. Current rates will apply until March 2020, or until 30,000 installations in 2019/20 have been supported.



PLAYING TO THE GALLERY

With its bold geometric design in danger of upstaging the exhibits inside, V&A Dundee has been making waves far beyond the museum world. **Phil Lattimore** looks at how the showstopping design influenced Arup's low carbon strategy and choice of the renewable energy source

Situated on the banks of the River Tay, the V&A Dundee is a stunning new landmark for the Scottish city's £1bn waterfront regeneration scheme. Its striking design makes a bold architectural statement, with a complex, twisted and folding, double-inverted pyramidal structure resembling the prow of a ship emerging from its dockside setting.

The building – covering 8,445m² and featuring 1,650m² of gallery space – was designed by Japanese architects Kengo Kuma and Associates, and is the V&A's first foray outside of London. Clad with about 2,500 pre-cast textured-stone panels, its exterior evokes the rugged cliffs on the north-east coast of Scotland. Work on the museum began in 2014, with Arup providing the engineering design services and BAM Construction the main contractor.

Arup produced a low-energy design by first examining how the need for mechanical cooling could be minimised. It analysed the potential cooling and heating loads before specifying the services, opting for a ground source heat pump (GSHP) for primary heating and cooling, backed up by air source heat pumps (ASHPs) on the roof.

Such a highly aesthetic, architect-led design demanded that the services be hidden – but this presented a challenge to the engineers.

With the concrete fabric of the building being structural, there was little scope for services penetrations and limited space for plant.

'We had to be very careful how we distributed services,' says Wayne Butler, effectively Arup's project manager on the scheme, and in charge of the design of the mechanical services systems. 'The inclined walls are held in place by structural trusses or concrete walls within the building, so we were limited in where we could position

PROJECT TEAM

Client: V&A Dundee
Architect: Kengo Kuma and Associates
Contractor: BAM
Engineering services: Arup
Lighting: Arup - Patrick Elsdale (ex-Arup), Junko Inomoto, Ross Kettles, Florence Lam, Laura Phillips, Jeff Shaw, Predrag Stojicevic, Santiago Torres



COORDINATING THE DESIGN

The V&A's structural design is complex, with curved concrete walls locking together with limestone flooring to offer inherent stability and strength to the building. As a result, the engineers were limited in where they could position the services, so BAM and Arup used 3D BIM modelling and analysis tools to coordinate design and installation.

'All our services were fully coordinated in our 3D model, which the contractor had access to when generating their installation drawings for the buildings,' says Butler, who - together with a building services technician with a background in structural engineering - coordinated the services live in the model.

'As the specialist service contractor started to develop its coordinated installations drawings, workshops were held to walk them through our model and answer queries,' he adds. 'We then migrated onto their model, and they would show us where they'd modified the routing to ensure it wasn't contravening the rules or creating coordination issues.'

The services strategy was developed early in the process. Workshops with architects helped to ensure any services hidden for aesthetic reasons could still be accessed by maintenance engineers. 'For example, there are services cupboards where the isolation valves to each toilet suite are in a cleaner's cupboard rather than in the spaces above the ceilings, to avoid ugly access panels,' says Butler.

Joint workshops were also held with the client's facilities management staff, to familiarise them with how the building could be serviced and maintained. Small amendments to the design were made, such as changes to the fire-detection alarm systems and how they were accessed. Similar workshops were held later in the project to address the building management system configuration and requirements.

"You won't see any levers or similar services-related openings in the main walls of the building"

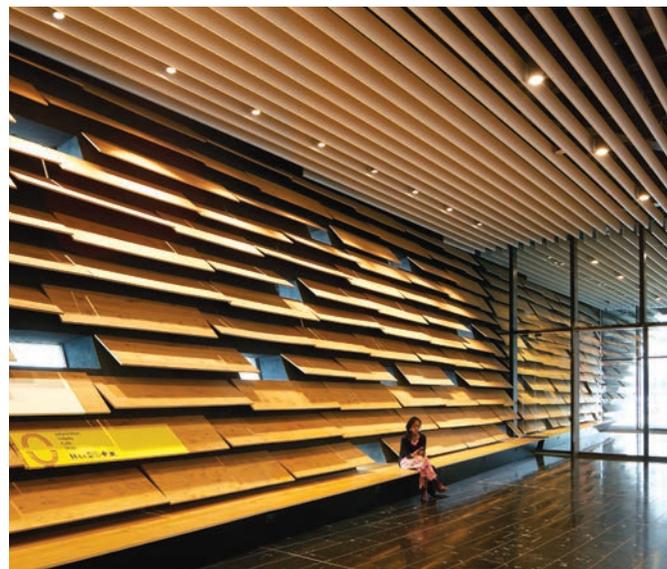
Wayne Butler, Arup

penetrations' (See panel, 'Coordinating the design through BIM'.)

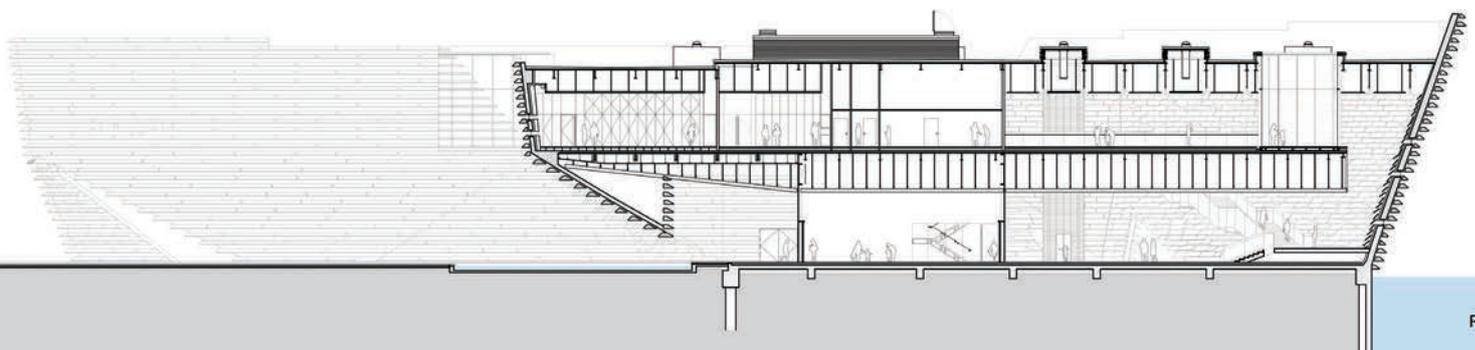
The architects also had clear ideas about the building's interior and wanted to eliminate the type of access panels often seen in plasterboard ceilings or wall panels. 'You won't see any levers or similar services-related openings in the main walls of the building,' says Butler.

Heat pump design

After a study into low and zero carbon technologies, the Arup team specified ground and air source heat pumps for Dundee V&A. Thirty, 200m-deep boreholes were created for two 225kW GSHPs and these were supplemented by two 50kW air source heat pumps on the roof - to cater for potential future changes in heating and cooling demands - plus a 20kW domestic hot water heat pump, which produces water at 60°C. The combined systems provide 800,000kWh



» Window openings in the raked interior walls



Section drawing showing building's proximity to the River Tay

HOW THE V&A DOCKED IN DUNDEE

Built at a cost of £80.11m, the V&A Dundee building was initially supposed to emerge from the River Tay itself.

After reconsideration of the design, however, this was revised to an onshore, infilled docksite berth - although the 'prow' of the roof still protrudes 19.8m over the water, beyond the footprint of the museum.

Situated next to the moored RRS Discovery, the V&A Dundee is now one of the city's major attractions, enticing 27,201 visitors during its first week and more than 100,000 since its opening on 15 September 2018.

» of heating and 500,000kWh of cooling per year. The technologies were selected on the basis of three criteria: compliance with Building Regulations; contribution of Bream credits; and payback.

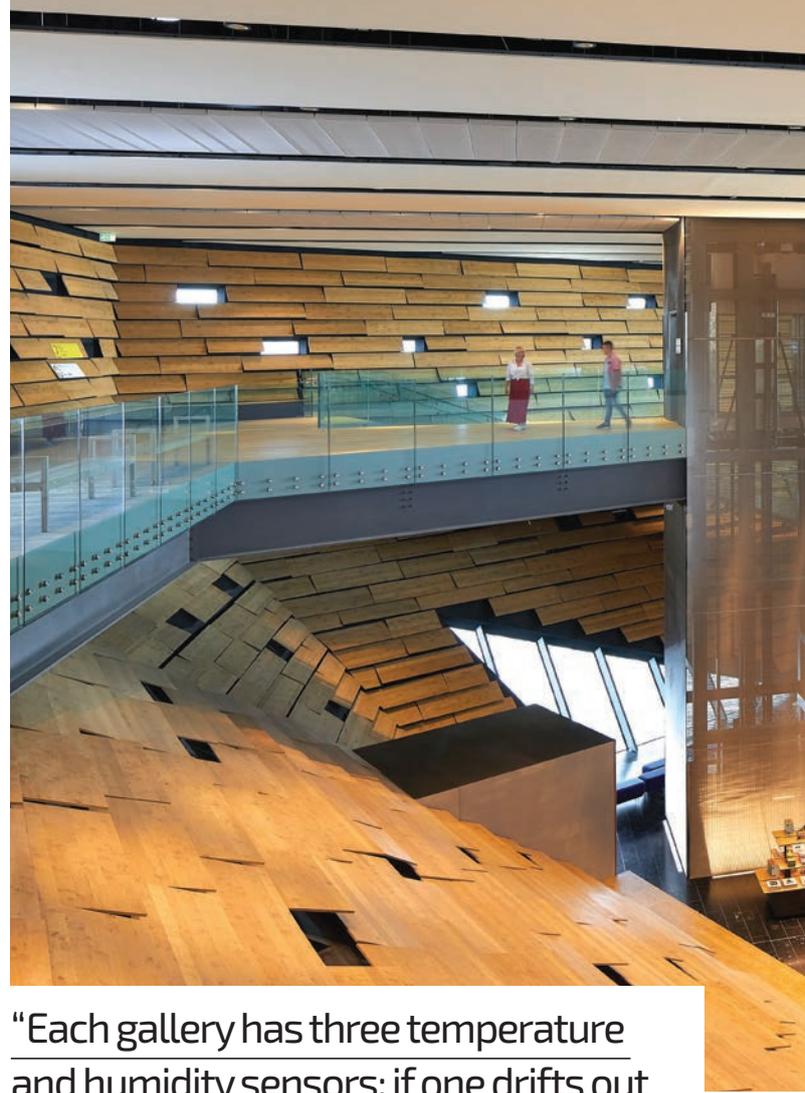
Open-loop source water heat pumps were considered at the design stage, says Butler, but once it was decided to move the building onto the riverbank it became technically easier, and more cost-effective, to go for GSHPs.

To size the equipment correctly, Arup did a profile analysis of potential imbalanced loads between heating and cooling over the lifetime of the building. Based on this, a performance brief was given to specialist heat pump contractor GI Energy to supply the plant that would satisfy heating and cooling requirements.

Gallery climate control

The museum's two galleries each require independent air conditioning, temperature and humidity control. Both are fitted with recirculation handling units providing heating and cooling, plus desiccant dehumidification and steam humidification.

'They work on a variable air volume (VAV) basis,' Butler says, 'so we have VAV dampers to control the air; they shut off a bank of diffusers in part-load conditions rather than reduce the flowrate to each, so the air from an active

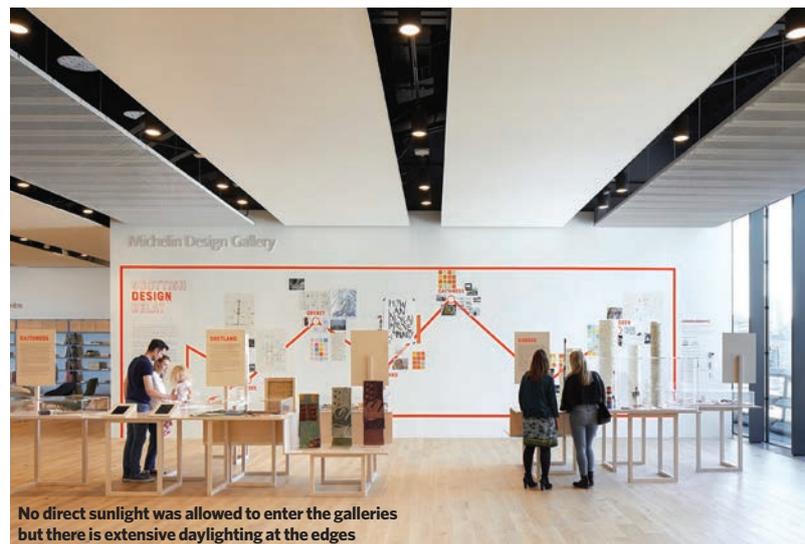


"Each gallery has three temperature and humidity sensors; if one drifts out of calibration, an alarm is triggered"

diffuser is at constant volume, creating good air mixing. This means we can guarantee a fixed amount of air from each diffuser and create the correct mix to give a consistent temperature and humidity throughout the spaces.'

Carbon dioxide sensors ensure there is enough fresh air for occupants. The museum goes into full recirculation mode at night, thereby saving energy by not having to heat incoming fresh air.

The system has built-in redundancy. For instance, each gallery has three temperature and humidity sensors to compare the measured data; if one drifts out of calibration, an alarm is triggered and the



No direct sunlight was allowed to enter the galleries but there is extensive daylighting at the edges



The building's main hall is naturally ventilated



The galleries' floorplan

system continues to operate based on the reading of the other two sensors. This allows the operator to replace or recalibrate the faulty sensor.

The building's main hall is naturally ventilated, while underfloor heating delivers most of the heating requirement. There is also some fan-assisted heating where glazing is deployed, such as in the restaurant and at the feature window that overlooks the

Tay at ground-floor level. The architect wanted to avoid shading or blinds for the west-facing restaurant window overlooking the river. To ensure the space did not overheat through solar gain, Arup carried out a thermal analysis, which resulted in the selection of radiant floor cooling and solar control glass with a G value of 0.42.

Multifunctional conference and classroom spaces in the building are linked to a common air handling unit. The Trend building monitoring system measures CO₂ and can increase air volumes depending on the number of people in the space.

LIGHTING THE MUSEUM

Arup worked with Kengo Kuma to develop the lighting brief, which included daylighting, architectural lighting to front-of-house areas, and gallery exhibition and exterior façade lighting.

The objective was to emphasize daylight, architectural integration and sustainability. Arup used computational modelling to analyse weather data and the sun's path to develop a daylight strategy with the architects. No direct sunlight was allowed to enter the galleries.

Façade openings giving good levels of daylight at the edges offer views out to the Tay and the city. Deeper into the building, a series of large-diameter Solatubes, which sit just above the perforated ceiling, let high levels of light into the restaurant and main hall.

For temporary galleries, north-facing skylights were integrated into the roof system to bring in natural light. An adjustable, blackout shading system allows modulation of the incoming daylight to meet exhibition conservation requirements.

In the Scottish Design Galleries, a series of small windows and one large picture window, fitted with automated blackout blinds, offers visitors external views.

Track-mounted projectors, equipped with high-colour-rendering LED, were carefully aimed and focused to model and reveal the exhibits in the galleries.

In the Charles Rennie Mackintosh Oak Room, in the Scottish design galleries, the light quality of the original space has been reproduced using original glass fittings and concealed, LED light sources.

At night, an array of small windows built into the linear façade allows interior lighting to 'glow out'. Uplights mounted in the reflecting pools surrounding the V&A illuminate the exterior to reveal the complex forms and texture of the stone façade.

Performance

The V&A Dundee has only been in public operation since September, so detailed, meaningful performance data for the building has yet to become available. With the museum capturing the public's imagination, visitor numbers have also been much higher than baseline projections – potentially skewing initial performance indicators.

As a relatively early BIM project, however, the V&A has provided plenty of data and experience for the Arup design team, enabling the organisation to develop its BIM skills and capability. Butler says the 3D imaging and virtual reality allowed the V&A to become more engaged in the project.

'It's always useful to come from a client's perspective and understand what their drivers are,' he adds. **CJ**

HEAT PUMPS: THE NEXT PHASE?

An InnovateUK research project is looking to combine phase change materials with a smart heat pump system to cut energy use, reduce overheating and control humidity in homes. PCM Products' **Sam Gledhill** explains how the system works



A group of companies is testing a heat pump system combined with solar panels and phase change materials to offer occupants energy efficient heating and cooling. Currently, only 0.5% of UK homes have air conditioning, but, for those that do, cooling represents around 30% of total energy consumption.

The new system, funded by InnovateUK, is known as Total Heat Energy and Moist Air Control (Themac) and aims to reduce significantly the energy required for cooling,

if required. Its goal is to maintain temperature and humidity within a building – throughout diurnal, seasonal and occupancy changes – while supplying hot water and heating from a renewable source.

The consortium consists of specialists in their respective fields: PCM Products, involved with phase change materials (PCMs); heat pump manufacturer Arkaya Energy; renewable housing developer Positive Homes; and a research institute in the University of Nottingham.

Its tri-modular approach aims to achieve a complete comfort solution. A high-performance heat pump supplies sufficient heating in winter and can provide domestic hot water. A super-water-absorbent, polymer-based desiccant is able to humidify or dehumidify the air, thereby maintaining relative humidity at a comfortable level. Finally, a passive PCM system helps prevent overheating during summer days while maintaining a habitable temperature overnight.

The Arkaya Energy heat pump is combined with solar thermal panels that can be mounted on roofs or walls. They draw thermal energy from the environment, even in the absence of direct solar irradiance. This gives the overall system a higher coefficient of performance (COP) than traditional systems, and it can reach temperatures of up to 68°C all year round with little decrease in efficiency.

The heat pump has two cycles – a water cycle and a refrigerant cycle with a heat exchanger in between – and a sensor monitors these to minimise heat loss. The system works at a higher pressure than most heat pumps, which improves COP and reduces heat losses in winter and overnight. The high temperatures allow the heat pump to supply energy directly to traditional radiators.

The technology is contained within a 'smart box', which can be put in lofts, cupboards or even outdoors. This, combined with minimal servicing requirements, offers consumers a user-friendly solution.

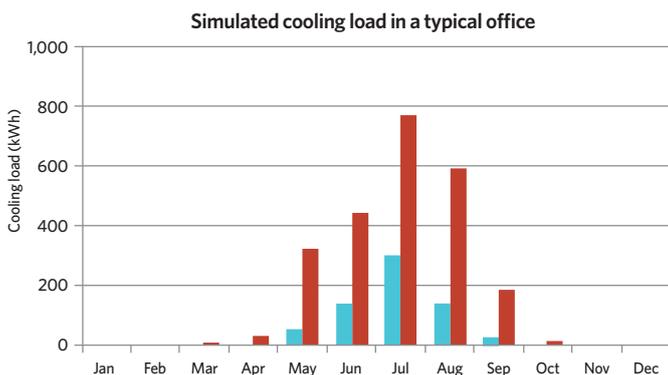


Figure 1: The red bars show the cooling demand for a typical office; the blue bars show the demand in the same office for cooling if the PCM passive cooling is installed

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Figure 2: Basic layout of the solar-assisted heat pump, with the solar thermal panels on the left and the smart box in the centre

PCM passive cooling is the second technology in the system. The PCM – normally fitted in the ceiling cavity or above ceiling tiles – melts and absorbs heat at 27°C, allowing it to remove excess heat from the air at the top of the room, keeping the air lower down at a comfortable level. The PCM is designed to provide all the necessary cooling; the heat pump will not offer any mechanical cooling.

At the end of the day, as temperatures drop, cool air is passed around the PCM to allow it to refreeze. An air vent allows the night air to circulate around the PCM for refreezing. PCMs are not fast-reacting materials, so it is not necessary to have fans blowing air over them – natural air movement is sufficient. The same process is repeated the next day and room temperatures are maintained at a comfortable level during the night.

The water super-absorbent polymer (wSAP), used for humidity control, works in a similarly passive way to the PCM. As the room humidity rises, the wSAP (commonly sodium acrylate) absorbs excess moisture from the air; this can then be naturally released back into the room if humidity drops too low. The heat pump is linked to the wSAP material, so it can be regenerated should it become saturated.

As a result of the modular arrangement, each individual unit can perform as a stand-alone. Currently, the combined system is estimated to achieve a 51% reduction in energy consumption for heating (based on the simulations for a conventional gas central heating system compared with the heating provided by the heat pump) while offering an energy-free cooling solution.

Six months of lab testing will take place soon, before the system is installed in a three-bed home in summer 2019, where it will be monitored until August 2020. [CJ](#)

SAM GLEDHILL is a chemical engineer at PCM Products

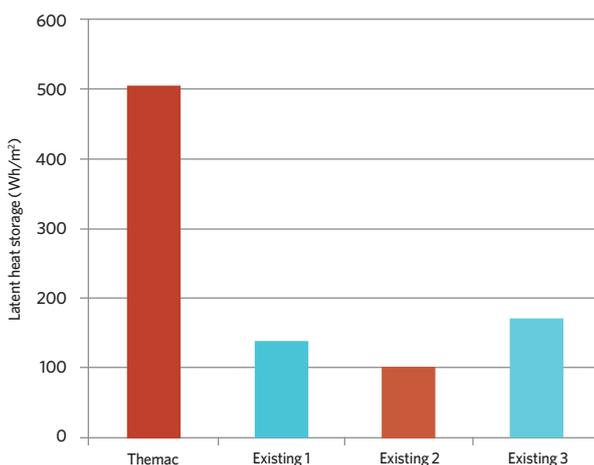


Figure 3: The amount of latent heat that can be stored in the PCM per m² compared with existing systems



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In recent years, there has been a substantial increase in the number of battery stores and charging rooms incorporated into buildings used by a variety of occupiers.

The purpose of these rooms – that potentially contain wet-cell batteries – could be to offer emergency power in the event of a mains failure. Because most power failures are temporary, backup batteries can be a good solution to keep critical systems running without the need for generators.

Many other applications use wet-cell batteries – for example, in aviation, public transport, warehousing, university research and development departments, and the Ministry of Defence.

There are two main types of battery solutions for the storage of power – wet-cell lead-acid and lithium ion. The latter are used in today's electric vehicles and mobile phones, and have the advantage of a deeper discharge of up to 70% of the full charge, as opposed to 50% for a lead-acid battery. However, they are more prone to overheating.

Wet-cell lead-acid batteries are easier to recycle and cheaper than their counterparts, so they tend to be used for industrial and commercial applications.

Lead-acid batteries produce hydrogen (H₂) and oxygen (O₂) – two parts H₂ to one part O₂ during a normal charge cycle. These gases are vented to air in the room. In the case of valve-regulated batteries, venting can occur when a battery becomes warm or is overcharged.

TAKING CHARGE

A build-up of hydrogen in battery stores or charging rooms will create an extremely flammable atmosphere, so detection systems should be competently installed and commissioned, says Medem's **Chris Dearden**



Lithium ion batteries have the advantage of a deeper discharge of up to 70% of the full charge, as opposed to 50% for a lead-acid battery

Rising temperature and other factors will increase the amount of gases produced and discharged to air.

Hydrogen dangers

Hydrogen gas is colourless, odourless, lighter than air and highly flammable, so it must not be allowed to accumulate in concentrations greater than 1% of the volume of air in a space. The lower explosive limit for hydrogen is 4%, and the upper explosive limit is 75%.

A build-up of H₂ in a battery room installation will create an extremely flammable atmosphere. With added O₂, the risk of a powerful explosion is significant. Adequate ventilation is important to stop gas build-up, but consideration should be given to installing a hydrogen gas detection system to give an early warning of a change in gas levels or failing ventilation.

Gas detection

The installation of a gas-detection system for H₂ enables the permanent monitoring of a given space for the target gas. This will guard against equipment and battery failure – which could lead to significant levels of H₂ being produced in a short period – and minimise the risk of both explosion and exposure to users.

A pre-alarm level of 1% with a high alarm level of 2% ensures time is given for action to be taken to stop a dangerous situation from developing.

Placement of the detector heads should be at high level near a ceiling because H₂ is lighter than air, and >>

direct airflow from ventilation ducts or fans should be avoided so true atmosphere can be monitored.

A radius of up to one metre around the batteries under charge should be considered as a Zone One hazardous area, as defined by the Dangerous Substances and Explosives Atmosphere Regulations 2002.

Remote signalling of a developing unsafe environment, via beacons placed outside the charging area and/or connection to a BMS system, enables an alarm to be picked up by personnel. Automatically increasing mechanical ventilation within the space once the pre-alarm level is reached should also be considered.

A gas-detection system that can give a gas concentration reading of the instantaneous level, as well as a time-weighted average and a peak reading, would be ideal.

Commissioning

The importance of correct commissioning and servicing of systems that have a primary function of protecting life, health and the

“A build-up of H₂ in a battery room installation will create an extremely flammable atmosphere. With added O₂, the risk of a powerful explosion is significant”

built environment cannot be overemphasised. A gas-detection system is being relied upon to carry out its intended design function. In this case, if the H₂ detection system has not been commissioned, there is no guarantee it will operate as intended in the event of a rise in H₂ levels.

Commissioning must be carried out by a competent person, with certificates issued to the relevant companies and people involved in a project.

Competence is a combination of skills, experience and knowledge. So a commissioning engineer should not commission a gas-detection system if they do not have the knowledge, and specific equipment, necessary for a particular manufacturer’s system, even if they have the skills and experience of commissioning other types of controls.

It is important for a commissioning engineer to be trained – and approved – by the manufacturer. Alternatively, the manufacturer should commission such systems.

It is also imperative that those who are competent to carry out the task service gas-detection systems regularly. Just as important are the tools for ensuring the target gas is in the correct concentration for testing the sensors, and the correct delivery method is employed so sensors are not damaged. **CJ**

CHRIS DEARDEN is managing director at Medem UK



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BATTERY BASICS

Battery storage systems are becoming a key component in building services as economies decarbonise and clients turn to electric power. Aecom's **Peter Baxter** and **Will Holland** outline the points to consider when choosing a system

Photovoltaic (PV) cells have, in recent years, increased in efficiency while falling in price. This trend has been driven by competition between mono and polycrystalline silicon technology – which is the most efficient per pound – and thin-film technology, which is cheaper, but less efficient per pound. With renewables becoming so cheap – spot prices for silicon solar modules in 2010 were five times what they are now – the attention now turns to battery storage.

A battery storage system (BSS) is a method and technology capable of storing electricity. It has numerous benefits; it allows an owner to import energy, either generated on site or bought at a cheaper price from the grid, and then to export it – for example, at a higher price when demand outstrips supply.

The BSS can carry out 'peak shaving', where the system discharges at the optimal time when load is suitably high, and prices greater, so reducing electricity costs. It may be used as an uninterruptible power supply (UPS), to offer backup power during unexpected outages (though it is costly to provide instantaneous backup). The BSS can also be used as a frequency response (FR) module to regulate power frequency coming in from the grid.

Finally, BSS can significantly cut the operator's carbon footprint, especially when paired with onsite renewable power generation. These benefits could be harnessed by the UK commercial sector to reduce its energy bills and generate a long-term return on investment (ROI), but also to take responsibility for its carbon footprint and help combat climate change.

Available technologies

Although the lithium-ion BSS has undergone the most innovation in recent years – and currently offers the greatest potential ROI – other battery technologies are available.

These include, in order of operational popularity: lithium-ion phosphate; sodium sulphur; vanadium redox flow; and lead acid.

The sodium sulphur battery technology has been used successfully on large-scale energy-storage projects, but is not suited to the built environment because of the very high initial capital expenditure required and the need for it to operate at very high temperatures. It is also hazardous if exposed to water. Vanadium redox flow – while very tolerant of overcharging and deep discharges – requires a lot of supporting equipment, including pumps, sensors, and secondary containment. Lastly, lead acid has very low energy density, so does not always offer a commercially viable solution in the built environment.

These technologies have been used on projects around the world, but none has come close to the cost and efficiency achieved by lithium ion. This technology is the cheapest per kWh and has the highest round-trip efficiency. It is commercially attractive because prices have plummeted since 2010 (see Figure 1). Lithium-ion prices are projected to fall below £100 per kWh by 2020, as manufacturing is streamlined and economies of scale kick in. Several manufacturers, such as Tesla, Bosch and LG, offer the Li-ion solution, with the Tesla PowerPack well known for its dramatic impact on the car industry. [C](#)

PETER BAXTER is a director, and **WILL HOLLAND** a graduate quantity surveyor, at Aecom cost management. In future issues, Aecom will give a technical and cost analysis of battery storage systems, outlining advantages and disadvantages, and potential revenue streams available to building owners and operators.

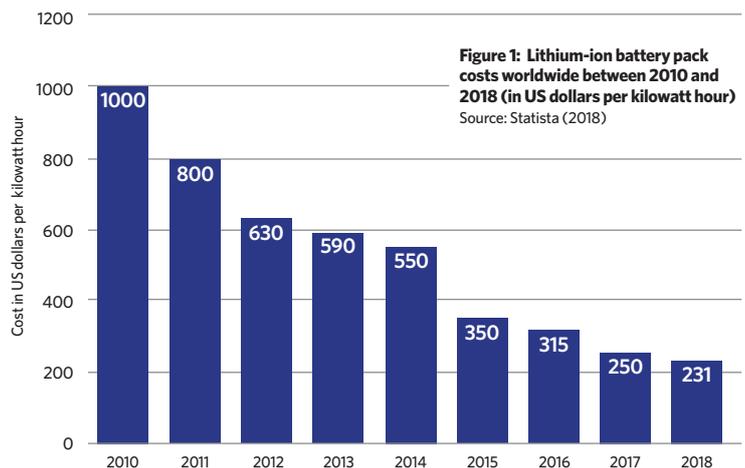


Figure 1: Lithium-ion battery pack costs worldwide between 2010 and 2018 (in US dollars per kilowatt hour)
Source: Statista (2018)

BATTERY STORAGE SYSTEMS: WHAT TO CONSIDER

- **Power output (MW):** Rate at which the power can be discharged
- **Length of time power to be released (hour):** Amount of power discharged over time. This length of time discharged would be governed by power purchase agreement between the owner/operator and the purchaser.
- **Energy storage capacity (MWh):** Amount of power capable of being discharged in a single cycle, which, in reality, would not normally exceed 40% to a purchaser, because of operator needs and battery health.
- **Cycle or round-trip efficiency:** Ratio between amount of charging energy put in and the amount you get out. Typical range is 85-89% and it degrades over a lifetime.
- **Response time:** How quickly the storage can begin importing/exporting and respond to power outages. Response time is less than 200ms for lithium-ion systems, and most other battery types, excluding lead acid.



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Pressure-independent control valves in variable volume heating and cooling systems

This module considers the application of pressure-independent control valves to provide stable operating conditions and consistent control in systems

The application of variable flow systems in building heating and cooling water circuits is now commonplace. Driven by the desire to reduce pumping energy use and operating costs, the variation in flowrates across different parts of the piping network will inevitably disparately alter the available pressures at the various heating and cooling devices. This CPD will consider the application of pressure-independent control valves (PICV) to provide stable operating conditions – and so consistent control – at each terminal load.

Many heating and cooling loads in commercial and industrial buildings can be controlled by varying the water flowrate – notably heating and cooling coils in air-handling systems, fan coil units and chilled beams. This so-called ‘throttling’ control will affect the total flowrate being circulated around the system and so, if there is an appropriate control mechanism in place, can significantly reduce the energy consumed by the pump.

The more traditional solution was to use a three-port diverting arrangement that controlled the load but did not reduce the overall flow through the main distribution pipework and the pump. In heating systems, the return water temperature increased at low loads, so reducing overall system effectiveness and making it less likely to be able to operate boilers in (the more energy-efficient) condensing mode. In cooling systems, the temperature of the return water would drop towards the flow temperature as the cooling load reduces, so not using the full benefit of the chilled water. By applying two-port control valves at the terminal loads – and so not

diverting flow around the loads – the main distribution flowrates will modulate to give the total required flows that meet the sum of all the branch flows. As the pump power is proportional to the cube of the flowrate, this gives an opportunity for reduced pumping power, as well as maximising the temperature difference across the system and improving the exergetic performance.

There are a number of technologies that have been used to achieve operational savings >>

PICV GUIDANCE

The diagrams and explanations in this article are focused on specific aspects. For detailed PICV design and installation guidance, refer to the references and bibliography in CIBSE Knowledge Series 7¹ (and supplement), as well as manufacturers’ literature.

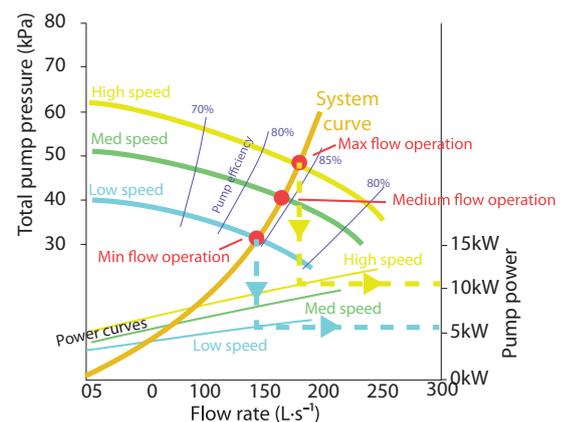
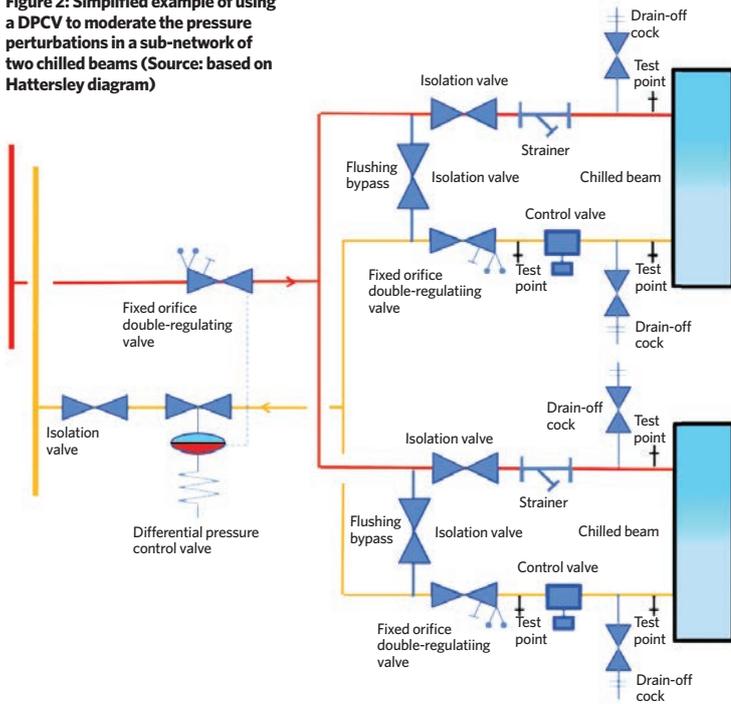


Figure 1: Energy saving through variable speed pumping. As demand for heating or cooling water drops, so does the pump power as its speed is reduced

Figure 2: Simplified example of using a DPCV to moderate the pressure perturbations in a sub-network of two chilled beams (Source: based on Hattersley diagram)



load itself, plus a variable resistance provided by the control valve. As the – potentially numerous – two-port ‘throttling’ control valves individually modulate (so altering their resistance to flow), the relative pressures will change across all the separate system branches as the flow modulates in the main pipework distribution network. This will erratically alter the available pressure that drives the flow through any particular branch, making it challenging to offer stable, controllable flow at all terminal loads.

To overcome this, the automatic differential pressure control valve (DPCV) has been applied typically to branches supplying several individually controlled loads, such as in the example in Figure 2. The DPCV contains a diaphragm that separates two chambers in the valve; in this example, one chamber is connected (internally) to the valve inlet and the other, via a capillary tube, to a tapping in the double-regulating valve in the flow pipework. An adjustable spring-loaded valve spindle is connected to the diaphragm, closing the valve when differential pressure rises and opening it as differential pressure falls. This effectively isolates the sub-circuit from variations in the main system pressure, and is a widely applied solution. It can be challenging to select the correct DPCV size for systems, and the individual two-port control valves in the sub-system can still be adversely affected by pressure variations – and will, in any case, require separate balancing. However, this arrangement is particularly useful

» in pumping variable flowrates. However, the maturity of low-cost, electronically controlled (‘inverter’ or ‘variable frequency’), variable-speed, motor-driven pumps has led to the widespread application of variable flowrate heating and cooling water distribution systems.

The example pump performance, as shown in Figure 1, indicates a system where – as the system requires less flow – the pump speed can be gradually reduced to provide the operating points. Three example operating points are shown at nominal maximum, medium and low speeds. Pump power is clearly significantly lower as the flow reduces.

Typically, each separate branch serving a load will have an element of fixed resistance to flow that comprises a balancing device, isolation valves, flow-measuring device and the heat-transfer surface that makes up the

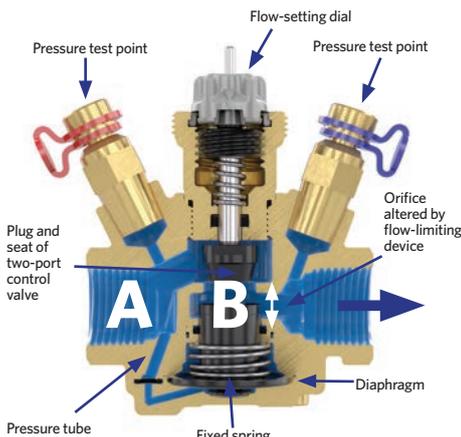


Figure 3: A section through a pressure-independent control valve

where there are likely to be very low flowrates or where there is a high differential pressure across the main distribution flow and return pipework.

As described in detail in CIBSE KS7 Supplement,² the PICV integrates the function of a DPCV together with a balancing valve to limit the maximum flow, as well as providing modulating control.

As illustrated in the section through a PICV in Figure 3, the key element that makes a PICV stand out from other control valves is the integral diaphragm that has differential pressure across the control-valve inlet and outlet. The specific internal configuration varies between manufacturers; however, the movement of the diaphragm (working against a spring) drives a flow-limiting device (as shown in the diagram, altering the space indicated by the white arrows) to maintain a (practically) constant differential pressure between A and B. So – for example, as the system pressure increases at point A relative to the pressure at B, because of valves closing or the pump varying its speed – the action of the diaphragm further restricts the flow and lowers the effective differential pressure across the control valve. The constant pressure difference between points A and B effectively maintains a consistently high valve authority at all loads, so assuring good controllability across the operating range of the control valve.

A flow-setting dial, which is usually marked with flowrate (or calibrations), is used to set the maximum design flow during commissioning. Some valves have a specific flow regulator to enable the maximum flow through the valve to be set (in the same way as a separate balancing valve). However, most commercial valves – as with the one illustrated – are designed to limit the maximum control valve opening in place of a separate flow regulator; this will potentially impact the valve turndown, as it will

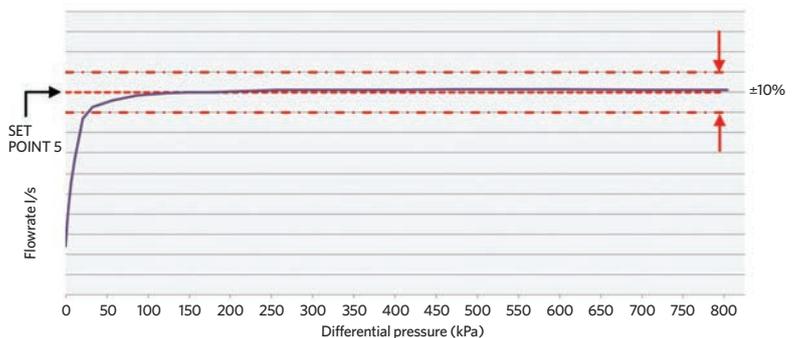


Figure 4: Example of the operating stability of a commercial PICV (Source: Hattersley)

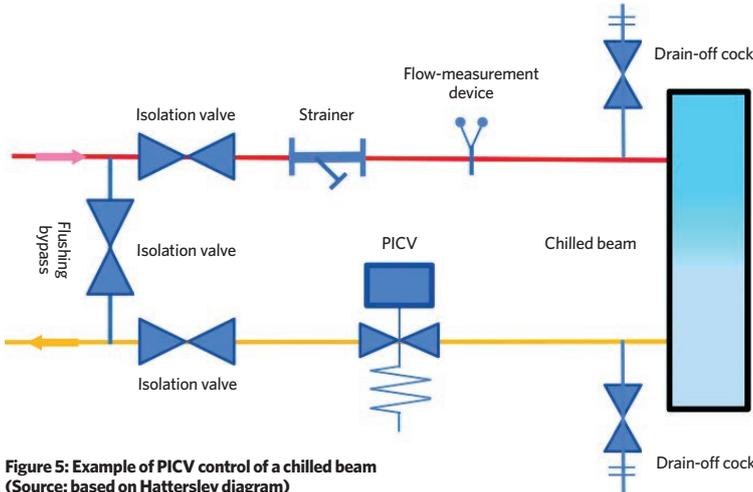


Figure 5: Example of PICV control of a chilled beam
(Source: based on Hattersley diagram)

reduce the effective travel of the valve, but this is somewhat compensated by the maintenance of constant pressure across the valve. When the two-port control valve is used for flow regulation as well as flow control, it will be adjusted – using the flow-setting dial – during system commissioning until the maximum design flowrate is achieved, then the remaining valve travel will be used for modulating control. (The valve can be manually operated by rotating the flow-setting dial.)

The combined action of the integrated components in the PICV is capable of very stable control across a wide range of pressure differentials, as shown in the measured flowrate in the example valve in Figure 4.

When controlling ducted heating and cooling coils, the control delivered by the actuator to the valve is more consistent if the control valves have a water-flow characteristic that complements the load characteristic from the coil.

Equal-percentage control characteristics are typically used for variable flow applications in building services applications, as an appropriately actuated equal-percentage control valve will complement the heat-output profile of a coil. This results in a percentage valve stem position that is proportional to the percentage coil output. As with any valves, the characteristic of the PICV will alter with valve authority. As a PICV will maintain a typically high valve authority, the characteristic is maintained. However, some small valves will not maintain linearity at low flows.²

The PICV can be installed – as in the example shown in Figure 5 – where, in smaller systems, it will remove the need for a DPCV and simplify the installation and commissioning process.

Figure 6 shows part of a system layout incorporating PICVs and the accompanying components that are required on connecting branches. Pump-speed control is effected using a differential pressure sensor across the sub-system feeding to the most remote group of terminal units (the ‘index’). In systems with multiple sub-systems (with potentially different load patterns), additional sensors might be required on other sub-systems. There are opportunities with some building

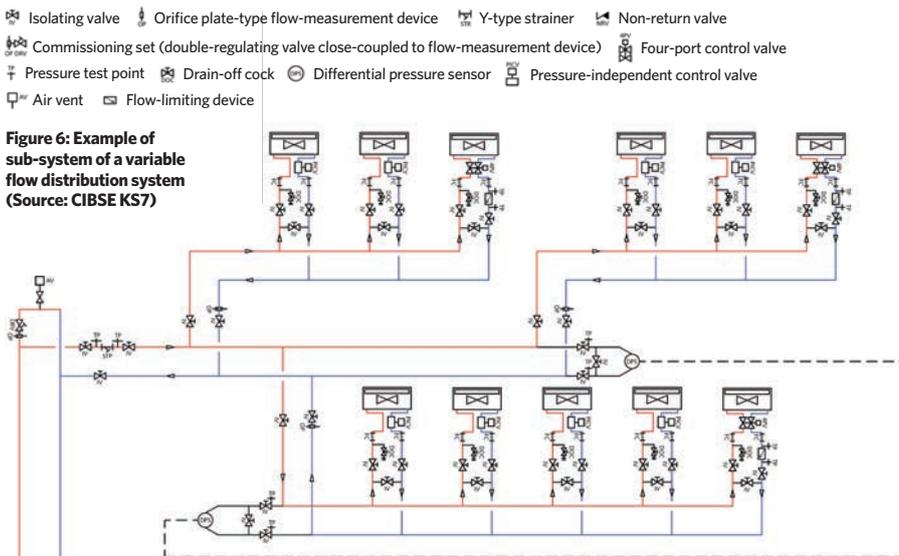


Figure 6: Example of sub-system of a variable flow distribution system
(Source: CIBSE KS7)

management systems to use a position signal from all the individual PICVs to control the pump speed to optimise operation so that all terminals are supplied using the least power. The four-port valves (effectively three-port valves with built-in bypass and connecting ‘T’) in Figure 6³, at the end of each sub-system, are used to ensure that the pump will maintain a minimum of approximately 20% flow even when there is no terminal demand.

The selection of PICVs is based on the design flowrate. There are practical limitations of minimum controllable flowrates, as well as the minimum required operating pressure, so it is important that a PICV is selected to operate effectively across the range of expected loads. If the operating differential pressure is too low, the differential pressure spring remains in an uncompressed state, and if it is too high, the spring will be fully compressed – in both cases, it will not maintain appropriate control of the pressure differential across the control valve. In the case of large systems where there are numerous sub-systems, selective application of DPCVs in branches may be needed to limit the maximum differential pressure across the PICVs. However, as shown in the example in Figure 4, commercial PICVs are capable of maintaining control across a wide range of operating pressures.

A significant benefit of PICVs is that they obviate the need to proportionally balance the system because of the integrated differential pressure control. PICVs are simply set to give the required design flowrate using the adjustment on the valve. When commissioning a system, the pressure at the test points (integrated into the PICV body) will be checked – at least in the index of each sub-system – to ensure that the operating pressure differential is within the manufacturer’s specified limits. That means that at maximum flow, with all branches drawing design flow, the ‘least favoured’ (index) PICV has – at least – the minimum required differential pressure to operate (this may be checked using the tapping points on the PICV).

If this pressure is available at the index PICV, then all other PICVs will have greater differential pressure available and so will be able to operate. The CIBSE Commissioning Code W⁴ requires that the flowrate be checked for each load; this is normally determined using a separate orifice valve (the integral PICV test points cannot be used to determine the flowrate through the valve) – this is indicated as the flow-measurement device in Figure 5.

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■ Turn to page 50 for references.



» Module 140

January 2019

1. In the example in Figure 1, how much is the pump power reduced between maximum and minimum flow?

- A By less than 10% of the maximum power
- B By between 10% and 30% of the maximum power
- C By approximately 50% of the maximum power
- D By between 60% and 90% of the maximum power
- E By more than 90% of the maximum power

2. Which one of these is unlikely to be true in the illustrated application of the DPCV?

- A One side of the diaphragm is influenced by the pressure at the valve inlet
- B The diaphragm will modulate the pressure to maintain a constant flow through the load
- C The DPCV closes as the differential pressure across the diaphragm increases
- D The pressure in the branch flow pipework at the exit of the FODRV affects one side of the diaphragm
- E The valve spindle position is modulated by being directly connected to the diaphragm

3. In the PICV, which one of these is the primary purpose of the pressure test points?

- A To provide, indirectly, feedback of flowrate to the building management system
- B To allow the measurement of the available differential pressure across the whole PICV as a check when commissioning and testing
- C To provide a pressure differential to set the valve to the required maximum flowrate at commissioning
- D To be able to set the minimum flowrate using the lookup value of pressure differential
- E To test for reversed flow through the valve assembly

4. What is the valve characteristic typically used as the control element of a PICV?

- A Equal percentage
- B Hyperbolic
- C Linear
- D Parabolic
- E Quick opening

5. Which CIBSE Knowledge Series supplement provides an introduction to PICVs?

- A KS1
- B KS3
- C KS5
- D KS7
- E KS9

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References:

- 1 CIBSE Knowledge Series KS7 *Variable flow pipework systems*, CIBSE 2006.
- 2 Supplement to CIBSE Knowledge Series KS7 *Variable flow pipework systems: valve solutions*, CIBSE 2009.
- 3 BG 12/2011 *Energy Efficient Pumping Systems – A Design Guide*, BSRIA 2012.
- 4 CIBSE Commissioning Code W: 2010 *Water distribution systems*, CIBSE/BSRIA 2010.

COLT

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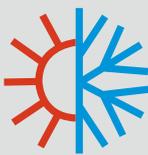


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PRODUCTS & SERVICES

Knights to the rescue on NO_x emissions

Lochinvar has added four models to its Knight range of water heaters so end users can meet emissions regulations.

The latest phase of the Energy-related Products (ErP) Directive came into force in September 2018, introducing a maximum level of NO_x emissions for water heaters. Lochinvar's new Knight models produce between 22mg/kWh and 48mg/kWh – comfortably inside the ErP's 56mg/kWh.

They offer storage capacities of 108l to 358l, with recovery rates of 140 to 290 litres per hour based on a temperature rise of 50°C.

■ Visit www.lochinvar.ltd.uk



UK first for Rinnai's water heater

Rinnai's Infinity Solo condensing and low-NO_x water heater is said to be the first in the UK to combine low-NO_x, wall-mounted continuous flow water heaters with a stainless steel storage cylinder. The range features 35kW and 54kW appliances, and the larger model can act as a high-efficiency alternative to gas-fired storage appliances. Lighter than glass-lined heaters, with a far greater life expectancy, the stainless steel cylinders also have extremely low heat loss figures – as low as 1.41kW/h per day.

■ Visit www.rinnaiuk.com



TSSA move into new headquarters at 17 Devonshire Square

The Transport Salaried Staffs' Association has just completed a fit-out of its new headquarters space on the second floor of 17 Devonshire Square, London. The 6,846m² building is located in a prominent corner position within the square and was fully refurbished with underfloor air conditioning.

The building, described as a subtle blend of heritage features and contemporary finishes, now has services, including heating, ventilation and air conditioning,

and has been transformed into modern offices. The system at 17 Devonshire Square is a CAM-V direct expansion system, using the plenum beneath the raised access floor as the supply air path with return, spent air received back at high level. Because there is no division in the floor plenum, adding and repositioning Fantiles is unrestricted, easily adapting to future change of use and making it ideal at Cat-B fit-out stage.

■ Call 01342 310 400 or email aet@flexiblespace.com

Rehau releases new acoustic drainage guide

Polymer specialist Rehau has produced a 12-page guide to help M&E contractors with acoustic drainage in multi-storey buildings. *The Sound of Silence* looks at common mistakes and discusses how to reduce noise and vibration to make internal drainage systems quieter. It also introduces Rehau's Raupiano Plus pipe, which has three layers to increase rigidity and enhance its sound-insulation properties. *The Sound of Silence* is the first free-to-download guide to be published under Rehau's Build Your Legacy campaign.

■ Visit www.rehau.uk/buildyourlegacy



Geze Cockpit can help drive smarter buildings for happier workers

Placing people at the heart of design, construction, operations and development decisions can boost productivity and generate cost-savings in human resources and building management.

That was the message from Geze UK's national sales manager for window technology, Spencer Allen, during his talk at the Smart Building Show in London.

Controlling a building's heating, lighting, ventilation, air conditioning and other applications offers improved efficiency, reduction in energy consumption and extended product life-cycles, he said. The greatest return on investment, however, could be by creating better workplaces for the occupiers.

According to Knoll Workplace Research, 90% of an organisation's expenditure is on its people, with only 10% spent on operations and energy consumption. 'The need to look after our people is evident,' said Allen, who suggested better ventilation could help with this.

'Natural ventilation will save a property between 10% and 30% in energy consumption, help remove air pollutants by as much as a third, and offer low-maintenance and easy-to-access operation of windows, helping staff feel "in control" and more satisfied in their working environments.'

Allen highlighted how technological advances have increased the opportunity for connectivity and how intelligent hubs, such as the Geze Cockpit, could integrate natural ventilation with the management of automatic doors, smoke and heat extraction, escape and rescue route management, and access control.

'But this requires designers to consider the proposed use of the building and to create a workplace that puts people at the heart of how it should operate,' he added.

■ Call 01543 443000 or visit www.geze.co.uk



Luceco lights up Royal Infirmary

Manchester Royal Infirmary (MRI) can now boast pioneering, energy efficient lighting thanks to LED luminaires from Luceco.

The company worked with A C Electrical (North) and the MRI's estates and facilities directorate to reduce the amount of energy consumed by replacing old lighting technology.

Richard Horton, of Luceco, said: 'We removed 120W wall washers and replaced them with LED asymmetric LuxPanels from Luceco, running at 44W - creating substantial savings.'

'Using LitelP, however, we reduced the energy consumption of the 44W luminaires to give an additional 95% saving by using available daylight. The corridor operates at 5% for the majority of the burning hours when personnel are not present, illuminating to 100% when traffic is detected.'

LitelP is a flexible, intelligent, wireless lighting system that requires no complicated electrical installation. It includes energy monitoring and reporting, and is compatible with all driver types, including DSI, DALI and 1-10 V.

■ Call: 01952 238100, email uk_sales@luceco.com or visit www.luceco.com



Impressive stats for Stovkis hot-water units

Stovkis's Econoplate BV Series of semi-instantaneous hot-water units are suitable for premises with modest plantroom space and medium levels of hot-water demand. It has five heat output capacities, from 56kW to 231kW, with flowrates from 606 litres in 10 minutes to 1,551 litres in 10 minutes. The BV can supply domestic hot water direct on demand, or rapidly reheat the stored volume, which can be 300, 500, 800 or 1,000 litres. Peak output over a one-hour period can be 4,851 litres.

■ Call 020 8783 3050 or visit www.stovkisboilers.com

Boost for fire safety with Actionair controls upgrade

Actionair, part of Swegon Air Management, has upgraded its controls packages in response to growing demand for more flexible operation and testing of fire and smoke dampers.

The company's Actionpac LNS5 uses a solid-state embedded computer for reliability, and is simple to use and install. A two-core network cable communicates with local interfaces at each damper, reducing wiring costs compared with more conventional, hard-wired solutions.

Heat and smoke detectors can be fitted directly into the damper interface, to control the damper to which it is fitted or others within the system. They can also be linked to a local test switch, allowing dampers to be tested remotely or via the test function at the panel.

The LNS5 works on interoperable, open-protocol platforms and can be linked to the BMS via RS485 or BACnet. This offers considerable life-cycle benefits for ongoing operation and maintenance, while the server architecture reduces commissioning time, simplifies operation, and allows for future changes to the building and its HVAC systems.

■ Visit www.swegonair.co.uk



Evinox hails hot-water services change as key for heat network growth

Evinox has welcomed updates to hot-water services in the new National House Building Council (NHBC) standards, to be launched on 1 January 2019. Changes have been made to some flowrates and supply temperatures at the outlets. For example, the supply temperature at the kitchen sink has been reduced from 60°C to 55°C.

Helen Gibbons, Evinox technical and design manager, said: 'This will enable district and communal heating system flow temperatures to be reduced - which is important for the growth of fourth-generation heat networks in the UK. The lowered DHW temperature, combined with the new table in the NHBC standard for simultaneous hot-water use, will also give design engineers the confidence to reduce the kilowatt demand for individual properties. This will improve efficiency and cost of UK heat networks.'

'We hope to see the temperature from the kitchen outlet reduced further, to 50°C, for heat network developments using instantaneous DHW heat interface units in the near future.'

■ Call + 44 (0)1372 722277, fax + 44 (0)1372 744477 or visit www.evinoxenergy.co.uk or www.evinoxresidential.co.uk

8.1.3 Hot water service
Hot water service shall be provided in accordance with statutory requirements and be adequate for the demand and consumption.
Hot water services should be designed in accordance with Tables 3.4, 4 and 5, and:

- the minimum flow rate should be in accordance with the statutory requirements and generally be available, it may be less where the pressure and flow rate of the incoming supply falls below 1.5 bar;
- the design flow rate available at each outlet when the total demand does not exceed 0.3L/s (where simultaneous discharge occurs, the flow rate of individual outlets should not be less than the minimum rate).

Table 3: Flow rate and temperature requirements

Outlet	Design flow rate ¹⁾ (L/min)		Minimum flow rate ²⁾ (L/min)		Supply temperature ³⁾ (°C)
	Flow	Temp	Flow	Temp	
Bath (from storage)	0.30	(80)	0.15	(60)	48
Bath (from combi)	0.20	(120)	0.15	(60)	48
Shower (non-electric)	0.20	(120)	0.15	(60)	40
Wash basin	0.15	(80)	0.10	(60)	40
Sink	0.20	(120)	0.10	(60)	55

Notes:
1) The design flow rate should be used to establish the hot and cold pipe sizes to provide the flow rate specified at each outlet when that outlet is used at its design flow rate.
2) The minimum flow rate should be available at each fitting when that fitting is used continuously with one or more other fittings as shown in Table 4.
3) The supply temperature is the temperature at the outlet. In accordance with BS 6891 the water temperature at an outlet or thermometer fixing shall be at least 5°C above the minimum flow rate.

Redruth offices receive boost from Elco

Elco Heating Solutions has supplied two Thision L ECO 70kW condensing gas boilers to the Redruth headquarters of Curver UK.

The boilers, part of an upgrade to the heating and hot-water system, were installed on a wall-mounted cascade frame, with low loss header, a 100/150 room-sealed flue gas system, and cascade insulation kit.

Available in three outputs, from 66kW to 120kW, the Thision L ECO offers exceptional performance, with extremely low NO_x and CO emissions. Servicing is also straightforward.

■ Visit www.elco.co.uk





^ A roaring success for Grundfos

At the beginning of 2018, there were very few expectations that the year would turn out to be a memorable one for English football fans.

However, as soon as the whistle blew in Russia for the start of the World Cup - one of the most watched sporting tournaments on the planet - expectations, along with the temperature, rose dramatically.

Within the 12 venues, which were spread across 1,800 miles, were 859 Grundfos pumps. These units quietly played their part in the unfolding football drama by delivering essential services, including water supply, ventilation, irrigation and drainage, cooling and fire protection.

England losing to Croatia in the semi-finals was painful, but this was somewhat redressed when Gareth Southgate's side beat them at Wembley - another Grundfos-supported venue - to reach the final stages of the UEFA National League, to be played in June.

Grundfos is delighted to be playing its part at these and many major sporting locations, both at home and abroad.

■ Call 01525 850000, email grundfos-uk@sales.grundfos.com or visit www.grundfos.co.uk



^ Vent-Axia pleased to see healthy homes and buildings white paper

British ventilation manufacturer Vent-Axia has welcomed the All Party Parliamentary Group white paper *Building our Future: Laying the Foundations for Healthy Homes and Buildings*. The document makes clear recommendations to the government on how it can improve standards in housing to benefit occupants' health and wellbeing. It says poor indoor air quality (IAQ) is reportedly costing the UK more than 204,000 healthy life years. To help protect health in the home, Vent-Axia has been working hard to provide ventilation solutions to improve IAQ for households.

■ Call 0844 856 0590 or visit www.vent-axia.com

Toshiba launches website for rapid access to customer support and technical data >

Toshiba Air Conditioning has launched an updated website that gives customers quick access to the company's comprehensive range of product support, training and technical resources.

Managing director of sales for TCUK David Dunn said: 'We have a simple philosophy: deliver the best products and customer support in the market. Key to that is enabling our customers to access the technical and support materials they need to deliver for their own clients.'

Every Toshiba product has a download centre, giving access to the latest versions of data sheets, and owner and service manuals, while a spare-parts section allows users to identify and order replacement components online.

A technical resources area includes demonstration videos, trouble-shooting guides, and FAQs on key topics such as handling R32.

Customers can also access their personal Rewards programme account, which enables them to keep track of points and purchase items directly from an enhanced range of incentives and Toshiba merchandise.

■ Visit www.toshiba-aircon.co.uk



< Fully integrated DX and AHU system offers optimised, simplified heating and cooling

CIAT UK has developed a fully integrated air handling unit (AHU) and direct expansion (DX) system to meet the complex requirements of today's building services projects.

Development engineers from CIAT worked to develop the Floway DX. A key requirement was to ensure that the CIAT coils within the Floway DX were optimised for the most efficient output and control when connected to the DX outdoor units.

CIAT UK's sales manager, Paul Smith, said: 'Until now, combining AHUs with DX systems has required installers to purchase separate equipment and go through the complex process of trying to make them work together effectively. This can be time-consuming and may result in inefficiencies in performance, as well as adding risk to the project. The Floway DX solves this problem with a fully integrated airside and DX system.'

Floway DX can be used in a wide range of applications, including offices, retail and residential buildings, where compliance with Building Regulations and precise control of the coil capacity are required.

■ Visit www.ciat.com

Warm air, radiant and heating products now affected by European regulations >

Warm air heaters are subject to Lot 21, and radiant heaters to Lot 20, of the European Energy-related Products Directive (ErP). Minimum efficiencies are now 72% for warm air and 74% for radiant heaters.

These minimum criteria apply to both new installations and when replacing existing products. As a result, customers can be assured the heating equipment they are purchasing is energy efficient and emissions of harmful environmental pollutants are constrained.

Nortek's ErP-compliant range includes PREEVA EC, which offers combined heating and ventilation with optional cooling.

The units come with a wide range of heat outputs and cooling capacities, and are available as non-condensing heaters with thermal efficiencies above 91%, or fully condensing heaters with thermal efficiencies of 102% (net calorific value).

The design combines high thermal efficiency, quality components, and ease of maintenance for enhanced life expectancy and reduced life-cycle costs.

The PREEVA EC range incorporates an EC plug fan, which gives a wide range of air duties and external static pressures.

■ Email erp@nortek.com or visit www.nortek-erp.com





◀ **Breathing Buildings' hybrid ventilation system wins Energy Award**

Breathing Buildings has won a prestigious Energy Award. Recognising the vital importance of good indoor air quality and thermal comfort in schools, the Cambridge-based company's new energy efficient NVHR hybrid ventilation system has been named Energy Efficient Product of the Year HVAC&R.

Technical director at Breathing Buildings Dr Owen Connick said: 'We are thrilled to have won another important industry award for our NVHR and that its many benefits have been recognised by the energy industry.'

■ Visit www.breathingbuildings.com



⤴ **All smiles as Kingspan says 'cheese'**

Kingspan's KoolDuct System has been used in a lightweight ventilation and cooling solution for Welsh manufacturer GRH Food Company's new facility, which includes a Cheese Innovation Centre.

The pre-insulated ductwork can reduce air-leakage rates and limit heat transfer to maintain cold-room temperatures. It also weighs up to 75% less than ductwork built from galvanised sheet steel and insulated with mineral fibre.

Kingspan KoolDuct can be installed in a single fix and the system panels have a BRE Green Guide Summary Rating of A+.

■ Call +44 (0) 1544 387 384, fax +44 (0) 1544 387 484, email info@kingspaninsulation.co.uk or visit www.kingspaninsulation.co.uk



◀ **Mikrofill's HWS loading cylinder goes to new extremes**

The pioneering Extreme hot-water loading cylinder from Mikrofill Systems now delivers hot water at 6 bar, nearly doubling its previous capability.

Available in 200, 300 and 500 litre models, the WRAS-approved stainless steel loading cylinders can accommodate 120kW of primary input at 80°C. The net result is an instantaneous secondary performance of more than 2,000 litres per hour at 60°C, with 500 litre models producing 2,570 litres per hour.

The Extreme is designed to operate at a ΔT of 30°C on the primary side, maximising a condensing boiler's efficiency while initially loading, and further producing 60°C instantaneous hot water. It also has an onboard automated/manual pasteurisation programme.

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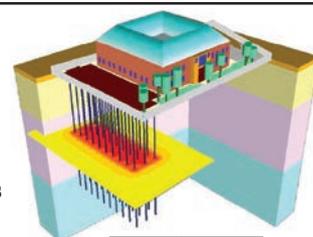
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Revit Technician

London, £35 - £38 p/h

A Revit technician is required for an international M&E environmental consultancy working on projects in excess of £50m in value. You will be assisting the Revit team working on commercial projects in London. The role will involve developing 3D BIM using Revit MEP and implementing 3D coordination whilst liaising with stake holders in the multi-disciplined team. Ref: 5300

Senior BIM Technician / Coordinator

London, £40k - £50k + bens

An opportunity has arisen at a medium sized and well-established MEP design consultancy that boast impressive & diverse portfolio of projects including: residential, commercial, retail, historical, healthcare, as well as many others. There is ample opportunity to progress to BIM Manager and beyond in this rapidly growing business for someone with the right team leading abilities, BIM knowledge, and software expertise. Ref: 5301

Electrical Associate

London, £60k - £65k + bens

A highly respected building services consultancy renowned for their dynamic approach are seeking an inspirational and driven electrical associate to join their multi-award-winning office in London. The company encourage a forward-thinking culture with an environment that allows their employees to thrive, think freely, and share ideas. This role would suit someone with a similar mindset, a person who will embrace challenges and lead a team constructively to develop solutions and deliver high quality results. Ref: 5294

Lead Electrical Engineer

London, 60k -65k + bens

We are working with an established design team within one of the UKs largest main contractors to appoint an ambitious and capable electrical engineer. You will have the opportunity to lead projects from conception to completion including aftercare. Projects span across the commercial sectors ranging from £70 - £165 million in and around London. Ref: 5010

Junior Electrical Engineer

North London, £28k + bens

A medium sized company renowned for delivering some of the most iconic commercial, residential, mixed use, and master plan schemes across London and overseas is looking to appoint an ambitious electrical engineer to join one of 4 MEP teams. Typical projects values range from £10m to £200m. Excellent benefits package offered along with continuous CPD opportunities and long-term career prospects. Ref: 5296

Mechanical Engineer

Hampshire, £34 - £37p/h

A mechanical engineer is required to assist a national design consultancy based in Hampshire. You will manage multiple projects in a clear, concise, coordinated manner, meeting project deadlines and financial restraints. You must work with your own initiative and minimal supervision. The projects are within the high-end residential sector. An ongoing contract for the successful engineer. Ref: 5040

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Students at Bridgwater & Taunton College



Richard Bullock

Building an education

Schools and colleges will offer T Levels from 2020 – and Bridgwater & Taunton College’s Richard Bullock helped create the building services engineering course

As curriculum manager for construction trades at Bridgwater & Taunton College, Richard Bullock leads a large team that delivers building-industry training. He worked in construction for more than a decade, completing a bricklayer apprenticeship before progressing into site supervision. He then did a Level 5 teaching diploma to pursue a career in education.

Last year, the Department for Education appointed 38 industry professionals to determine course content for the new construction T Levels, and Bullock was on the building services engineering (BSE) panel. From 2020, three construction-related T Level courses – design, surveying and planning; onsite construction; and building services engineering – will be offered as an alternative to A Levels.

How will the building services engineering T Level prepare young people for a job in the sector?

It will develop not only the technical understanding and skill set of the learner, but also the industry experience that is crucial when embarking on a career within the BSE sector and the wider construction industry. The knowledge, skills and behaviours promoted throughout the programme will ensure the learner has an understanding that spans the BSE spectrum and this will allow links to be made with real-life situations through industry placements. A key focus will be employability skills. Completion of the T Level will prepare the learner to know what opportunities are available within the BSE area and give them attributes that lead to successful career progression.

Where will T Levels be available?

They will be available nationally at a host of educational institutions and training providers around the country. Bridgwater & Taunton College will continue to lead in the field of technical education and will deliver T Levels across the board.

Why choose a T Level over a maths and/or science A Level?

The T Levels will allow learners with a specific interest or talent in the technical and vocational areas of learning to achieve their potential. They will provide a

valuable alternative to traditional class-based training, with a focus on practical skills alongside the knowledge necessary to have a successful career. The industry placement will allow learners to develop behaviours and use their skills in real situations.

What did you do on the Building Services Engineering T Level panel?

The panel comprised members with a variety of backgrounds and experiences within the BSE and education sectors. Regular meetings took place around the country and members of the panel brought their respective areas of expertise to the table. This led to some very productive debates around all aspects of industry and education. The group worked closely with apprenticeship standards to maximise the mapping potential and to ensure the suitability of the final product. We saw the opportunity to have a positive influence on the future of technical education, and everyone involved is driven to deliver a programme that will have a hugely positive and constructive impact on the BSE sector – and the future of young people.

Is there merit in targeting future engineers at an earlier stage in life?

Capturing interest and enthusiasm early on – and creating the chance to harness curiosity within the delivery of the technical routes – will be crucial for the development of future world-class engineers. The modular approach allows flexibility within the programme, and the specialisms that will be available to young people will ensure well-rounded and confident learners graduate with the tools to continue their learning – whether that be through apprenticeships, employment, or further research and study.

Will a T Level help to make building services engineering more ‘visible’?

It will certainly change the landscape of traditional progression into building services engineering. The opportunity for a young person to explore their interest at an early stage is paramount for the development of outstanding engineers, and the fact that these areas will now be available to learners at such an early stage is extremely exciting.

RICHARD BULLOCK is curriculum manager for construction trades at Bridgwater & Taunton College

EVENTS

NATIONAL EVENTS AND CONFERENCES

CIBSE Building Performance Awards

The winner of the new Building Performance Engineer Award will be unveiled, along with 13 other category winners, during a celebration of excellence and achievement across the industry. Guest speaker is Dr Sarah Prichard, partner at BuroHappold Engineering. www.cibse.org/bpa

CIBSE TRAINING

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

Overview of IET wiring regulations

8 January, London

Successful design management

15 January, London

Fire risk assessment to PAS 79

16 January, London

Building services one-day overview

17 January, London

Energy efficiency building regulations: Part L

18 January, London

Low carbon consultant building operations training

21-23 January, London

Practical controls for HVAC systems

23 January, London

Mentoring skills workshop

24 January, London

Power system harmonics

25 January, London

Low carbon consultant design training

28-29 January, London

The new London Plan

29 January, London

Electrical services explained

29-31 January, London

Energy Savings Opportunity Scheme (ESOS)

1 February, London

Standby diesel generator

4 February, London

Mechanical services explained

5-7 February, Birmingham

Low carbon consultant design training

6-7 February, Manchester

Air conditioning inspection for buildings

7 February, London

Fundamentals of digital engineering (including BIM)

8 February, London

Overview of IET wiring regulations (18th edition)

11 February, London

Fire sprinkler systems: design to BS EN 12845

11 February, London

Emergency lighting to comply with fire-safety requirements

12 February, London

Below-ground building drainage

15 February, London

Fire safety in purpose-built blocks of flats

15 February, London

CIBSE GROUPS, SOCIETIES AND REGIONS

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

North East: Building information modelling

8 January, Newcastle upon Tyne

Presentation by Ian Chapman, Mott MacDonald.

West Midlands: Soft landings

9 January, Birmingham

The 2018 Soft Landings Framework update and new publications to support clients and project-delivery teams.

CIBSE closing date surgery

10 January, London

Member applicants can book a 20-minute slot with a CIBSE interviewer to discuss the draft Engineering Practice report and interview process.

South West: Debate – Passivhaus: the rewards and challenges in social housing

17 January, Bristol

CIBSE and RIBA South West host a debate.

North West: Annual celebration dinner

22 January, London

With Andrew Hawes, director of special projects, Burgess Management Consultants

West Midlands: Blues-busting quiz night

24 January, Birmingham

Join CIBSE WM YET to beat the January blues with a quiz night at Bierkeller.

Preston: Technical meeting and Gilberts research centre visit

24 January, Blackpool

Technical meeting at Gilberts, with live diffuser testing within the air-movement test centre.

North West: Annual celebration dinner

25 January, Manchester

Annual celebration dinner offering the chance to mingle with familiar and new faces from the industry.

CIBSE ANZ: Power-outage solutions

12 February, West Perth

Presentation on some of the most reliable backup power equipment manufactured by Magellan Power.

CIBSE UAE: Annual dinner

20 February, Dubai

With speaker Simon Penney, Her Majesty's Trade Commissioner for the MEAP, from the British Embassy, Dubai.

East Midlands: Annual dinner

8 March, Nottingham

With guest speaker Paul Boardman, stand-up comedian and writer.

North East: Expert witness

12 March, Newcastle upon Tyne

Gerry Brannigan, of HKA, will present on expert-witness work within building services engineering.

HIGHLIGHTS



Dr Sarah Prichard will speak at the Building Performance Awards



Ian Chapman will speak at the North East BIM event on 8 January

SLL LightBytes

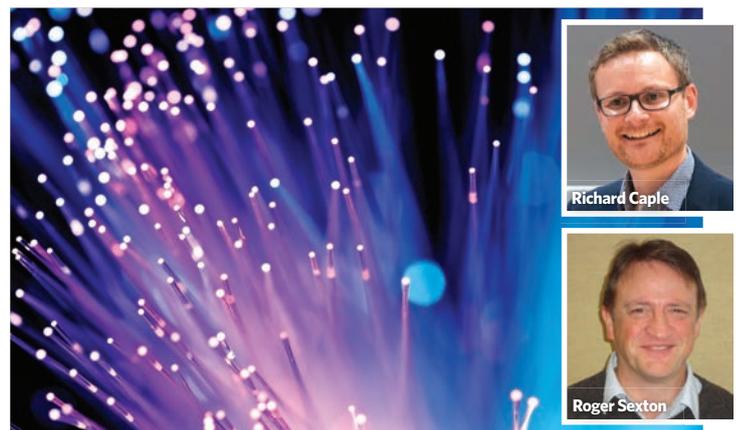
24 January, Liverpool
28 February, York
28 March, Bristol

25 April, Edinburgh
9 May, London

The 2018-19 LightBytes series, in collaboration with the CIBSE Facilities Management Group, continues in 2019. There will be CPD peer-reviewed, bite-sized presentations on: how to specify a luminaire, with speakers discussing light sources, optics and electronics; retrofit and upgrade, exploring what needs to be considered with a retrofit project; emergency lighting, looking at emergency lighting throughout a building to beyond the exit door and a place of safety; and the Internet of Things, touching on the use of smart lighting for predictive or pro-active maintenance.

Speakers will come from the Society of Light and Lighting's (SLL's) sponsors, and will include: Les Thomas, Fagerhult; Richard Caple, Thorlux; Roger Sexton, Xicato; and Graeme Shaw, Zumbotol.

For details, visit www.cibse.org/sll



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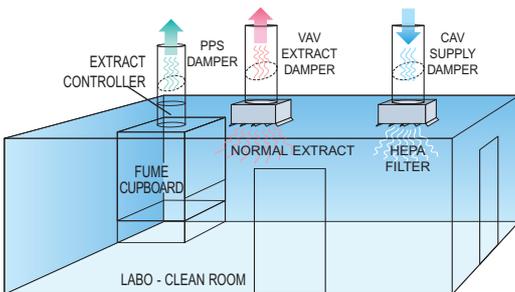


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