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October 2018

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## Change is in the air



Government documents published this Autumn in response to Dame Judith Hackitt's report on the Grenfell fire will define the regulatory framework for the next generation of projects in the UK.

The government also said it would soon clarify its plans for restructuring and revising Building Regulations Approved Documents, and publish a call for evidence for a wider technical view on the guidance on fire safety.

Our roundtable on smoke control is a fascinating insight into the work being done by industry on implementing Hackitt's recommendations. Competency and the question of who takes responsibility for whole life safety were two recurring themes (page 36).

All this work will, of course, happen in the shadow of Brexit which, as we go to press after the EU summit in Salzburg, looks to be veering towards the cliff-edge scenario. Last month the government issued a series of guidance notes to help industry prepare for a no-deal Brexit and to offer some clarity on what might replace EU rules once the UK leaves. Among them was information on how the UK would continue to regulate the trade – and use of – F-Gases and ozone-depleting substances (ODS). The government said it would still maintain the same high standards and that the majority of the requirements in the EU ODS and F-Gas Regulations would apply. (See Hywel Davies' column on page 18 for a full analysis).

There will be more on Brexit and Building Regulations at the CIBSE Build2Perform exhibition on November 27-28. Following the launch of a new CIBSE Air Quality Working Group in the summer, we preview the conference seminars on air quality and ventilation. The topic has become a key issue for building services engineers who are faced with balancing the demand for naturally ventilated buildings with the reality of external air pollution.

To meet the complex requirements of our urban environment, buildings are becoming more complex. To achieve technical resilience contractors are increasingly turning to offsite construction (page 8). In the first of our series on this trend we visit SES Engineering Services' Prism facility in York and talk to managing director Jason Knights on why consultants should be asking themselves: 'why not offsite?' (page 31).

For a demonstration of technical bravura, look no further than the fantastical façade for the Morpheus hotel (page 26). It looks as complex as the lair from the *Alien* films, but the engineers still strove to make the design as resource-efficient as possible.

The annual international competition run by CIBSE's Society of Façade Engineering is currently open for entries. For a chance of winning, enter at [www.sfecompetition.org](http://www.sfecompetition.org). The closing date is 15 October 2018.

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### Hywel Davies

looks at how the UK government will legislate for the use and installation of F-Gases after Brexit next March



### Iain Carlile

The new SLL president aims to raise awareness of good lighting during his term in office



### Liza Young

reports on our smoke control roundtable discussing the impact of the Hackitt report



### Tim Dwyer

This month's CPD considers measures used to predict the efficiency of water chillers



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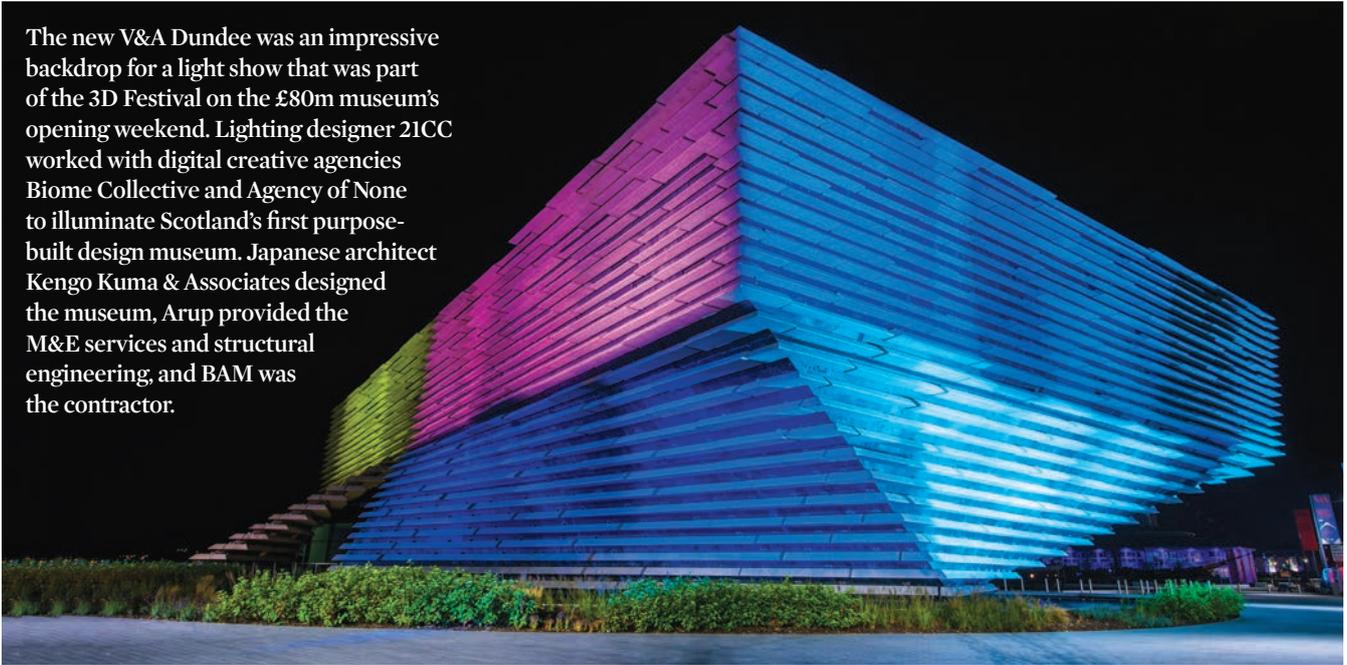
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## V&amp;A MUSEUM LIGHTS UP DUNDEE

The new V&A Dundee was an impressive backdrop for a light show that was part of the 3D Festival on the £80m museum's opening weekend. Lighting designer 21CC worked with digital creative agencies Biome Collective and Agency of None to illuminate Scotland's first purpose-built design museum. Japanese architect Kengo Kuma & Associates designed the museum, Arup provided the M&E services and structural engineering, and BAM was the contractor.



## Refrigeration deaths were preventable, says coroner

**Explosion could have been averted through correct maintenance**

The deaths of two men in a hotel explosion caused by flammable refrigerant gas could have been prevented if they had been properly trained and made aware of the risks, according to an Australian coroner's inquest.

Barry Purtell and David Lobb died in the cellar of the Hotel Rochester, Bendigo, Victoria, Australia, in June 2014, while helping the owners close down the hotel by removing a refrigeration compressor. Neither of the men were qualified refrigeration engineers and one – a motor mechanic – had used hydrocarbon gas from a car to top up the leaking unit eight months before the fatal accident.

A mixture of flammable and non-flammable gas leaked into the cellar when the pipework was cut and this ignited when one of the men used a cigarette lighter, according to coroner Paresa Spanos.

'The deaths were preventable in the sense that the explosion could have been averted through correct maintenance, correct use and labelling of refrigerants, and correct dismantling

and removal processes,' said Spanos. '[These] deaths highlight the dangers of unqualified people doing work that requires qualifications or, at least, a solid understanding of the substances and risks involved.

'There is ample evidence before me that the refrigeration industry, which is not without its regulatory complexities, faces additional challenges with the move to low-GWP refrigerants... because the low-GWP refrigerants are flammable, and the vast majority of refrigeration mechanics/technicians were not trained in the use of such refrigerants.'

Since the accident, the Australian industry has been revamping its training courses and now has a course specifically for engineers planning to work with refrigerants classified as A2/A2L (mildly flammable).

### F-Gas survey

The Environmental Investigation Agency (EIA) has issued a survey to understand the extent of non-quota HFCs and illegal HFC trade in light of media reports highlighting the issue.

The EIA wants to explore measures that can be taken to ensure effective implementation of the EU F-Gas Regulation.

To complete the survey, which should be returned to the EIA by 3 October, visit [bit.ly/CJOct18FGas](http://bit.ly/CJOct18FGas)

## F-Gas Regulation stays with 'no deal' Brexit

The EU's F-Gas Regulation, which applies to all air conditioning and refrigeration work in the UK, will remain in place even without a negotiated Brexit deal, says the government.

It means the UK will continue to phase down global-warming and ozone-depleting gases in line with its obligations under the Montreal Protocol.

The current quota system for these gases will be split in two to cover those gases placed on the UK market and those used in the EU. New computer systems for monitoring the phase down separately from the EU will be set up by the Environment Agency, but companies' reporting requirements will not change.

Certificates issued by EU bodies will still be valid for technicians working in the UK, but engineers certified by UK bodies to service F-Gas equipment may need to be recertified by an EU body if they want to work in the EU. (See page 18 for more on the regulation of F-Gases after Brexit).



## Fossil fuel demand to peak in 2020s

The world will reach peak fossil-fuel demand much earlier than previously thought, according to the think tank Carbon Tracker.

It predicts worldwide demand will peak between 2020 and 2027 as the cost of renewable installations and battery storage technology falls. Its report, *2020 Vision: Why You Should See Peak Fossil Fuels Coming*, forecasts a 1-1.5% rise in energy demand each year during the 2020s, but says it will be met by renewable power.

Fossil-fuel demand is entering a period of 'structural decline' for the first time in 200 years, according to the report's author, Kingsmill Bond. 'This will inevitably lead to trillions of dollars of stranded assets across the corporate sector and hit petro-states that fail to reinvent themselves,' he said.

The report argues that some investors are likely to lose trillions of dollars unless they react to this change. However, Carbon Tracker believes many corporate players are re-aligning their investments as renewables gather pace.

# Construction firms set to double use of prefabrication

## OSM being heralded as key to tackling chronic low productivity

The amount of offsite work carried out by construction firms is likely to surge in the next five years, according to a survey of the industry's top managers.

Legal firm Clyde & Co found that two-thirds of the top 50 construction firms expect to double the amount of work they carry out



away from sites, to improve efficiency, reduce costs, tackle the skills shortage and overcome technical challenges.

In a survey carried out as part of an *Innovation in Construction* report, 31 senior executives replied and said lack of investment and expertise were the main reasons for sluggish uptake of offsite manufacturing (OSM). Four-fifths (80%) of respondents said they only use OSM for 1%-20% of workload, but almost two-thirds (61%) expect that to double in the next five years.

Just over half said they had invested 0-2% of revenue in OSM in the past five years, but the majority expect to increase that to 3-5% in the next five. 'OSM is now being heralded by many as the key to tackling chronic low productivity problems,' said Robert Meakin, projects and construction partner at Clyde & Co.

'Momentum has been building and, with the government actively encouraging the use of OSM in some of its projects, the tipping point appears to be within reach.'

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## IN BRIEF

## Government outlines regulatory next steps

The government has announced it will publish an implementation plan this autumn in response to Dame Judith Hackitt's report on fire safety. In the *Government Response to the Housing, Communities and Local Government Select Committee Report on the Independent Review of Building Regulations and Fire Safety: Next Steps*, the government also said it would clarify its plans for restructuring and revising Building Regulation Approved Documents, and publish a call for evidence about a wider technical view on the guidance on fire safety.

## FPA speeds up cladding tests

The Fire Protection Association (FPA) says it has accelerated its process for testing combustible building materials in the wake of the Grenfell Tower tragedy. Construction companies and clients will now be able to get the results of tests within two weeks.

Two new test rigs have been made available at the association's Moreton-in-Marsh headquarters.

'The FPA has been instrumental in guiding research in the testing of external cladding systems and the use of non-combustible materials,' said managing director Jonathan O'Neill. 'To help facilitate a change, the FPA has created capacity within its testing facilities. It provides an independent, timely, cost-effective service, administered by experts.'

## Contractors enjoying infrastructure surge

The growth in new infrastructure construction activity gained momentum over the summer, according to market analysts Glenigan. It used figures from publicly quoted contractors Balfour Beatty, Morgan Sindall and Costain to track rising activity in road and rail work as investment starts to have an impact, and as work gets under way on national projects, including High Speed 2.

Glenigan Construction data shows civil engineering starts rose by 15% in the quarter to August, compared with the same period a year ago.

# Manufacturers call for EU rules alignment after Brexit

## Increase in barriers to trade will have an impact on UK's global competitiveness

Four out of five manufacturers in the industrial product supply sector want continued regulatory alignment with the EU after Brexit, according to a survey by the advisory body EURIS and analysts at the UK Trade Policy Observatory (UKTPO).

Of the industrial product manufacturers, including firms in the building services engineering sector, that responded to the survey, 83% support continued 'barrier-free trade' in order to remain competitive in a global market. Most respondents said they could not see any benefit in moving away from EU regulations for their products.

They warned that currency upheaval after the referendum had already disrupted their supply chains and the remaining EU members had started to select non-UK suppliers because of

the uncertainty around 'Brexit' arrangements.

They added that a no-deal Brexit would 'cause severe damage and must be avoided'.

The survey results are included in the *Securing a competitive UK manufacturing industry post-Brexit* report, which said imports account for more than half of total costs for 44% of companies, so any increase in barriers to trade will have a significant impact on the UK's global competitiveness. Four in 10 companies said they would face a skills shortage without EU workers and 15% of survey respondents claimed even a two-hour delay at customs would impose additional costs on their business.

'The longer the uncertainty over the Brexit process continues, the more long-lasting damage will be incurred by our businesses,' the report said. 'It is not a choice of exporting to Europe or the rest of the world. If we become less competitive in the EU, we will be less competitive in other international markets.'

# Output up, but new orders on the slide

Construction output rose by 3.3% in the three months to July, according to the Office for National Statistics (ONS). However, forward orders look grim. The industry experienced three months of steady growth - 2.9% in May, 1.4% in June and 0.5% in July - after a weak start to the year caused by poor weather and the collapse of Carillion.

Repair and maintenance work increased by 5.3% and new work was up 2.3%, the ONS said, but forward orders dropped for a third consecutive quarter to their lowest level since 2013 - largely because of a 17.6% plummet in planned new housing. Private industrial and public infrastructure were

also down, 18% and 23% respectively. 'The ONS construction new orders look terrible,' tweeted Noble Francis, chief economist at the Construction Products Association.

'Q2 construction new orders were 6.5% lower than in Q1 and 7.4% lower than a year ago, with falls in most sectors and sharp falls in public non-housing (education and health), industrial and commercial offices and retail.'

He said Brexit was to blame. 'The uncertainty is largely affecting new contracts where it is high investment upfront for a long-term rate of return - industrial factories, commercial offices and high-end residential. If/when uncertainty falls, we could see a surge in this area.'

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## Brunel develops Lego-style solar panels

**Photovoltaic cells combined with flat heat pipes to transfer unwanted heat away from surfaces and re-use it**

Solar panels that click together 'like Lego' are being developed at London's Brunel University as part of £10m sustainable energy scheme.

Funded by Horizon 2020, the project aims to perfect a flexible, solar-powered renewable energy system that generates heat from hot water and electricity.

The 'PVadapt' hybrid panels combine photovoltaic (PV) cells with flat heat pipes, which transfer unwanted heat away from surfaces. PVadapt aims to use the heat pipes to cool the PV cells to make them more efficient and longer lasting - with the removed heat being reused.

'There is no waste heat with our system,' said technical coordinator Professor Hussam Jouhara. 'The approach focuses on low-cost, high-efficiency and modular prefabricated, Lego-type construction elements for near-zero-energy buildings.'

PVadapt is a team effort involving 18 organisations from 11 countries. Click-in-place hybrid solar roof panels are to be installed into eight buildings - including homes, offices and shops - in Spain, Greece, Austria and Portugal.



## California passes law to be carbon free by 2045

US state California has defied President Donald Trump and passed a law committing it to carbon-free electricity by 2045.

It is the second state, after Hawaii, to commit to carbon-free energy, and Governor Jerry Brown said there was 'no understating the importance of this measure'. He added that California would honour the USA's commitment to the 2015 Paris climate accord, despite the President's determination to withdraw from it.

The new legislation requires utility companies to generate 60% of their energy from renewable sources by 2030. By 2045, all Californian electricity must come from carbon-free or renewable energy. Currently, around one-third of its retail electricity sales come from renewable sources

Some utility companies have condemned the new law as 'not affordable... not sustainable', despite widespread praise for Governor Brown from environmental groups.



## Schools face challenging air-quality upgrades

**Use of 'hybrid' or 'mixed mode' systems is addressed for first time**

Changes to government guidelines for school buildings published in the new Building Bulletin 101 (BB101) have set challenging targets for improving indoor air quality, thermal comfort and ventilation.

A new requirement for fresh air rates of five litres per second per person is a major change from the last version, published in 2006, with a 'purge' fresh air rate set at 8 litres per second per person for all new-build teaching spaces. As a result, many educational facilities are expected to review their air quality strategies and may be forced to carry out expensive upgrades, experts say.

Natural ventilation systems must be able to reduce carbon dioxide (CO<sub>2</sub>) levels to below 1,500 parts per million (ppm), with mechanical ventilation

achieving 1,000ppm. CO<sub>2</sub> levels cannot exceed 1,500ppm for more than 20 minutes in any new classroom. Refurbished teaching spaces must now achieve an average CO<sub>2</sub> level of below 1,750ppm.

Where mechanical ventilation is used, it should not be the sole means of summertime ventilation in occupied spaces, according to the new BB101. Windows or vents should be provided to ensure an 'effective opening area' equivalent to approximately 3-5% of the floor space. Natural ventilation should be the first option for designers where the school is in a rural location, it adds.

The use of 'hybrid' or 'mixed mode' systems is addressed fully in the guidance for the first time and eliminating cold draughts has been made a priority, to prevent teachers from closing windows and compromising the overall ventilation design.

## New trends reflected in revised energy management standard

The ISO 50001 energy management standard has been revised and updated for the first time since it was introduced seven years ago.

Developed by the International Organization for Standardization (ISO), and represented in the UK by the British Standards Institution (BSI), the revised version reflects new trends, such as rising energy costs and climate change. It offers step-by-step guidance on how businesses can reduce energy costs and grow more sustainably while complying with legislation.

The new standard, which is used by more than 20,000 businesses and organisations worldwide, places a stronger emphasis on the role of top management. It has also been brought in line with the revised versions of ISO 9001 and ISO 14001.

BSI's head of sustainability, David Fatscher, said the update tackled significant changes in technology, scientific knowledge and the regulatory environment.

### IN BRIEF

#### Ex-Skanska director to lead 'transforming construction' plan

Skanska's former innovation director Sam Stacey is to head up a £170m programme, run by UK Research and Innovation (UKRI), to 'transform the construction industry'.

The scheme is linked to the Construction Sector Deal and includes funding for research, a new construction network, and the creation of an active building centre and innovation hub. Its finance will be drawn from the main £1.7bn Challenge Fund aimed at stimulating the UK's research base.

UKRI was created in April 2018 and unites the seven existing research councils – as well as Innovate UK and the Research and Knowledge Exchange functions of the Higher Education Funding Council for England (HEFCE) – into a single organisation.

A key aspect of Stacey's role will be to bring together researchers and businesses to identify construction innovations.

#### Teasdale wins ECA Edmundson Award

Jack Teasdale, of Tyne and Wear's Opus Building Services, has been crowned 2018 ECA Edmundson Apprentice of the Year.

The 21-year-old, who was trained by provider JTL, won £1,500 and a study tour to France. He will also go on to be an ambassador for the electrotechnical industry over the next 12 months.

Teasdale said: 'One of my mentors was himself the winner of this award in 1997, so it's an honour to follow in his footsteps.'

The two runners-up, who each won £750 and a toolkit, were Niall Watson, of Derry Building Services, and Conor McCarthy, of Darke and Taylor.

#### Pepper steps down as Lochinvar MD

Former CIBSE board member David Pepper has moved from managing director to business development manager at boiler, water heater and heat pump company Lochinvar. Eelco van Driel has taken up the role of general manager and Liam Elmore has been promoted to sales director.

Pepper, who was Lochinvar MD for 20 years, will focus on sales and marketing in his new part-time role, while continuing to give support to the management team.

Van Driel was general sales manager of a European water heater company for 20 years – including 10 years' experience in the UK – and Elmore joined Lochinvar in April 2014 as UK sales manager.

## RAMBOLL WINS AT WEMBLEY



Ramboll is to design and deliver a heat network for 20 newly constructed buildings on the £3bn Wembley Park regeneration project, developed by Quintain. A single energy centre will distribute low temperature hot water 3.5km across the site. Ramboll is working with manufacturer SWEP to install a system that uses returned water from the radiator circuit heat exchanger to pre-heat domestic hot water. Ramboll is also providing engineering design services on the site, including structural, energy and civil engineering services.

### Two peers call for payment reform

Former cabinet minister Lord Adonis has called for reform of the construction industry's payment practices. He said the construction industry must drive out wasteful processes and bad practice.

'This includes eradicating payment abuse and manipulation of the cash-flow process, which impacts upon quality and delivery within time and cost,' added the former chairman of the UK Infrastructure Commission. 'I see no reason why we can't insist that projects use project bank accounts. Furthermore, the government should support the Construction (Retention Deposit Schemes) Bill, submitted by Peter Aldous MP, which protects cash retentions.'

This intervention in the supply chain payment row was welcomed by the Specialist Engineering Contractors' Group. Its president, Lord O'Neill, said: 'The solutions referred to by Andrew Adonis will help to curb payment malpractice.'

## Ministers and union demand more action over Carillion

### No senior official oversaw company in period leading up to its liquidation

The government has been criticised in the wake of Carillion's collapse for failing to review the role of officials and the monitoring system tasked with overseeing major public sector contracts.

The committee leading the parliamentary inquiry into Carillion said the Crown Representative system should be overhauled because it had failed to give early warning of the impending implosion of such a key public sector supplier. The current system was dismissed as 'semi-professional and part-time' by the inquiry chairs, after it was revealed that no senior official oversaw Carillion during a critical period leading up to its liquidation in January.

In a letter to the Cabinet Office, they said it was 'astonishing that there has been no

indication of any government action to resolve this'. Committee chair Frank Field MP said: 'This [lack of] response illustrates the complacency that got us, the public purse and some key public contracts into this mess. The picture the Cabinet Secretary paints of our Crown Representatives is more Johnny English than James Bond.'

Meanwhile, trade union Unite has called for an urgent criminal investigation into the Carillion episode. At the TUC Congress in Manchester, assistant general secretary Gail Cartmail said there was 'nothing normal about the biggest corporate collapse in the UK's history', and - if no laws were broken - 'then we need, better, stronger laws'. 'While thousands of workers have been thrown on the scrapheap, those responsible for driving the company into the ditch have dusted themselves off and started again, as if nothing had happened,' she added.

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## IN BRIEF

### How your expertise can help children

In the latest CIBSE blog, James Collins, operations manager for an M&E contractor, talks about being a school governor and how his experience as a building services engineer is making a difference to children in his community.

'Running a school is so much more than teaching children in a classroom – which is why schools need support from people in a variety of fields,' says Collins, who acknowledges that being a school governor also has benefits for his working life. 'Using softer skills like negotiating, being open to other viewpoints, and managing general discussions are helpful to take back to work.'

Go to [www.cibseblog.co.uk](http://www.cibseblog.co.uk) to read Collins' blog.

### Society launches digital awards

The Society of Digital Engineering (SDE) has launched its digital awards to showcase excellence and best practice for clients and engineers, contractors and manufacturers who use digital engineering to deliver better outcomes.

The awards aim to recognise and reward excellence and achievement in digital engineering in building services, and celebrate digital innovation in all its forms.

Entries are being sought for categories including: best innovation; best process and application; best digital engineer; best contractor; best manufacturer; best consultancy; best project/collaboration small; best project/collaboration large; and digital champion.

Entries need to be received by 22 October, with judging taking place in early November. Winners will be announced at Build2Perform Live on 27 November. For more information and to enter, visit [www.cibse.org/sdea](http://www.cibse.org/sdea)

### Sponsors sought for annual dinner

The CIBSE North West Annual Dinner takes place on 25 January 2019 at the Midlands Hotel, Manchester. Early booking is recommended as places sold out fast last year. For details, or to sponsor the event, contact Colin Lehane at [clehane@idom.com](mailto:clehane@idom.com)

# New Digital Engineering guide on soft landings

## Improvement to final constructed asset should outweigh soft landings cost

The latest publication in the Digital Engineering series has been released. DE9: *Application of Soft Landings & Government Soft Landings in Building Services Engineering* is intended for those who specify, commission and deliver soft landings or government Soft Landings on construction projects.

It is not meant to be an exhaustive or definitive document, however, and users will need to exercise their own professional judgement.

Soft landings – whether for governmental use or not – are intended to ensure the constructed asset runs as designed, and that it has been designed to run effectively. The

financial logic behind this approach is that a constructed asset will cost far more to run than it will to design and construct, so – for a small addition of capital expenditure – it should be possible to create a far greater saving in operational expenditure.

Other benefits include a reduction in the costs of defect rectification and improvements in the functionality of the constructed asset.

Soft landings involves the inclusion of facility management requirements from the earliest design stages, and the input of the design and construction teams once the facility is occupied, post-completion.

The essence of the process is to improve performance outcomes of a construction project in terms of energy efficiency, user comfort and general operation. It involves better consultation with facility managers and other key stakeholders during briefing and early design stages, to ensure lessons learned from other projects inform design decisions at the beginning.

Soft landings also requires more focus on managing operational and defect risks during the construction phase, and better input from design and construction teams after handover.

While this process implies associated cost, the savings generated by soft landings – and the improvement to the final constructed asset – should far outweigh this.

DE9 and the rest of the series is available at [www.cibse.org/des](http://www.cibse.org/des)



# Piner is the pick of the undergraduates



Dr David Sanders with Jake Piner

Portsmouth University student Jake Piner has won the CIBSE Undergraduate Award 2018.

Piner studied for a BEng in mechanical engineering and took the prize with his final-year project, 'Analysing the benefits of a well-engineered building control system'. He will be presented with £500 and a certificate at the President's Awards Dinner on 12 October.

A trophy will also be awarded to Piner's course tutor, Dr David Sanders, in acknowledgement of Portsmouth University's achievement.

Robert Ralph, from Dublin Institute of Technology, and Thomas Lusty, from Coventry University, were runners-up, and will each receive a prize of £100.

The award, sponsored by Hays Building Services, is designed to encourage students to develop their potential and aim for excellence.

It is awarded to those in their final year of a building services course accredited by CIBSE, and recognises their academic achievements.

## Young Lighter of the Year longlist revealed

To preview the potential winner of the 2018 SLL Young Lighter of the Year competition, visit [www.cibse.org/sll](http://www.cibse.org/sll), where you can view the longlist of video submissions. This includes:

- Emma Beadle - 'Children's utopian visions of the city: co-designing lighting masterplans through play and exploration'
- Katia Kolovea - 'Light as a medium to enhance communication in urban spaces'
- Carla Piatti - 'Interactive lighting in public spaces'
- Sunny Sribanditmongkol - 'Design strategies for daylighting in a Thai rowhouse'
- Sanny Yuwono - 'Is there a threshold for the degree of chroma used to allow colour in exterior lighting without making the building incongruous to its surroundings?'

At the time of going to print, the judges were still deciding on the shortlist of finalists, who will present their papers at the LuxLive exhibition, at London's Excel, on 15 November. The winner will be announced at the Lux Awards that evening.

The competition helps young lighters show their research and hone their presentation skills.



## Six on the shortlist for employers' award

**Small, medium and large companies will compete for overall winner status**

Six businesses have made the shortlist for this year's Employer of the Year Awards.

The accolades celebrate organisations with progressive strategies for recruiting, nurturing and empowering young people. There are three award categories, for small, medium and large companies, with one overall winner. The shortlisted companies are:

- **Small:** S I Sealy & Associates and Services Design Solution (SDS)
- **Medium:** Elementa and Black & White Engineering
- **Large:** Aecom and Hoare Lea.

Together with the Graduate of the Year competition, the awards form part of the CIBSE Young Engineers' Awards, sponsored by

Andrews Water Heaters, Kingspan Industrial Insulation, Swegon Air Management and the CIBSE Patrons.

Kevin Mitchell, chair of the CIBSE Employer of the Year judging panel - and the first winner of the graduate award - said entries had been particularly difficult to separate.

'The standard was very high, which is extremely heartening in light of the sector's ongoing battle with skills shortages,' he said.

Winners will be announced at the awards night on 11 October, at the Institution of Mechanical Engineers, in London, where the Graduate of the Year finalists will also give their presentations. You can find out more about the student finalists on page 22.

The event is free to attend, but pre-registration is required. For more details, visit [www.cibse.org/yea](http://www.cibse.org/yea)

**Last year's winners in Tandem Systems**

## New members, fellows and associates

### FELLOWS

<b>Ng, Hon Lam Albert</b> Hong Kong, Hong Kong
<b>Coker, Isaac Kweku</b> Dubai, United Arab Emirates
<b>Perry, Keith Murray John</b> Dubai, United Arab Emirates
<b>Dunne, Mark Eric</b> Huntingdon, United Kingdom
<b>Raghobur, Komal</b> Caterham, United Kingdom
<b>Luk, Wang Tin Martin</b> Kowloon, Hong Kong
<b>Wan, Kwok Wah, Vincent</b> Tin Shui Wai New Territories, Hong Kong
<b>Wu, Wing Kin Dennis</b> Taikoo Shing, Hong Kong
<b>Shea, Tat Chi</b> Kowloon, Hong Kong

### MEMBER

<b>Hendrix, Garry</b> Melbourne, Australia
<b>Torre, Roseller Jr</b> Singapore, Republic of Singapore
<b>Spinozzi, Elisabetta</b> London, United Kingdom
<b>Bednarski, Maciej</b> London, United Kingdom
<b>Masourekos, Giorgos</b> Nicosia, Cyprus
<b>Gibbs, Andrew</b> Devon, United Kingdom
<b>Cichon, Maciej Michal</b> Hong Kong, Hong Kong
<b>Lum, Kam Cheung</b> Wong Tai Sin, Hong Kong
<b>Wang, Aaron Juan</b> Pu Dong, China
<b>Ho, Ka Lam</b> Shatin, Hong Kong

<b>Liu, Wai Yeung</b> Ap Lei Chau, Hong Kong
<b>Wong, Chi Ming</b> Cheung Sha Wan, Hong Kong
<b>Casuso, Pablo Valcarce</b> Billericay, United Kingdom
<b>McEvoy, James Michael</b> County Down, United Kingdom
<b>Barker, David Ian</b> Slough, United Kingdom
<b>Wong, Hong Chye</b> Auckland, New Zealand
<b>Lam, Tak Yeung</b> Yuen Long, Hong Kong
<b>Vig, Zsolt</b> Dubai, United Arab Emirates
<b>Cheung, Kin Ho Eric</b> Yuen Long, Hong Kong
<b>Cheung, Lap Fai</b> Tseung Kwan O, Hong Kong
<b>Lee, Ka Fai</b> Choi Hung, Hong Kong

<b>Ho, Kwok Wai</b> Tseung Kwan O, Hong Kong
<b>Chou, Ho Kit</b> Wanchai, Hong Kong
<b>Wong, King Fai</b> NT, Hong Kong
<b>Ward, Garreth</b> Dundalk, Ireland
<b>Shan, Kui</b> Hung Hom, Hong Kong
<b>LICENTIATE</b>
<b>Shepherd, Hannah Jane</b> Bath, United Kingdom
<b>Rust, Thomas B</b> Brandon, United Kingdom
<b>Kazane, Anna</b> Sharjah, United Arab Emirates
<b>Collins, Jacob</b> Leamington Spa, United Kingdom
<b>Alshibli, Mohammad</b> Amman, Jordan

Calvin Barrows: Solar paint can help cool tubes



## Readers discuss tube overheating, heatwave resilience through acclimatisation, and building pre-heating

### Resilience during heatwaves

On the hottest day so far this year – 26 July – the House of Commons Environmental Audit Committee published its ninth report of the session, *Heatwaves: adapting to climate change*. Professor Paul Cosford, director of health protection and medical director at Public Health England, informed the committee that the higher rate of heat-related illness and mortality occurs in the first two to three days of a heatwave. Heat-related deaths then tend to fall, partly because of acclimatisation.

The report calls for local authorities to be responsible, requiring all new buildings to be assessed for summer comfort through dynamic thermal modelling. When undertaken to the current guidance, modelling will often show that cooling is required to meet the necessary comfort standards, unless a small degree of overheating can be proven to be acceptable.

As engineers, we tend to go straight to the standard design criteria as soon as cooling becomes necessary. It offers safety in terms of our PI and gives us design margins to make sure we hit the nail with a hammer that's between 110 to 120% of the size required. The result is a premium comfort environment at the continued expense of our environment. We need to investigate what cooling for essential health looks like, giving engineers the opportunity to design systems that limit peak temperatures to reduce the heat stress that causes illness. This may be to limit cooling to workspaces and living areas to 28°C and bedrooms to 26°C.

Cooling should be provided to 'respite' areas, such as

communal lounges of nursing homes – new and existing – so those most at risk have access to the necessary environment for their health.

We can challenge technology to provide carbon and cost-effective solutions to our increasing need for cooling. SAP 10 and the proposed new carbon factor for electricity will promote the use of heat pumps. Perhaps we can begin to use these to cool dwellings while putting the recovered heat into our hot water. Such systems open opportunities to dissipate or share the heat via ambient district heat networks – previously installed for the now carbon-positive CHP systems – thus eliminating a major cause of overheating in apartment buildings in London, and reducing the pollution that affects health during a heatwave.

The next question we should be asking ourselves is whether our air conditioned offices are preventing or limiting the adaptability and acclimatisation that helps us deal with higher temperatures, putting us at greater risk of heat-related illnesses. If we act now, we can use our experience and knowledge to help the regulations get it right first time. Through creating the criteria and methods needed for buildings to achieve life-sustaining temperatures, we can minimise the in-use burden on our energy systems that retrofits are likely to impose.

*Darren Coppins, MCIBSE*

### Sun shields for tubes

I am concerned that the message from London Underground on tube overheating is being received without critique. A CNBC article recently stated that 'for all the technological advances in the world, nothing will stop the rising heat surrounding the London Underground train network'. This is not true. There is a very simple technology that could make the difference.

Cooling the stations is not going to address the very real risk of getting trapped in an overheated train in a tunnel. The train overheating needs addressing.

It appears Transport for London (TfL) has never monitored the trains to ascertain when they take on most heat. So it is convinced they absorb most of the heat in the tunnels, and has concluded this must be from the traction motors and brakes. My temperature-monitoring results, however, have demonstrated that trains gain more heat in the summer overground, than underground.

On the surface, trains generally travel greater distances at a constant speed, because the stations are further apart and, when they brake and accelerate, there is a better chance of the resulting heat being released into free air. That being the case – and with the train gaining more heat on the surface than in the tunnel – it can't be the brakes and traction having the greatest effect.

If Australian Navy patrol boats can achieve surface temperatures 15-20°C cooler using solar reflective paint ([bit.ly/CJOct18aus](http://bit.ly/CJOct18aus)), then why are London Underground trains immune from this phenomenon in the summer? They are not. They are absorbing heat from the sun on the surface and then emitting some of that heat in the tunnels. That is why there is an irrefutable correlation between the weather and the metro overheating. Effectively, TfL is sending eight significant storage heaters into the tunnel every two to three minutes.



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We have a full-scale test going on at Glasgow Subway, which travels its whole route underground. It was built a little after London's tube was started in the late 1800s, but the infrastructure and train stock is very similar. The weather is cooler in Glasgow, but it did reach 31°C this summer and the operators – Strathclyde Partnership for Transport – said this did not cause a problem. Tunnel temperatures hover around 16°C. The trains are shorter, but so is the total tunnel length – so, if heat was a problem, it could affect the lower volume more quickly, but it doesn't. Trains are stabled appropriately in the heat of the day, in sheds with the doors open – the parasol effect. Braking and traction would be more frequent than on London's network because there are 15 stations on a 10.5km track.

Knowing and acting on the above information will benefit metros the world over. It will also represent a significant cost saving on new-build metros and reduce operating energy costs.

*Calvin Barrows*

### Send in the cleaners

I've prepared an energy analysis ([bit.ly/CJOct18JH](http://bit.ly/CJOct18JH)) showing savings by reducing the design pre-heat period to two hours – instead of three or more – coupled with cleaning buildings in the morning, instead of the evening. This reduces the two-hour pre-heating, saving 6-20% of energy for the 112.5m<sup>2</sup> factory example, shown on page 5.31 in *CIBSE Guide A: Environmental Design 2006*.

Similar analysis was conducted for two multifloor office buildings with U and Y values similar to those for the factory, producing savings of around 42% (three hours pre-heat) to 66% (10 hours pre-heat) for a two-floor, 900m<sup>2</sup> office, and from around 53% (three hours pre-heat) to 72% (10 hours pre-heat) for a 10-floor 9,000m<sup>2</sup> office, with no distribution losses. These savings are because many buildings become/approach self-heating after occupancy at the average winter temperature, making the pre-heat load the predominant daily heating load, and its reduction significant.

The analysis includes calculations each hour of an average low 5.44°C London winter day and different pre-heat times. At 5.44°C, the heaters have a quicker structural warming time than the -1°C design outdoor temperature. The paper shows calculations to determine this reduction. The first spreadsheet for the factory includes cleaning in the morning, with about 1.07 hours pre-heat time at 5.44°C outdoor temperature, instead of two hours at -1°C. The other sheets have cleaning in the afternoon and energy-use comparison with the first sheet. The analysis shows the factory approaches self-heating, while the offices become self-heating at – or just after – occupancy at 5.44°C average winter temperature with heat from lights, equipment and people.

*John Hammond, MCIBSE*

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# The future of refrigerant

**Graham Wright explains what can be done now and in the longer term to manage the use of refrigerants as the next quota reduction approaches in 2021**

Despite the focus moving to low global warming potential (GWP) refrigerants, it is important to recognise that engineers and consultants should not be concerned about specifying units that use R410A. For some applications, such as larger VRF/VRV systems, this is still the best option for customers. The phase-down does not include a complete ban on the use of R410A, and F-Gas producers – such as



Daikin Industries – are committed to maintaining the supply of a range of refrigerants to meet the needs of air conditioning, heating and refrigeration systems.

However, the perceived uncertainty about the prices and availability of these products has meant many are unsure about planning and costing future installations. In response to this, Daikin has launched a new service – Commission with Confidence – with set prices for a package that includes the supply of R410A trim charge for new installations until March 2019.

Beyond the immediate change to how and where virgin refrigerants are used, the industry also needs to make more effective use of refrigerants already in circulation. Figures from the European Environment Agency show that, despite increases in levels of reuse in recent years, the volume of reclaimed gases represents just 5% of the total produced. Encouraging the recovery, reclamation and reuse of refrigerants when systems are serviced or replaced will be an important part of maintaining the supply of gases over the next two to three years.

In the longer term, the aim will be to move to lower GWP options entirely and, while there are a number of options available, R32 is generally recognised as the most suitable replacement in comfort cooling applications. R32 versions of the VRF/VRV systems are being developed, but it will take time to redesign and engineer compressors and heat exchangers intended for use with the new refrigerants.

While R410A is still a wise choice for a number of applications, the efficiency and recyclability of R32 means that, in the long term, switching will have benefits beyond the environmental impact.



**GRAHAM WRIGHT** is legislation and compliance manager at Daikin UK [www.daikin.co.uk](http://www.daikin.co.uk)

# Chequered future

Regulations covering the use of fluorinated gases and ozone-depleting substances will be affected by the UK leaving the EU on 29 March 2019. Hywel Davies considers the consequences

F-Gases are used as refrigerants and in fire-suppression equipment. They are subject to stringent rules about their use and replacement, and those who work with them must be trained, competent and registered to do so.

Many of these requirements are set out in the EU F-Gas Regulation. As a regulation, not a directive, it has direct effect across Europe, and – although aspects of it require implementation through national legislation – the principal requirements are contained in the European legislation.

So what happens when the UK leaves the EU? Even if Theresa May's Chequers deal goes through in some form, there is still the issue of what replaces the rules in the F-Gas Regulation – and what if there is no deal?

Last month the government released a guidance note<sup>1</sup> on 'Using and trading in fluorinated gases and ozone-depleting substances if there's no Brexit deal', setting out how the UK would continue to regulate the trade and use of F-Gases and ozone-depleting substances (ODSs) if the UK leaves the EU without a deal. (See panel for more detail on EU F-Gas and ODS regulations).

The F-Gas Regulation bans certain uses, requires leakage checks, and stipulates that handlers of F-Gas must be trained and certified. Certificates are mutually recognised by EU countries, so someone certified in one EU country can work in another.

The European Commission allocates quotas to businesses, permitting them to place quantities of



“Whatever happens to the Chequers deal, getting F-Gas competence right for the UK outside the EU could be a matter of life and death”

hydrofluorocarbons (HFCs) on the EU market each year. The regulation requires the quota to be reduced to achieve a 79% cut against 2009-12 levels by 2030. The greenhouse gas emissions savings delivered by the F-Gas Regulation are counted as a contribution to the savings required to meet UK carbon budgets under the Climate Change Act.

Enforcement of the ODS and F-Gas regulations is mostly devolved – to the Environment Agency in England, the Scottish Environment Protection Agency, the Natural Resources body for Wales, Welsh local authorities, port health authority or Welsh ministers, and the Department of Agriculture and Rural Affairs (Daera) and district councils of Northern Ireland.

Government says that 'in the event of a "no deal", the UK would maintain the same high standards', and that 'the majority of the requirements in the EU ODS and F-Gas regulations will continue to apply in the same way after the UK leaves the EU, including in the unlikely event of no deal'. This is clearly essential if we are to meet Montreal Protocol and Climate Change Act obligations.

Current quota systems operate at EU level and apply to companies, not countries. In the event of no deal, a UK quota system will be needed, splitting UK and EU markets. New IT systems for the UK HFC and ODS registry and reporting will be required, but reporting requirements will not change.

Businesses that produce, import or export HFCs, ODS or products and equipment pre-charged with HFCs or ODS would need to apply for a UK quota to place them on the UK market.

A 'no deal' Brexit will also have an impact on technicians with competence certificates to work with F-Gases. Those issued by EU-recognised bodies will still be valid in the UK, so technicians holding them may continue to work here.

Those certified by UK bodies are likely to need to be recertified by an EU-recognised body to work in the EU, unless the EU decides to continue recognising such certificates. So technicians from Ireland will be free to work throughout the UK, but the reverse may not apply.

This is an important consequence. There is already

## EU REGULATIONS

Regulation 1005/2009 on ODS implements the Montreal Protocol and restricts the use of chemicals that damage the ozone layer. It bans certain products containing ODS and requires companies to control leakages, report on their usage, and seek a licence to import or export ODS. The regulation also enables the European Commission to set quotas for companies to allow them to place limited quantities of ODS on the market for certain permitted activities.

The F-Gas Regulation (517/2014) is phasing down use of HFCs, the main group of F-Gases, to help mitigate climate change and implement obligations under the Montreal Protocol to phase down HFCs globally by 2036. However, the F-Gas Regulation requires a faster rate of phase-down than the Montreal Protocol, and extends controls to a larger number of F-Gases.

# Prepare to put the value back

Grenfell is changing attitudes to building services specifications, says Robin Vollert

There is a very good reason why building services now account for a greater proportion of the overall cost of projects – commonly between 35 and 50%. Our technologies are increasingly required to deliver better comfort and health conditions inside buildings while supporting clients' strategies for minimising energy use and – above all – making buildings safe.



More often than not, however, the user is blissfully unaware of what our systems are doing. As long as they are not too hot or too cold – and cannot hear, see or smell anything – they are content. We only come to their attention when there is a problem. That is starting to change in the wake of Grenfell, and – in 2019 – we should expect to be challenged like never before to provide hard evidence of our technical quality and our people's competence.

Dame Judith Hackitt's Review of Building Regulations and Fire Safety was tough on our industry, but it stressed the importance of clients taking greater responsibility for the products that go into their buildings. It also underlined how breaking specifications can compromise performance and threaten occupant wellbeing.

Despite the tragedy, the scourge of 'value engineering' has not gone away; crucial components of building engineering systems are still being changed from the original design to cut upfront costs. There can be good reasons for this, but changes should never be sanctioned without full awareness of how they could alter performance. For example, Arup's report into the Grenfell fire strategy revealed that the fire- and smoke-control system in use was not the same as the one originally designed. There was also no evidence that it was ever fully commissioned.

Some clients are worried about the implications this may have for their buildings, and are rushing to fill in the information void by asking contractors to give evidence of completed work – in some cases, from projects going back many years. The industry should welcome this scrutiny. We should also support the Hackitt review's proposal for each project to have a 'golden thread of information' provided by digital record keeping and BIM models.

Manufacturers welcome the opportunity to see where our products end up and to have more involvement in the design and construction process, to help deliver more compliant and fit-for-purpose designs.

**Swegon**  
Air Management

**ROBIN VOLLERT** is managing director at Swegon Group UK&I [www.swegonair.co.uk](http://www.swegonair.co.uk)

confusion and ignorance around work with F-Gases and the requirements for those who do so to be correctly trained and certified. Maintaining high standards requires clarity over the rules for work with F-Gases after 29 March 2019.

It also requires continuing education and awareness of the potential risks of working with flammable refrigerants – as the tragic deaths of Barry Purtell and David Lobb, two untrained workers in the state of Victoria, Australia, demonstrates. The two men died after gases from a refrigeration compressor ignited in the cellar of the Hotel Rochester, Bendigo, in June 2014<sup>2</sup>. (See news on page 7).

The two men, who were not qualified refrigeration technicians, were helping to close down the hotel by removing the refrigeration compressor in the basement. The coroner noted that the 'deaths highlight the dangers of unqualified people doing work that requires qualifications or, at least, a solid understanding of the substances and risks involved'.

The coroner said the move to flammable refrigerants with lower global warming potential will exacerbate the challenge of ensuring that those working with these gases are competent to do so safely.

He referred to the evidence of Phil Wilkinson, manager of government relations and technical services at the Australian Institute of Refrigeration, Air Conditioning and Heating, who explained that fewer than 1% of air conditioning technicians in Australia are trained to work with flammable, and sometimes toxic, refrigerant gases. This shows that, whatever happens to the Chequers deal, getting the F-Gas training and competence regime right for the UK outside the EU could be a matter of life and death.

CIBSE is working with the Air Conditioning and Refrigeration Industry Board to raise awareness in government and parliament<sup>3</sup> that this is a serious matter of public and workplace safety. Members specifying, installing or maintaining refrigeration systems need to be well aware.

## References:

- 1 Defra, *Using and trading in fluorinated gases and ozone-depleting substances if there's no Brexit deal*, 13 September 2018 – [bit.ly/2NVmHGH](http://bit.ly/2NVmHGH)
- 2 Coroners Court of Victoria, *Finding: Inquest into the death of David William Lobb* – [bit.ly/2xmgOJO](http://bit.ly/2xmgOJO)
- 3 Acrib, *Environmental Audit Committee F-Gas Report*, 25 April 2018 – [bit.ly/2PPWIEK](http://bit.ly/2PPWIEK)

**DR HYWEL DAVIES**

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

# BRIGHT SPARK

The Society of Light and Lighting's new president, Iain Carlile, aims to spread the word on good lighting and show how exciting a career in the sector can be. Liza Young finds out more

**L**ighting design should always start with the person for whom you are designing, and their needs and requirements, says Iain Carlile, associate at dpa lighting consultants.

The new Society of Light and Lighting (SLL) president wants to spread the message about good lighting to the general public, as well as the wider construction industry. 'Good lighting has to be visually comfortable, and designed for the person and the task they're doing,' he says. That task can vary, so the light also needs to be variable, and avoid glare and excessive contrast.

When a space is badly lit, you know it, adds Carlile. 'We've all been in a restaurant where the lighting has been badly focused, shining directly into your eyes causing glare when you're supposed to be looking dreamily at the person sitting opposite you. A well-designed lighting scheme is one you don't necessarily notice, because you enjoy the space for its function and appreciate the beauty of the objects being lit without being distracted by the lighting equipment.'

It should also change during the day. 'For example, a restaurant should be light and airy in the morning during breakfast, and – in the evening – intimate and low-key, and all about the person you're having dinner with, isolating you from others around you,' says Carlile.

This, he adds, can be achieved with controls. The change between daytime and evening scenes can be set over a 10-minute fade, so you don't notice it changing. It can also be linked to time clocks, based on sunset



SLL president Iain Carlile says lighting marries up engineering with the artistic

and sunrise. 'In the summer, 9pm is completely different from 9pm in the middle of winter, so your lighting needs to adjust to the time of day and the time of year,' says Carlile, who believes these nuances can mean the difference between a good and bad lighting design.

## Technical roots

Cynics would say lighting consultants 'point and squirt', but Carlile points out that you need to be able to validate and prove your designs, especially where lighting levels are critical. 'At concept, what we do is typically more visual – selling the idea about how the spaces might look to a client – but it has to be grounded in sound technical knowledge. There's no point presenting a concept that won't work technically.'

A lot of technical knowledge is needed to specify the right type of luminaires, to ensure the light source is correct, and to understand the technical properties of the light specified, he adds. 'What is the spectral distribution of it? How is it controlled? How does it interface with the dimming system? You need to understand and interpret requirements – that vary from country to country – to ensure they are met, while creating a stimulating and interesting environment.'

Such understanding is especially important at the schematics stage, when the concept is interpreted into detailed drawings and specifications, and coordinated with other teams. 'We don't work in a vacuum: successful projects have cooperation between teams. A firm background in engineering has helped me with that interface,' he says.

## The future of tech

The continual refinement of light-emitting diode (LED) lighting fascinates Carlile, who believes its development is akin to an arms race between manufacturers trying to get more lumens per watt –

## SEEING THE LIGHT

As a child, self-professed geek Carlile was interested in science fiction, *Doctor Who*, the *A-Team*, Lego, and Airfix kits. He studied science and maths at A level, and spent a year at British Nuclear Fuels' Magnox Generation Group, working as a computer programmer – a job he soon realised wasn't his passion.

At the University of Exeter, Carlile studied general engineering before specialising in electronic engineering. During his summer holidays, he worked at Swindon-based building services consultancy TDP, where he was exposed to all aspects of building services engineering. 'But my interest always lay in electrical and electronics – and lighting design really grabbed me.'

At the time, his interest in lighting was numbers-driven – what did 500 lux look like? 'I was trying to understand how the numbers related to how someone envisaged the space. Later, I worked out that numbers only get you so far. Lighting is the one part of the built environment I believed could influence people, because a large part of their appreciation of a space comes from how they visually perceive it.'

Carlile joined Whitbybird – now Ramboll – as a graduate electrical engineer and started the light and lighting Master's course at UCL's Bartlett School of Architecture. 'I had more appreciation for lighting architecture and human perception, rather than just the numbers – the artistic side was marrying up with the engineering side.'

In 2004, Carlile joined dpa lighting consultants, working his way up from a designer to associate.

sometimes at the expense of light quality. 'As LED has become more commonplace, the quality of the light has improved and the spectral distribution has got better, so the colour appearance of the objects being lit has also improved – which has enhanced the visual effect,' he says.

But tendencies still exist to use lighting with a cooler, more aggressive appearance in the built environment. Just because it has the highest efficacy doesn't mean it's the correct thing to do. We must not forget who we are lighting for – the people who use the spaces.'

Although a cooler colour temperature lighting has benefits – studies show a cooler white-light source can make people more alert, allowing you, in theory, to light to lower levels – human visual perception at such levels responds better to warmer light temperatures. 'That's probably because we've spent hundreds of thousands of years evolving with nothing but fires at the edge of our caves, and candlelight,' says Carlile.

More lumens per watt and more luminaire efficacy are good, but they shouldn't be looked at in isolation, because human visual comfort, glare,

**"A well-designed lighting scheme is one you don't necessarily notice, because you appreciate the beauty of the objects being lit"**

colour temperature, and how a space is used have to be taken into consideration. 'There's also the deception that, if it's LED, it must be good,' says Carlile. 'There's a lot of LED out there with varying quality.'

For years, he adds, the lighting industry for domestic use got it wrong, marketing lamps using wattage. Thankfully, with the introduction of LED lamps – not bulbs – lumen output, colour temperature and colour rendering are now widely used terms. And, with the advent of wellbeing standards, there is a growing understanding of how light colour temperature and intensity affect circadian rhythms. 'But there are a lot of unknowns. Lighting affects mood, but humans are complex and everyone is affected differently.'

There are other issues, too. A lot of energy marking only considers 'as installed' electrical lighting load, but – with dimming and scene-setting – some lights may be at 100% of their output at certain times of the day, and 5% at other times, which helps extend the life of the luminaire and lower in-use energy cost. 'Where local requirements only work on installed load, or give you allowance for controls nowhere near what you might be using, it is a challenge. Good lighting should be a benefit to everyone, so educating people is important,' says Carlile.

During his SLL presidency, Carlile aims to engage with the membership, making sure that what the society is doing – and plans to do in future – is relevant.

'I want to spread the word that all people involved in lighting can be members of the SLL. The society gives people the tools to help them progress in their careers and achieve professional recognition through membership grades, as well as offering guidance, events and networking opportunities.'

He also wants to build on previous SLL presidents' work in promoting lighting as a career to young people. Having lit everything from a single piece of artwork to a city masterplan, Carlile enjoys the varied nature of his work and wants to show how exciting a career in lighting could be. 'We see wonderful spaces expressed with light, and it sparks inspiration.' 



dpa lighting consultants' lighting design at the Mandarin Oriental Hotel, Geneva

# RISING STARS

Eight graduates have been shortlisted in this year's CIBSE Graduate of the Year competition. Ewen Rose finds out who has made the cut

**T**his year's CIBSE Young Engineers' Awards will be once again held at the Institution of Mechanical Engineers (IMEchE), in London, on 11 October.

The Graduate of the Year accolade celebrates the industry's best young engineering talent, recognising the individuals whose academic and professional achievements set them apart from their peers. It also identifies them as potential future stars of the profession.

The eight finalists will be judged on a five-minute presentation, addressing the topic: 'Recent events have raised questions about how the industry manages and monitors professional competence and upholds technical standards. What does this mean to you as an engineer, and where does the engineer's responsibility begin and end?'

This will also be the subject of a panel debate, featuring the presidents of CIBSE, ASHRAE and the IMechE, plus current graduate of the year Raphael Amajuoyi.

This year's winner will win a trip to the ASHRAE Winter Conference in Atlanta, USA. Cash bursaries will be presented to two runners-up by The Rumford Club, and all other finalists will receive £100 each from The Manly Trust. Visit [www.cibse.org/yea](http://www.cibse.org/yea) for details and to register for the event. **C**



**Waqar Ahmed  
Hurley Palmer  
Flatt/University  
of Surrey**

Ahmed was born near Islamabad, Pakistan, where he had his early education before

moving to the UK in 2013. He received a first-class BEng mechanical engineering degree from the University of Surrey, before obtaining a Master's in advanced mechanical engineering from Cranfield University.

Ahmed joined Hurley Palmer Flatt as a graduate engineer through the company's Graduates and Training Engineering

Solutions (Gates) programme. At this year's staff conference, he was awarded the firm's Graduate of the Year prize by CEO Paul Flatt.

Since joining the consultancy, he has worked on retail, educational, commercial and mission-critical projects, acquiring a good level of proficiency in several design software packages. He is now working towards chartership with CIBSE.



**Rachel Bell  
Atkins/  
University of  
Manchester**

Bell joined the Atkins building services team after graduating from the University

of Manchester with a first-class Master's degree in mechanical engineering. She has carved a unique role in the team, predominantly working on energy and water masterplanning. She undertook a secondment with Thames Water's Energy and Carbon team, assessing eligibility of onsite renewable energy generation, storage and ways to reduce carbon emissions.

Bell has also developed an automated tool that predicts energy and carbon use of buildings, recommending the most effective renewable technologies. Currently, she is predicting energy and water use for a 13-hectare Middle East waterpark, researching ways of generating and distributing energy and water around the site. An active STEM ambassador, she runs workshops, and often mentors work experience students.



**Reanna Evans  
NG Bailey/  
Leeds Beckett  
University**

Evans joined NG Bailey as a first-year building services engineering apprentice in 2011.



With sponsorship, she achieved a first-class honours degree in building services engineering from Leeds Beckett University. During this time, she was asked to be lead electrical engineer on The Hut Group project, and is now the lead mechanical engineer on a project in Manchester city centre.

After winning the Building Engineering Services Association (BESA) Chairman's Choice Award for Outstanding Achievement, Evans was elected as a member of the BESA Future Leaders group. She has also been nominated for NG Bailey's internal talent scheme, and is now aiming for CEng status.

Evans is a willing mentor and a STEM ambassador for the North West, and hopes to contribute towards bridging the skills gap.



**Carl Fisher  
Corps of Royal  
Engineers/  
Cranfield  
University**

Major Carl Fisher is a graduate in the British Army, with 19 years' service,

and has recently returned from his industry placement with Arup in Australasia.

In 2013, he completed a BEng with

“The award celebrates the best young engineering talent and identifies them as potential future stars of the profession”



honours in design engineering from Aston University and, this year, gained a MSc in military construction engineering (electrical and mechanical) from Cranfield University.

Fisher encouraged Arup's Environmental Sustainability Development Team to consider incorporating combined heat hydrogen and power technology into the built environment, to reduce greenhouse emissions and generate onsite revenue – a method of power generation and distribution not yet used in Australia.

As a graduate, his development has been overseen by the Royal School of Military Engineering's senior lecturers. While on placement, his project director offered daily guidance to ensure Fisher succeeded as interface manager on a time-constrained multidiscipline and fully integrated project – the first of its kind in Sydney.



**Josh Hunt**  
Aecom/  
University of the West of England

Hunt is a graduate engineer at Aecom, Exeter, working in the building services team. During his

six years with the firm, he has worked on a range of projects and completed an HNC in mechanical engineering, a BEng in building services engineering, and achieved EngTech status.

Hunt graduated in 2018 with a first-class BEng (Hons) in building services engineering from the University of the West of England (UWE). He organised events for CIBSE South West young engineers' network and, during his final year at university, was named CIBSE South West Student of the Year, and invited to Hong Kong with UWE.

Hunt has signed up to the MSc course in high-performance buildings at Plymouth University and is undergoing the CIBSE professional development scheme to achieve IEng status.



**Hannah Muller-Jones**  
Buro Happold/  
University of Nottingham

Muller-Jones is a mechanical engineer at Buro Happold's London

office, having achieved a Master's degree in mechanical engineering with management from the University of Nottingham in 2016. She has worked on a range of projects, and is currently running multidisciplinary engineering teams for several residential projects, which involve collaborating with other Buro Happold offices around the world. This role includes managing detailed design reports, deadlines and meetings.

Muller-Jones is also visual programming lead for London Building Services; she is training the team in the Dynamo system and offering manager role training to show the benefits of computational engineering. She is also running 'hack sessions' to encourage the team to create efficient processes. Muller-Jones sits on the Women's Business Network Committee and is one of the NextGen Engineers to Watch, nominated by the Women's Engineering Society.



**Gemma Taylor**  
Atkins/  
University of the West of England

A graduate building physics and services engineer at Atkins, Taylor holds an upper second-class

degree in building services engineering, having graduated from the University of the West of England in 2017. She gained practical experience in the workplace during her studies and, as a result, developed a mature technical and commercial understanding of the construction industry. She is now responsible for delivering client and project management roles for her current projects.

Taylor also volunteers her time as a committee member and social media coordinator for CIBSE Young Engineers Network, South West.



**Ryan Wesley**  
Tata Steel  
Europe/  
Loughborough University

Wesley is a PhD student at Loughborough University. After

studying physics at Nottingham Trent University, he graduated with honours in 2012 and, in 2016, enrolled on a sponsored MSc in low-energy building services engineering at Loughborough.

In 2017, with support from Tata Steel Europe, Wesley was awarded an EPSRC case studentship. In the first year of his project, he has assisted in workshops, carried out laboratory demonstrations, and supervised dissertation projects. The research project is linked to the Building and Industrial Services Pipework Academy at Loughborough. As part of the research team, Wesley has been involved in meetings with industry contacts and manufacturers, and has delivered CPDs on pipework and corrosion in HVAC systems.

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# Air of authority

CIBSE's new Air Quality Working Group will host a session at next month's Build2Perform Live. We explore what the event has to offer from air quality and ventilation experts



**A**ir quality will be one of the key themes at Build2Perform Live, following the launch of the new CIBSE Air Quality Working Group in June. Comprising CIBSE members and professionals from practice and academia, the group will inform CIBSE activities and guidance on air quality, through events, publications, policy, research, and collaboration with other parties and CIBSE groups – such as Resilient Cities and HVAC – on areas of shared interest. It will also benefit from cross-disciplinary expertise, including that of public health specialists, architects, and external air quality consultants.

One of the group's first activities was putting together the air quality session at Build2Perform. Group chair Ed Wealend, associate at Cundall, will chair the session on 28 November, exploring case studies and strategies for dealing with poor air quality in an urban environment.

On 27 November, Theatre D will host a ventilation stream, with sessions covering: ventilation of low carbon buildings; acoustic issues; natural ventilation in non-domestic buildings; and ventilation in schools.

■ For the full Build2Perform Live programme, and to register for this free event, visit [www.cibse.org/Build2PerformLive](http://www.cibse.org/Build2PerformLive)

## We give a snapshot of what's to come at the air quality and ventilation sessions:

VENTILATING LOW CARBON BUILDINGS FOR HEALTH AND WELLBEING  
10AM-11.30AM, 27 NOVEMBER

Covering areas that affect ventilation, this session offers delegates a holistic approach to low carbon ventilation of buildings.

### The session will cover:

- Modelling naturally ventilated buildings to assess compliance with thermal comfort and air quality
- Integrating air quality factors into ventilation systems
- Criteria for combating overheating
- Maximising the benefit of hybrid systems
- Understanding sensors and controls
- Case study: Meadowhall Centre
- Application to Passivhaus
- Designing ventilation for retrofitting nearly zero energy residential buildings.

ACOUSTIC ISSUES IN RELATION TO NATURAL VENTILATION  
12PM-1PM, 27 NOVEMBER

External noise can be a significant constraint on the use of natural ventilation, but a range of strategies are available to

help practitioners in challenging environments. This session looks at opportunities in homes, schools, and commercial buildings. A panel discussion will follow a series of short presentations.

### The session will cover:

- Acoustic challenges and solutions
- Getting to grips with acoustic constraints under different modes of ventilation (BB93)
- A practical approach to acoustic design of non-domestic buildings.

NATURAL VENTILATION IN NON-DOMESTIC BUILDINGS (AM10)  
2.30PM-3.30PM, 27 NOVEMBER

CIBSE guidance AM10 covers natural ventilation design and application. This session introduces the revised edition, which showcases new case studies and an update of calculation methodologies.

### The session will cover:

- An introduction to CIBSE AM10, third edition
- An overview of natural ventilation modelling considerations
- Natural ventilation calculation developments, pressure calculations and the loop method
- Sizing opening windows and constraints on opening windows.

BUILDING PERFORMANCE IN SCHOOLS  
3.45PM-4.30PM, 27 NOVEMBER

This session will examine what building performance is in schools, framing school building design against the changing regulations, reducing budgets, and changing educational visions. A panel discussion will follow a series of short presentations.

### The session will cover:

- BB101 *Ventilation for School Buildings*: developments and understanding the guidance
- The implications of ventilation strategies for environmental quality and energy performance of schools
- User perception of draughts in a range of completed schools
- Performance in use of secondary schools.

AIR QUALITY  
11.15AM-1PM, 28 NOVEMBER

This session will offer exemplar case studies and strategies for dealing with poor air quality in an urban environment.

### The session will cover:

- Introduction to CIBSE Air Quality Working Group
- What engineers can do to minimise outdoor pollution, especially NO<sub>2</sub>
- Design considerations for indoor air quality in commercial buildings
- Design considerations for residential buildings, including case studies of MVHR with PM filters and NO<sub>2</sub> filters
- Update on research into the impact of built form on air pollution in the City of London
- Measuring and monitoring indoor air quality; lessons learned from The Total Performance of Low Carbon Buildings in China and the UK project.

“Cundall's Ed Wealend will chair the session, exploring case studies and strategies for dealing with poor air quality in an urban environment”



# OUTWARD LOOKING

The design of the jaw-dropping Morpheus Hotel in Macau has a 40-storey, free-form exoskeleton that would not have been possible without the skill of the façade engineers. **Andy Pearson** talks to BuroHappold Engineering about the 30 façade systems needed to realise the striking design

**I**t might look like a brick wrapped in a string vest, but Morpheus is Macau's latest, and most remarkable, luxury hotel. Designed by Zaha Hadid Architects, the 40-storey, building is supported by, what is claimed to be, the world's first 'free-form high-rise exoskeleton'. This sinuous, external structure rises up to wrap, vine-like, around the rectangular building, which is formed from a pair of towers linked at the podium and roof levels. The steel-tracery also envelops two amorphous sky-bridges, which connect the towers, mid-height, to create three irregularly shaped voids that open up the centre of the building.

The architect's rationale in placing the supporting structure on the outside of the building was to give it a unique external identity while minimising the need for interior columns to maximise internal flexibility. The challenge for BuroHappold Engineering's façade engineers was to clad this serpentine, structural skeleton – and the layer that sits behind it – in a single, homogenous, glazed skin.

To add to the challenge, the façade has to be able to withstand typhoon-force winds, which – as Typhoon Mangkhut recently reminded us – are a feature of this part of China's coastline. Such potential for extreme weather has also resulted in the hotel's syphonic rainwater system being designed to handle 216mm/hr of rainfall, while the rooftop lightning system uses the cladding of the exoskeleton as a down conductor, in accordance with BSEN62305.

## Servicing the Morpheus

Away from the façade, the hotel's chilled and low temperature hot water is supplied by a central energy plantroom for the City of Dreams resort and casino. Its heating and chilled water circuits are isolated from the primary mains by heat exchangers, and the chilled water supply temperature on the secondary side is maintained at 6°C, and the return temperature at 14°C. Heating and chilled water mains rise up through concrete

### PROJECT TEAM

**Client:** Melco Resorts & Entertainment

**Design architect:** Zaha Hadid Architects

**Executive architect:** Leigh & Orange

**Façade and structural engineer:**

BuroHappold Engineering

**MEP:** JRP

**Main contractor:** Dragages HK

**Façade contractors:**

■ Jangho (flat glazing)

■ Kyotec Group (free-form glazing and free-form exoskeleton cladding)

■ Hacely (flat exoskeleton cladding)

KEEPING COOL IN THE CASINO

cores, and there are separate duct and pipe risers. The hotel has centralised hot-water plant based on gas-fired condensing hot-water boilers and water-storage vessels.

There is underfloor heating in the guest bathrooms, while comfort in these rooms is maintained using four-pipe DC fan coil units (FCUs), which are controlled by in-room temperature sensors and fan-speed controllers. Pre-treated fresh air is supplied via air handling units (AHUs) on the plant floors – 3, 19 and 39 – and AHUs with cooling and heating coils maintain perimeter comfort in the entrance lobby and the giant atrium.

AHUs with cooling only serve the interior spaces. The units supply fresh air, via jet nozzles, to the occupied zone, based on CO<sub>2</sub> concentration of the return air. Buoyancy forces then drive the stale air upwards and it is exhausted at high level.

Unsurprisingly, however, it is the Morpheus Hotel's façade – rather than its building services – that steals the limelight.

**Design parameters**

BuroHappold's highly engineered solution incorporates more than 30 façade systems, including: unitised with flat glazing; unitised with single-curved glazing; unitised and stick with faceted glazing; giant free-form, triangulated glazed panels; and an aluminium panel system in which to clad the structure.

Understanding the building's geometry



The stunning Morpheus Hotel rises high into the Macau skyline

In the casino, the gaming areas are conditioned by modular AHUs. Fresh air is provided at a rate of 8 L·s<sup>-1</sup> per person, and this is increased to 16 L·s<sup>-1</sup> for the smoking areas.

The VIP gaming area has a variable air volume (VAV) system in areas where the ceiling is higher than 4m and a fan coil unit (FCU) system, with pre-treated fresh air, in areas where the ceiling is below this height. The air is supplied at a temperature of 14°C. Independent air conditioning systems are supplied for the smoking and non-smoking areas to ensure a pressure differential between the two areas by ensuring the non-smoking area is always at a higher pressure.

To comply with Macau's smoking law, high-efficiency air filters and electronic air-cleaning systems are installed in the AHU serving the smoking area.

The casino is sub-divided into air conditioning zones of approximately 2,400m<sup>2</sup> that tally with the sprinkler zones. Each AHU incorporates a supply fan, return/exhaust fan, mixing section, chilled water cooling coil, disposable glass-fibre, paper-type pre-filter and HEPA filter, and electronic air cleaner. The AHU fans have DC motors to vary the air-supply rate in response to the space loads, based on CO<sub>2</sub> and volatile organic compound (VOC) sensors in the occupied space.

The AHUs serving each air conditioning zone are used to purge smoke from any fires using the return air grilles and ductwork, and AHU exhaust fans.

**"The building's geometry was so complex it forced us to change the way we designed"**

was key to developing the façade. From the outset, the design team worked in a three-dimensional environment. 'You wouldn't be able to construct this building in a traditional way, using 2D drawings, because the geometry is unique,' says Victoria Cameron, BuroHappold associate and façade engineer for the project. 'It was so complex, it forced us to change the way we designed.'

Most of the geometrical modelling was done using Rhino3D CAD application using the Grasshopper visual programming language for analysis. A set of parameters was agreed as the basis for the design. These included: ensuring the nodes of the exoskeleton aligned horizontally with the floor-edge beam; and that the stub-beams – which project from the nodes through the façade to connect to floor beams that transfer forces between the exoskeleton and each tower's concrete core – are both horizontal and perpendicular to the face of the façade.

The architect supplied a wire-frame model of the exoskeleton and a reference surface defining the outer boundary of the glazed envelope. Using these parameters, the team defined a topological mesh that describes the outside surface of the façade envelope. Within these geometrical constraints, BuroHappold's façade designers then established which system could be used, and where, to support the building's glazed skin. 'We took the envelope and broke it down into its different geometries. By understanding the technical limitations of how far we could push each system and, rationalising the geometry within these, we established the areas of unitised, semi-unitised, stick system and faceted glazing. This was followed by rationalising the use of flat, single-curved and double-curved glass,' explains Cameron.

Four principal façade types are used:

- Flat glazing and unitised façades covering the hotel rooms
- Single-curved glazing supported on a unitised system on the building's corners
- Faceted glazing supported by a combination of unitised and stick façade systems
- A triangulated glazing system for the façade surrounding the atrium voids, which Cameron calls the 'free-form area'. 'Nothing was standardised, so we've had to custom design each system,' she adds.

Perhaps the most straightforward parts to clad were the areas of flat façade that surround the two tower structures, where the majority of the >>

» hotel rooms are located. 'We used a traditional unitised, reinforced-aluminium frame façade system for the towers,' says Cameron.

The glass here is double-glazed, typically 12mm thick with a 16mm gap, and is solar control, high-performance. This was selected to limit solar gains to the rooms while giving the same visual consistency, whether flat, curved, single- or double-glazed. All the glass came from the same manufacturer and has the same low-E coating. On one side of the tower, the double-glazed units are acoustically treated and the inner and outer glass is laminated with a polyvinyl butyral (PVB) interlayer to prevent noise from MEP plant penetrating the façade.

Before the façade could be fitted, the building's structural exoskeleton had to be installed – which meant conventional installation, from the outside, could not be used. So BuroHappold designed a system that could be put in by operatives working on the floor plates. First, the opaque spandrel panels were fixed to the edges of the floor slabs, then the vision panels were fixed between the spandrel panels from inside the building.

'Even on the flat areas of the façade – where we were using the more traditional, unitised façade system – we had to break it up into spandrel and vision panels, to enable it to be installed from inside the building,' says Cameron. This allowed any glazed panel to be replaced from inside the building in the event of breakage. Single-curved glazing is used in units that wrap around the towers' corners.

There are no floor slabs from which to attach the façade in the central area of the building, where the sky-bridges surround the central voids – the 'free-form' area. 'We've had to attach the façade to the exoskeleton,' explains Cameron. Although it appears to be a twisting mass of steelwork, the exoskeleton



**“The panels were fabricated as a single piece in the factory, then cut up before being bolted back together on site”**

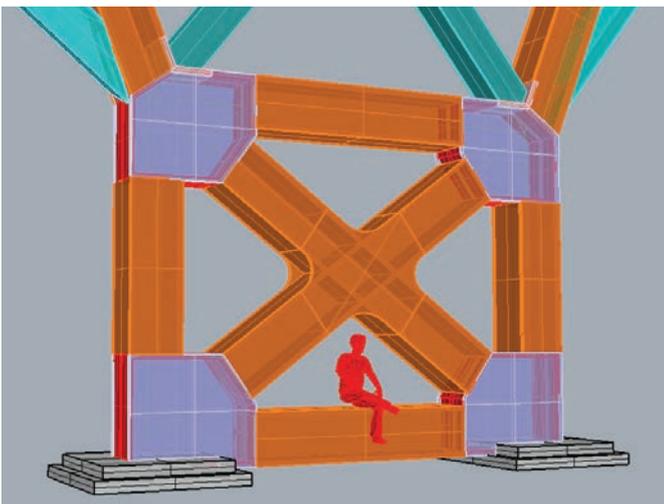
here has been very carefully rationalised, so each structural element is planar and formed from a single, curved steel. All the nodes connecting the steels are also flat, so they can be fabricated from steel plates.

Each of the 242 glazed panels in the free-form area is unique in shape and size. While the geometry of the flat façade surrounding the towers is defined by the vertical spacing of the floor slabs, the façade geometry in the free-form area is based on the three-dimensional spacing of the exoskeleton nodes. 'At every step of the design, we have tried to rationalise the design as much as possible, but – in the free-form area – it was impossible, because every panel is unique, so we had to bespoke design every one.'

The nodes in this area are spaced up to 20m apart, which meant the diamond-shaped, glazed façade panels that they support measure up to 20m wide and 10m high. These 'macro-panels' are made up of smaller, framed, flat-glazed elements that are combined to form large, curved façade elements. This allows the same system to be used to clad the inward and outward sloping parts of the walls and roof. Because of the long spans and high loads, the frames of the macro-panels are formed using solid-steel plate sections. They vary in depth and width as required, to minimise the total steel tonnage.

'The panels were fabricated as a single piece in the factory, then cut up to allow transportation and lifting on site, before being bolted back together,' explains Cameron. 'This was to ensure the complex tolerances would align in three-dimensional space. The panels are only ever supported from one nodal point on the exoskeleton, with the remaining nodes allowing for expansion and movement.'

The façade had to be designed to adapt to the exoskeleton's movements and twists as construction progressed and loading on it increased. Movement is accommodated by a large, flexible joint



Rhino3D was used in most of the geometrical modelling for the Morpheus Hotel



between each macro-panel in the free-form area. 'BuroHappold's structural engineers carried out extensive analyses to understand how the exoskeleton would move throughout construction. We had to separate the façade from this movement to ensure it didn't impose large stress on the glazing,' says Cameron.

Single-glazing is used for the façade of the free-form area because its thermal performance was not critical in the large internal atrium spaces. 'In this part, there is not much difference between daily highs and lows, and the internal temperatures are likely to be higher than the air conditioned rooms because of stratification,' adds Cameron.

The glazed panels are, however, laminated with a PVB interlayer, to hold the layers of bonded glass in place should a panel shatter. 'The glass is strong enough to be walked on, internally and externally, by rope abseilers for maintenance,' she says.

The glass is also heat-strengthened. This is a different heat treatment from that of the glazing units in the hotel rooms, which are tempered. Tempered glass is strongest, so the minimum thickness can be used to withstand the high wind loads experienced in Macau. However, tempering glass also locks in stress. By contrast, heat-strengthened glass has lower levels of in-built stress, so there is a lower chance of spontaneous breakage from inclusions in the glass. 'Because it is so much harder to access and replace the glass in the free-form area, we wanted the glazing to be as robust as possible,' says Cameron.

Glazing installation in the free-form area was done externally, from the top down. The contractor filled the atrium with scaffolding and, as the façade was installed, this was progressively removed. The flat façade covering the towers was installed by a different contractor, from the ground up, so the two passed each other halfway up the building.

The façade to form the transition between the free-form area and the flat façade is formed of irregularly sized, faceted panels, held in position by a unitised aluminium frame. It was fabricated in mainland China. 'We did look at using cold bending on site for the non-planar transition zone, but the façade contractors were unfamiliar with

the technique and would not warrant the installation,' explains Cameron. Instead, the units are flat and double-glazed, and the panels are fixed to the floor plates internally. 'It is a similar system to the one used for the flat façade but with a more complex geometry.'

While the building's façade is glazed, its exoskeleton is clad in 60,000m<sup>2</sup> of flat, single-curved and double-curved aluminium sheet. The cladding had to be very thick, because it forms the main part of the lighting-protection system, and the huge quantity of aluminium cladding that needed to be designed and installed meant two contractors were used – one for the flat areas and one for the free-form area.

While the steel members of the exoskeleton internally are planar, the cladding envelope warps and twists to accommodate the reference surface geometry, and maintains a consistent offset from the glazing. A complex system of bracketry was needed and had to fit within a very tight cladding zone, allowing for fire protection and tolerances of the exoskeleton.

Work on the façade design started in 2012, and installation two years later. 'It's been a long time in design and construction,' says Cameron. In June this year, guests were welcomed into the hotel's 772 rooms and suites, its casino and function spaces, and were finally able to appreciate the façade of this remarkable building. [C](#)

### THE FAÇADE OF THE YEAR COMPETITION

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# MAKE WAY FOR THE REVOLUTION

With contractors increasingly turning to offsite construction, we speak to some of the pioneers delivering prefabricated M&E. In the first of a regular series, **Alex Smith** visits SES Engineering Services' factory, in York, to find out how its factory focus is helping to change the culture of construction

**T**he factory floor at SES Engineering Services' Prism facility, on the outskirts of York, is quiet, bright and clean. Workers calmly assemble a range of roof pipework modules and utility cupboards, while engineers test completed plantrooms for leaks.

It's far removed from the experience of M&E installers on many building sites, where they vie with various trades for access to plantrooms and vertical risers, in a huge game of construction sardines.

SES Engineering Services business director, Steve Tovey, says the controlled factory environment offers benefits to the M&E design and installation that onsite construction cannot match.

'The main contractor's critical path is being attacked all the time by MEP [mechanical, electrical and plumbing] issues on site,' says Tovey. 'The real benefit is how many hours we take off site, into a factory. It leads to an improvement in quality, health and safety, and certainty of delivery.'

Around £500,000 of M&E work passes through the Prism facility every month. Plantrooms, plant skids, corridor pipework modules, roof pipework modules, and utility cupboards are built on assembly lines. Utility cupboards, in particular, have taken off in the past five years, says Tovey, as landlords are keen to separate theirs and their tenants' billing.

Landmark projects include the Queensferry Crossing and the

residential conversion of the Gasholders at King's Cross, where wedge-shaped modules were built off site.

SES has also just completed an £18m project to prefabricate services at a £75m food and health research laboratory for the Quadram Institute in Norwich (see panel on page 32).

Convincing developers of the benefit of offsite construction is not always easy though. 'Developers want everything faster and cheaper, and they aren't always interested in the offsite solution because they don't see the tangible benefits,' Tovey says.

'If you get the MEP contractor in early, you can work in partnership and design the services efficiently from day one.'

The firm's managing director, Jason Knights, says it is better to win a job with a main contractor, as you can work through the design with them at the beginning, using building information modelling (BIM).





**“Each new worker at Prism can learn the core skills required in 12 weeks. For each type of system assembly, Prism provides simple pictorial guides”**

**BIM and prefabrication**

Prism would not have been possible without the adoption of BIM by SES, say Tovey and Knights. Original drawings are sent to SES’ in-house BIM coordinators who will talk to project engineers before creating a BIM model.

Tovey believes people are not used to designing for a manufacturer. ‘The software modellers are not engineers, so you need a BIM model to explain how you access and tighten a joint, for example,’ he says.

Once the drawing has been made ready for manufacture in BIM, it will pass through an approval process, which includes consultants.

Lewis Jones, Prism general manager says this process can make up a large proportion of the time taken for designs to be manufactured. ‘A plantroom might only take six weeks to build, but the approval process, logistical arrangements and preparing the >>

>> ‘We help contractors win projects,’ he says. ‘In construction, the difficult things that can’t be solved tend to get pushed along. You’re forced to get it right with BIM.’

Knights says that if the M&E contractor is tendered separately – they would have much less time to design. It forces services designers to have conversations with architects about the amount of space services need, he adds.

‘They have to make decisions about their designers early in the process. That’s a massive tangible benefit. Prefabrication can cost more money, but we can install services in a tenth of the time. The tangible saving is the improvement in health and safety, quality and programme.’

One of the big drivers for prefabrication is the skills shortage in construction. Specific skills are not required to assemble services at Prism, and each new worker can learn the core skills required in a 12-week programme, which includes instructions on basic pipe-jointing techniques, pipe cutting and bending, trunking installation, and understanding drawings. For each type of system assembly, Prism provides simple, pictorial guides for workers.

The number of hours saved going on site is a key metric for SES; annually, it takes around 100,000 working hours off site, but it wants to double this figure within five years.

Tovey says onsite workers only work 40-50% of the time. ‘In projects up to eight storeys, for example, there is no requirement for a lift, which means workers have to spend time getting to each floor. With a prefabricated vertical riser, we can just drop it in with a crane,’ he says.

‘By taking work hours off site, the contractor can also save the cost of supplying services to onsite workers, such as toilets, toolbox talks, safety inductions and welfare facilities,’ says Tovey.

**THE QUADRAM INSTITUTE**

SES Engineering Services recently completed an £18m contract to deliver mechanical, electrical and plumbing services to a £75m food and health research laboratory in Norwich, the Quadram Institute.

The building comprises clinical laboratories and research environments that require strictly regulated, airtight conditions. Using BIM and prefabrication, SES delivered 36 plantroom prefabricated AHU valve arrangements, four plantroom pump skids, and 164 pipework and electrical containment modules. In addition, six ductwork risers, four pipework risers and three electrical risers were installed, each with platforms four floors high.

‘This project has been delivered with offsite methodology at its core and, critically, the project sequence would have been far more challenging without it,’ says Jason Knights, managing director at SES Engineering Services.

Knights says BIM and prefabrication enabled SES and the main contractor to work with the design team to maximise the offsite strategy. The coordinated design ensured clashes were detected at an early stage, resulting in less redrawing, and fewer snags and defects on site.

Prefabrication also meant fewer tradespeople driving to site, and fewer deliveries of materials, as well as better quality control on site. Plant and equipment was tested in the factory before installation, says Knights, which meant problems were identified off site.

The building’s scale – and the logistical challenges of a confined site – would have made producing modules on site extremely difficult, adds Knights, who says offsite was the only sensible option from day one.

The MEP package for the Quadram Institute was large for the local market, which gave SES the challenge of securing the necessary labour at the right time.

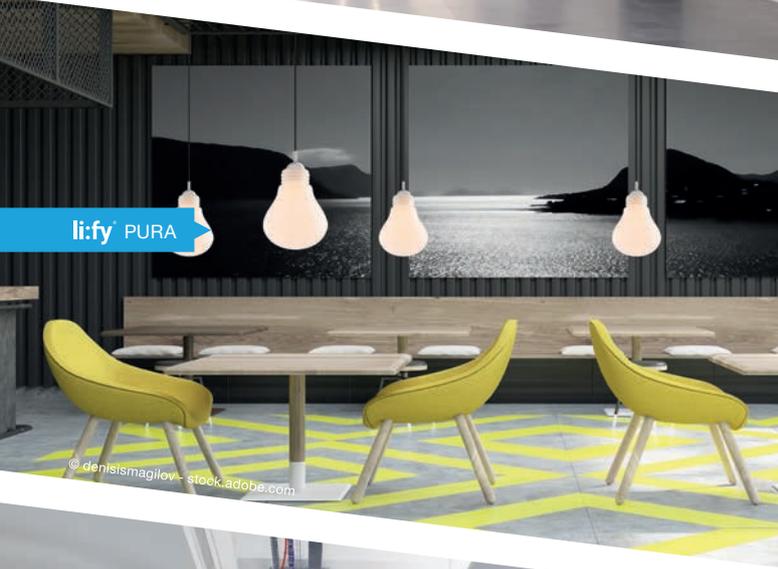
‘Moving some of this construction off site helped temper these resource requirements, and give reliability to achieving a challenging programme,’ Knights says.



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building might take a further 10 weeks. If the plantroom is included as a manufactured product in the original design, you could reduce the programme by 10 weeks.'

Tovey says the products manufactured at Prism involve many in the supply chain, from structural to M&E engineers. 'With better collaboration, the industry has the opportunity to improve quality and reduce programmes,' he says.

'Take digital collaboration for instance: what software are suppliers going to use? We get it passed to us in lots of different formats and it takes time to coordinate the drawings.'

Tovey believes understanding of offsite manufacturing is patchy within the industry. 'People talk about offsite, but don't always do it. The idea that you sit and plan the details of a bathroom or services distribution is quite alien to some,' he says.

'Clients often like to see a concrete frame being built to show progress, but that doesn't get you any closer to the end of the project when the last thing you do is turn on the lights.'

SES is keen to boost the amount of services that are fabricated. Knights is aiming to increase annual work at Prism from around £7m to £20m, as well as widen the product range. He is also aiming to work on more prefabricated projects for parent company Wates, which purchased SES in 2015.

'The whole basis of our approach is to reduce labour on site, which reduces the exposure to bad quality. We try to prefabricate up to 30% of services on each job,' he says.

'Prefabrication brings you value and certainty of programme. I always ask, why not prefab?' **CJ**



A utility cupboard assembled at Prism



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# PEERING THROUGH THE SMOKE

Fire safety issues flagged by Dame Judith Hackitt after Grenfell were tackled by smoke control experts at a recent roundtable sponsored by Colt. **Liza Young** follows an in-depth debate on competency, guidance and whole life fire strategy

**T**he golden thread must run through all building projects to ensure the original fire and smoke-control strategy is preserved throughout the life of the building.

This was the standout message from *CIBSE Journal's* roundtable on smoke control sponsored by Colt and held at the Royal Pharmaceutical Society in September.

The roundtable debated some of the key recommendations in Dame Judith Hackitt's Independent Review of Building Regulations and Fire Safety in light of the Grenfell fire, including the creation of rigorous dutyholder roles and responsibilities to ensure a stronger focus on safety during design, construction and refurbishment. Another consideration was getting competent people who understand their responsibilities to maintain safety throughout the lifecycle of a building.

The fire engineer responsible for the life-safety system design has to see it through to the end, said Ian Doncaster, fire and smoke solutions director at the Smoke Control Association.

Fire engineers are commissioned to write a fire strategy 'to get a tick in the box for building control, and they are never seen again', added Nick Troth, chartered fire engineer and associate director at Arup. 'You never know if a contractor has read it, let alone the sub-contractors who are meant to be installing the systems.'

Dr Ahmed Allam, director at Cundall Fire Engineering, said the fire strategy must be part of the holistic construction process because it interrelates with other disciplines, including structures, architecture and mechanical, electrical and plumbing (MEP).

'For years, the fire engineer has been pushed down the ladder in the design process, but their work should fit into the bigger picture so everyone [in the project team] has a chance to look at – and criticise – it,' he said. He added that the fire strategy needs to be a living document throughout the lifecycle of a building, addressing the methods and

the building's operational requirements. 'I insist the fire engineer reviews the MEP, referencing the fire strategy, before it's issued to the contractor. We have to tie it together so we can get the construction lined up with the philosophy of the building's fire safety.'

Conor Logan, technical director at Colt, said the fire-safety strategy is usually given to an M&E engineer, who writes the specification.

But there is a gap between the knowledge of the fire engineer and the building services engineer, said Chris Hallam, technical director, fire engineering, at Hoare Lea. 'A lot of fire engineers do not get the opportunity to go onsite, while the building services [engineers] are trying to interpret our designs without necessarily understanding the rules for fire and smoke dampers, for example.'

Logan said: 'Perhaps it's time for the fire engineer to do the engineering and write the specification for the systems that they want to put in place. It's time for the engineer to be a protected status, and that person should be on a register and accountable for the work they do.'

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"It's time for the engineer to be a protected status, and that person should be on a register and accountable for the work they do"  
– *Conor Logan*



Troth said Arup's philosophy is to check the principles of the fire strategy have been met at RIBA Stage 2, for example, and signed off. This, he said, is in line with Dame Judith Hackitt's third 'gateway point', proposed in her final report into her review of Building Regulations and fire safety. At gateway three – handover – the Joint Competent Authority must be satisfied that the signed-off design has been followed before occupation can start.

Dr Hywel Davies, technical director at CIBSE, said gateway three should involve the fire strategy's author returning to ensure it has been implemented and installed accordingly, commissioned and tested competently, and delivers what the strategy says.

'That's the issue of the golden thread – it's the continuation of

communication of the various stages to ensure the fire strategy philosophy goes all the way through,' said Troth.

**The principal engineer**

Eleven Working Groups have been set up by the industry-led competency review established in the aftermath of the Grenfell fire to consider competence requirements across the industry.

The working group on engineering competence has proposed the recognition of the role of principal engineer to provide an interface between all building systems throughout design, procurement, installation, commissioning and testing.

George Adams, engineering director at Spie UK and chair of the engineering working group, says this was particularly important for refurbishment projects, where systems are more likely to be procured separately leading to the risk of poor integration.

Under current regulations, the principal designer – who might be an interior designer or architect – is responsible for the project. However, they may not have the necessary technical knowledge to ensure the design and installation are completed as per the fire strategy.

'Somebody needs the responsibility of making sure, from a holistic point of view, that all technical systems that contribute to life safety and the safety of fighting a fire will work and do the job they're supposed to do,' said Adams. 'That's why, through the Hackitt report and the response to it, we are proposing the role of the principal engineer, who can inform the client of the skill and competencies needed on that project.'

**Competency**

David Quinn, group director, fire engineering, at BuroHappold Engineering, agrees with the concept of a principal engineer but says they would be relying on the competencies of those approving systems. 'Ultimately, it comes down to one person signing off an entire



Conor Logan and Nick Troth

Roundtable members (from left):  
 Nick Troth, chartered fire engineer and associate director, Arup  
 Chris Hallam, technical director of fire engineering, Hoare Lea  
 Ian Doncaster, fire and smoke solutions director, Smoke Control Association  
 David Quinn, group director, fire engineering, BuroHappold Engineering  
 George Adams, engineering director, Spie UK  
 Dr Ahmed Allam, director, Cundall Fire Engineering  
 Hywel Davies, technical director at CIBSE  
 Dr Roger Harrison, technical director of fire safety, BRE Global  
 Conor Logan, technical director, Colt (not pictured)  
 Alex Smith, chair and editor, CIBSE Journal (not pictured)





responsible for demonstrating how they will employ competency, not only in design and construction, but in operation too, and show how that can be transferred if building ownership changes, said Adams.

In response to Dame Judith Hackitt's review, the Smoke Control Association has launched a certification scheme for contractors. The IFC-run scheme was developed to deliver competency in fire strategy verification, system design and the installation of smoke-control systems, as well as service and maintenance work, said Doncaster.

'The SCA-accreditation scheme would check if a company is applying and abiding by the regulations, and using the right products that are correctly installed by competent installers and commissioned thoroughly with functional testing,' said Doncaster, adding that three firms are currently being accredited, and another four are in the queue.

'As engineering bodies, we have a process for overseeing the registration and training of competent engineers, who have to abide by a code of conduct. As professional engineers, we also have a moral responsibility that goes beyond our technical responsibilities,' he said.

He said smoke control needed to become a specific stage in the RIBA process, so it could not be ignored. 'Smoke-ventilation systems need to be designed into a building, not added to it,' he said, and this will only happen if a smoke-ventilation specialist is employed at an early enough stage. He added that a melding of disciplines, including fire engineers, mechanical services engineers and smoke control specialists, would make the system appropriate. 'A lot of competent fire engineers are not competent at designing smoke-ventilation systems because their specialism is a branch of fire engineering that is not cross-disciplinary, and smoke ventilation is a multi-disciplinary subject,' he said.

**"Beyond commissioning, how do you ensure the responsible person is maintaining and testing systems properly?"**

**– Nick Troth**

At Davies' call for a fire-engineering overlay to the RIBA Plan of Work, Adams said a fire-safety overlay – looking at the coordination of life-safety systems in high-rise buildings – had been proposed by his working group.

Troth also suggested the smoke-control industry adopts some form of registration scheme, potentially through CIBSE, to ensure a specific qualification is created for smoke control engineers to prove their competency. 'A registration scheme would give me some degree of confidence that it's an appropriate design.'

**Maintenance and testing**

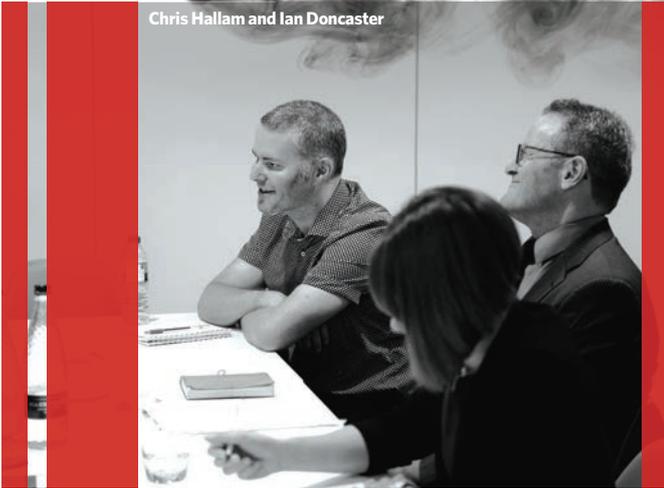
Maintenance of building systems is often an afterthought, said Doncaster. 'We need to promote maintenance of smoke ventilation systems as a recognised specialist activity because, commonly, it becomes something that the fire alarm guy does.'

He said facilities managers are competent, but they're not specialists at checking life-safety systems; they won't take measurements or airflows and, if they did, they wouldn't necessarily know if they were relevant or whether they matched the original design intent.

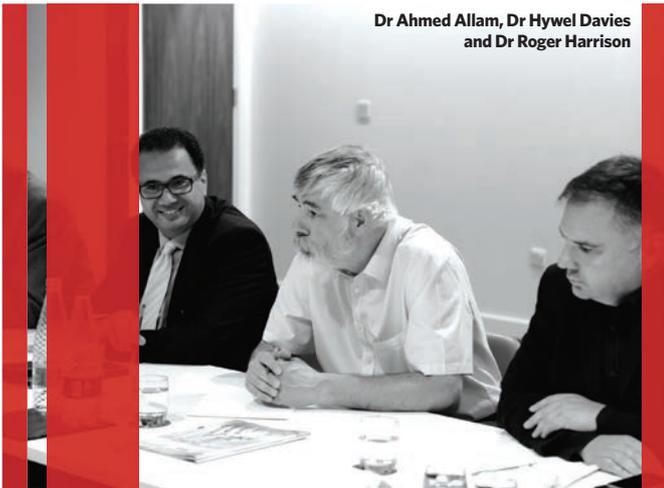
Logan said in some European countries, it is mandatory for the installer to maintain the systems or to nominate a third party to maintain them.



Chris Hallam and Ian Doncaster



Dr Ahmed Allam, Dr Hywel Davies and Dr Roger Harrison



» raft of design installations, commissions and testing, and they're not necessarily competent to do that, so they have to rely on other people's competencies. The project relies on the golden thread of competency, not just the golden thread of information,' he said.

Quinn said a stronger regulatory framework was required to empower fire engineers to drive the right outcomes from a project. 'We need clear guidance that is unequivocal that you need a competent person to drive a project right from the start to the end.'

Perhaps the client has to be legally

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George Adams, Dr Ahmed Allam and Dr Hywel Davies



Dr Hywel Davies and Dr Roger Harrison



Conor Logan, Nick Troth, Chris Hallam and Ian Doncaster

» But the Building Regulations, administered by Building Control, do not have any continuing powers, said Troth. 'Beyond the checking process at commissioning, how do you ensure that the end user or responsible person – who can change multiple times – is maintaining and testing systems properly?'

The Fire Safety Order puts the onus on the responsible person to maintain the fire safety systems in the building – but this is not being enforced, he said.

Adams said engineers could help take on this responsibility. He said Spie has recently completed a multi-storey building, and informed the client that one of its engineers would return every three months for two years – and then every six months for two years – to check maintenance procedures.

'But that level of scrutiny is not going on throughout the lifecycle of the building – there is a loss of information over time,' said

## A CHANGE IN GUIDANCE

Building Regulations are satisfactory, said Nick Troth. 'They tell us they are performance-based regulations and they tell us, as designers and constructors, what we need to do. The flaws lie in the guidance that supports them and the processes and procedures that are enabled to meet those requirements,' he said.

Troth said it was imperative for guidance to be continuously updated. The primary source of fire safety guidance in England and Wales is Approved Document B (ADB), but the majority of the information in it dates back to the pre-war years. 'We are designing buildings with parameters that are no longer relevant to current building design. We're using guidance that is poorly written, cobbled together out of bits of different documents, and is woefully inadequate.' He said guidance needed to be clearer, with some prescription of performance, and focus more on competency.

But George Adams said you don't have to follow the British Standards if you put forward an engineered solution that you can demonstrate will meet the minimum safety requirements. He said guidance is 'always going to be wrong because it can't keep up with modern thinking,' so engineers should strive beyond what the guidance requires.

Conor Logan added: 'The approved documents are minimum standards and you're quite entitled to do more if the project – and the building – requires it.'

Roger Harrison, technical director, fire safety, at BRE Global.

Davies said regulation 38 – the requirement to hand over fire safety information – has been found unfit for purpose because it is not possible in law to bring someone to account for failure to deliver that information. 'That has got to change,' he said.

Hallam questioned to what level smoke-control systems could be maintained. 'Sometimes, smoke-control systems are too complex because we're asking them to do a lot more than keeping the stair clear, like cool corridors. There are so many permutations of dampers being open or shut, for example, that it becomes really difficult to make sure these things are working.'

The simplest designs are often best, agreed Doncaster, but added that complex buildings sometimes need complex systems. 'With these, we have to take on board the additional responsibilities to make them safe and maintainable,' he said.

Davies suggested creating an annual building check with some form of regulated prescription, similar to a yearly MOT for cars.

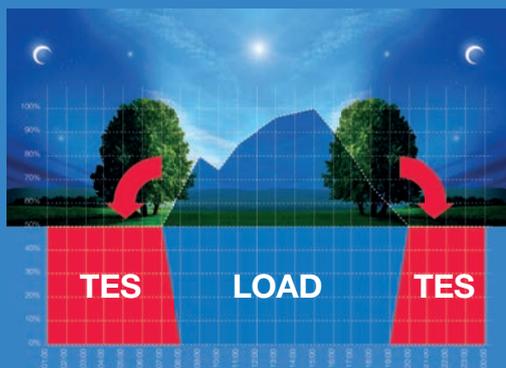
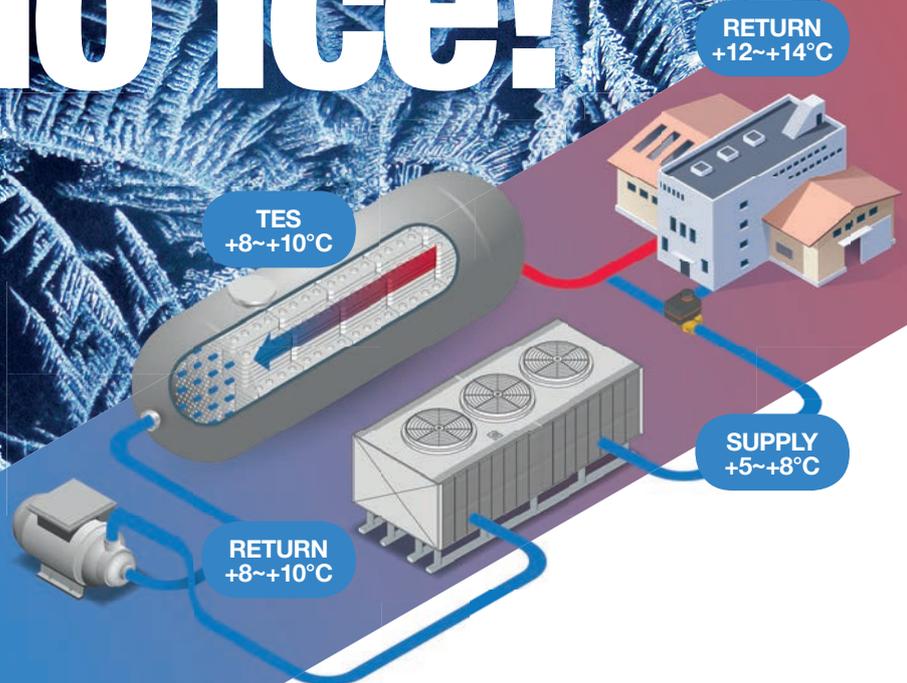
Doncaster agreed, and said remote monitoring technology could present an opportunity for the industry, as long as it does not dilute the maintenance procedure. 'If you don't know the fault exists, you can't do anything about it. Monitoring gives the opportunity to identify the fault early, but you still have to have competent maintenance people to look at the issue and get it fixed quickly,' he said.

Throughout the debate, members of the roundtable were of one mind: fire and smoke control is a specialism, and should be recognised as such. The golden thread of this strategy must be preserved throughout concept, design, commissioning, maintenance and testing, and overseen by a competent engineer, with input from the fire specialist.

'Putting aside our exit from the EU, this has the potential to be one of the most significant topics in parliament for a while,' said Davies. 'We must do anything we can to help the government understand what's needed and why. We have to help them understand what clever regulatory change could look like.' **CJ**

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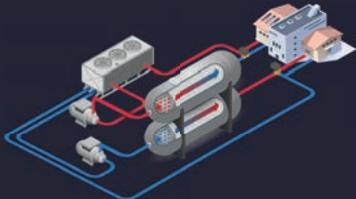


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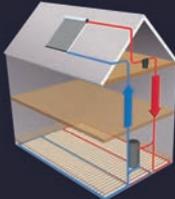
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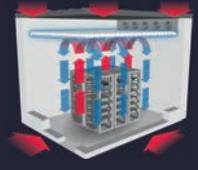
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## HARD FACTS

An estimated half of all commercial hot-water systems have operational problems because of limescale, says Sentinel Commercial's Chris Shelton, who believes Icom's new guide can rectify this



Cross-section of blocked pipe

**T**he Icom Energy Association has launched a guide to water quality, to help contractors and end users understand the effects of scale and corrosion in commercial heating and hot-water systems.

It has also produced a commissioning checklist linked to manufacturers' warranties, to improve general installation standards.

*Water quality consideration of domestic hot-water systems for commercial applications* analyses the effect of poor water quality on contamination, and suggests the water-treatment options open to installation teams, as well as ongoing maintenance regimes.

The association wants to raise awareness among commercial contractors of the importance of ensuring supply water is clean at the commissioning stage and throughout a system's operating life.

Although major components of heating systems are usually cleaned as part of routine maintenance, the waterways inside heat exchangers are frequently ignored, leading to a buildup of scale.

When water is heated, calcium salts precipitate from it and deposit on heat-transfer surfaces as solids, known as limescale – so hot-water systems are particularly vulnerable to limescale accumulation.

Limescale can result in: poor system performance; reduced water flow; potential health issues because it provides a place for legionella to hide; early replacement of system components; and even complete system failure. Because pumps have to work harder as a result of restricted water flow, limescale can

cause energy wastage; British Water estimates 1.6mm of limescale can increase a heating system's energy requirements by 12%.

Limescale deposits can accumulate quickly in appliances such as water heaters, immersion heaters and sanitary fittings. This can result in downtime, higher capital replacements costs, unplanned maintenance and repairs, and costs associated with cleaning 'visible' limescale from taps, shower heads and tiles. A commercial building can have tens, hundreds or even thousands of such appliances, so the cost of limescale can add up.

It is estimated that approximately half of all commercial hot-water systems receive ineffective or no treatment for the control of limescale. When more than 60% of England is served by hard mains water – more than 200 mg·L<sup>-1</sup> calcium carbonate equivalent – it is reasonable to assume that most commercial buildings in England are subject to the detrimental effects of limescale if it is not treated correctly.

This has now been addressed by boiler manufacturers and water-treatment companies coming together under the auspices of Icom to publish the 60-page water-treatment guide. Compiled from years of research, it promotes best practice for the management and safe operation of hot-water installations. It covers essential aspects of water treatment in such systems, including considerations for water analysis, system design, commissioning and maintenance.

The document pinpoints suitable technologies for the control of limescale – base exchange equipment, polyphosphate dosing and electrolytic zinc devices – to avoid the consequences of inappropriate water treatment or conditioning, which can prove costly to rectify.

It also informs those involved in water treatment, including specifiers and maintenance contractors, how they should identify the best regime for a particular system, and how to implement it. For example, the guide underlines the need to establish the system's water volume – to ensure correct dosage rates – and to analyse the chemical make-up of the water so the most appropriate corrective actions are taken.

It gives step-by-step instructions on areas such as initial cleaning and flushing to ongoing treatment, and covers methods of system fill and water types – including use of demineralised, reverse osmosis or softened water – pressurisation, de-aeration and filtration. **CJ**

■ **CHRIS SHELTON** is sales director at Sentinel Commercial



# Havering gets Plumbing Centre of Excellence

**CIPHE and SoPHE joint venture will enhance college NVQs**

A Plumbing Centre of Excellence (PCE) has opened at Havering College, east London, in an initiative developed by the Chartered Institute of Public Heating Engineers (CIPHE) and CIBSE's Society of Public Health Engineering (SoPHE) Contractors group.

The PCE will enhance the Plumbing NVQ level 1, 2 and 3 syllabus, and aims to offer opportunities for plumbing trainees and apprentices to develop further their technical skills, knowledge and career aspirations.

Accredited CPD lectures using SoPHE and CIPHE industrial associate resources will support the NVQ syllabus and are also



Steve Vaughan: initiative will cover water conservation, energy efficiency and environmental issues such as flooding

designed to be suitable for college staff.

Steve Vaughan, regional director at Aecom, and immediate past chair of SoPHE, said: 'The training programme will enhance and provide clear career progression opportunities for aspiring plumbing trainees and apprentices.'

# Xylem offers virtual reality tour of pump station layouts



Xylem has created simulations of its 3D CAD models to allow customers to explore various pump station layouts using virtual reality (VR) glasses.

The Swedish water solutions firm is aiming to roll the project out to other offices beyond its Stockholm HQ, including those in the UK and Ireland.

Xylem's Sundbyberg office team developed a virtual model of a pump station by transferring existing product data into gaming software to develop a VR scene.

The company said it was exploring the feasibility of using computational fluid dynamics to simulate the water in pumps as part of an enhanced VR model. The plan is also to roll out the VR experience to smartphones as well as VR devices.

# Pump comes with carbon filter

The latest version of DrainMinor water pumping system from Pump Technology now features a built-in carbon filter.

The self-contained, fully automatic, system, is suitable for domestic and commercial installations where gravity drainage is not possible.

It will pump wastewater from locations such as sinks, wash basins, domestic dishwashers and washing machines.

The carbon filter, which is incorporated into the lid, means a separate vent pipe is no longer required, allowing it to fit into tighter spaces, says the company.

The tank is manufactured from recyclable polypropylene, and can be customised to suit installation pipe layouts.

An improved lid seal and fasteners allow for easier access to the pump and tank interior for inspection and cleaning.

There are submersible pumps with fixed float arms for reliable on/off operation. There is also a low-level float option, which Pump Technology says virtually eliminates problems with fluid stagnation.

Different versions are capable of pumping up to 5m horizontally or 50m vertically.



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# UNDER PRESSURE

Large, complex or high-rise projects can present a challenge when designing pipework. Viega's **Scott James** focuses on system pressure considerations

**A**lthough not always recognised, water-, heating- and gas-distribution systems have a significant impact on the experience of building occupants and their safety. Getting the specification and design of pipework right is vital for both a new build and a refurbishment. As the size and complexity of the property increases, the effects of the layout, dimensions, material and product choice are amplified – either positively or negatively.

One of the most common consequences of incorrectly specified or designed pipework is low pressure, which causes reduced flow rates.

Besides the inconvenience and poor user experience, a low flow rate of cold-water to mixer taps or showers that do not have thermostatic protection could cause scalding injuries as a result of the sudden rise in water temperature.

With gas pipework, if the pressure or volume of gas to the burner drops too low, it can cause incomplete combustion, producing potentially lethal carbon monoxide.

For taller buildings, maintaining pressure can require careful planning. In the UK, mains water suppliers are required to deliver water at a minimum pressure of 1 bar and will often manage pressures across their network to reduce the effect of leaks. Assuming the pipework is sized correctly, 1 bar of pressure will be sufficient to lift water 10 metres. Above this height, additional measures – such as pressure-boosting pumps – will be required.

It is important to consider fitting design. For example, elbow fittings – where the internal structure and deflectors have been designed to optimise the flow of water – will lessen the amount of resistance in the system.

Choice of product is key, because some fittings will reduce the internal dimensions of the pipe when pressed, and this 'throttling' action increases the resistance of the system further. By selecting fittings that have very low resistance coefficients, the pressure loss can be cut by as much as 80% compared with standard designs.

Getting the pipework design right is also key to protecting the integrity of potable water in the building. One possible source of drinking-water contamination is backflow of fluids drawn into drinking-water systems from other pipework or outlets. Low water pressure heightens



Low pressure is one of the most common consequences of incorrectly specified or designed pipework

this risk. A design that allows water to stagnate – either because of low flow rates or flaws in the layout – creates an ideal environment for bacteria, such as legionella pneumophila, to grow.

The presence of static water in the system can cause serious contamination, so it is advisable to avoid filling the system until the building is about to be occupied – leak-testing with water should only be considered if the system will be made operational immediately afterwards. Any flushing of the installation should take place as close to handover as possible.

To dry-test a system, the pipework should be pressurised with air up to 110 mbar for a defined time. The length of the test depends on the volume of the pipework – for 100 litres of capacity, the test should last at least 30 minutes and increase by 10 minutes for every additional 100 litres. If a leak is detected, a recordable drop in pressure will occur across the system. It is often an advantage with large buildings to divide the water pipework into sections to allow areas – or floors – to be isolated in an emergency, or to carry out maintenance or repairs.

Testing each floor as it is completed allows improvements and adjustments to be made to the installation methodology if issues arise. Keeping the capacities of each section limited allows testing to be carried out in a more manageable way, and the source of any leaks to be identified more easily.

For buildings where the size of the pipework system is extensive, it is important to consider the design, products and materials used, to ensure they meet requirements. Many pipe and fittings manufacturers will offer tools to help designers and contractors calculate the correct pipe sizing and pressure for the system. [C](#)

■ **SCOTT JAMES** is director at Viega



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# SMOOTH OPERATOR

Piping made from multi-layer composite pipe is a viable alternative to copper because it offers flexibility, speed of installation and the elimination of hot works on site, says Emmet's James Field

**I**ncreasingly, price points, reliability and speed of installation are driving product choices when designing and specifying new developments. While copper pipe still dominates the UK pipework market to a large degree, multi-layer composite pipe (MLCP) is starting to prove its robustness and cost-effectiveness on projects throughout the UK.

Delivering successfully for modern construction means products need to be installed quickly without compromising on the quality of installation and specification.

First introduced to the UK market in the 1970s, MLCP has seen a recent growth in popularity alongside increased use of



renewable energy technology – such as underfloor heating. MLCP has also seen less dramatic price fluctuations in recent years compared with copper and steel.

The flexibility of the pipe, together with the use of press fittings, is where MLCP can offer significant savings to developers on installation time. The pipe can be bent readily, allowing efficient routing around the building. Once bent, it retains its form and stays in position.

MLCP is often perceived to be comparable to plastic-only pipe, commonly used in DIY projects. But it is a halfway house between polybutylene pipework and copper piping, consisting of a plastic pipe (PE-Xb) with an internal aluminium layer that offers rigidity, form retention and a solid oxygen barrier to prevent internal corrosion of heating system components.

The intermolecular bridges inside PE-Xb pipework give enhanced benefits of resistance over time to pressure and temperature, resistance to corrosion and the ability to be used with high and low temperatures.

Compared with copper and stainless steel, the smooth interior surface of MLCP pipe promotes the flow of water, considerably reducing pressure drops across the system, minimising running noise and reducing maintenance needs.

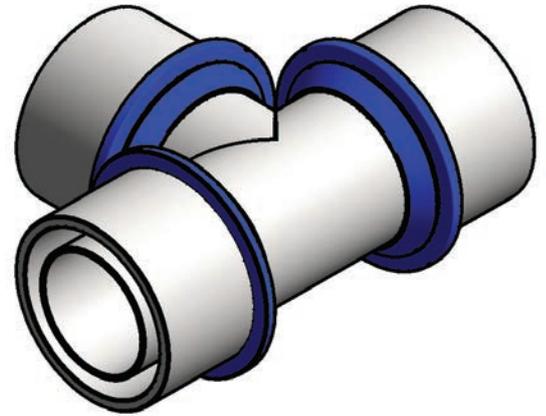
The aluminium intermediate layer creates an oxygen barrier and the ability to form 90-degree bends while retaining its shape – something not associated with plastic pipes but expected with copper. >>

» This element, combined with the speed of using press fittings – which the UK has now adopted as standard practice – is key to quicker, safer and a more technically astute product installation.

This type of jointing method has become increasingly popular because of its simple and quick installation, high working temperatures and pressure capability.

Press fittings are a clean, simple and more efficient alternative to traditional jointing methods such as soldered copper and threaded steel fittings. The use of a pressing tool to ensure a clean, secure joint means the system can be installed with no hot works on site. This saves time, permits and insurances and reduces the risk of fire.

While fittings can have different material make-ups, such as polyphenylsulfone (PPSU) composites, other systems use engineered brass, with an outer sleeve coating of nickel plating that is not in contact with fluid. The fittings have a two O-ring system made from ethylene propylene diene monomer (EPDM) rubber. Finally, a plastic



BIM of engineered brass fitting with outer sleeve coating of nickel plating

ring incorporated into the fitting prevents di-electric corrosion between the aluminium layer of the pipe and the brass-bodied fitting.

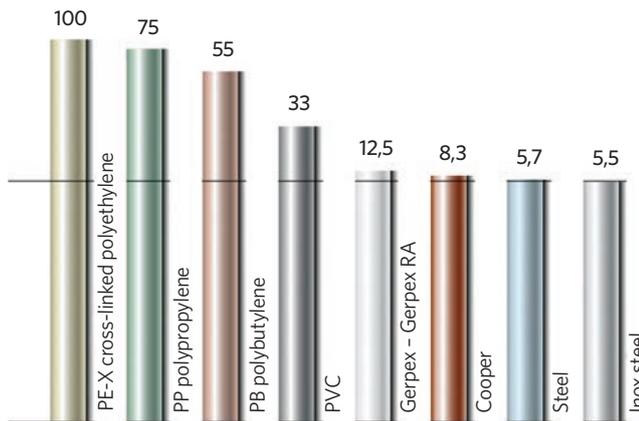
Compared with conventional plastic piping, MLCP has low expansion characteristics because of the internal aluminium layer. For design and specification purposes, thermal expansion is comparable to copper.

The table (left) highlights different materials common to the UK market and their linear thermal expansion. Using a set point of 10m with a  $\Delta T$  at 50°C, it is clear that MLCP systems are the nearest comparable material to copper and steel.

Applications of the Water Regulations Advisory Scheme (WRAS) approved system mean it is used regularly within potable environments as well as heating and chilled water systems.

Another market sector where MLCP is particularly suited is high-rise residential projects, where it is being used in risers and downstream in corridors and apartments. The flexibility of coils over straight bars means installation times are generally 30-40% quicker than when using traditional copper or steel. Also, the risk of theft is minimal because MLCP has no scrap value. CJ

■ JAMES FIELD is commercial director at Emmeti



Relative thermal expansion of pipework materials

### KEY BENEFITS OF MLCP SYSTEMS

- Reduction of fittings
- Comparable expansion characteristic to copper
- Removal of hot works
- Resistant to oxygen diffusion, corrosion and temperature
- WRAS approved
- Emmeti specific 50-year lifecycle testing

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# ACOUSTIC SESSION

Without appropriate acoustic drainage people living in close proximity can be disturbed by unwanted noise from neighbours, says Rehau's **Franz Huelle**

**T**oday, many people live in close proximity – London has 3,900 residents per square mile. These people are often living in expensive properties and, rightly, expect a quiet environment when they come home.

This expectation goes beyond the multi-residential sector – it applies to hospitals, hotels and offices too. The sounds caused by water vibrations in internal drainage are expected to be silenced at installation stage.

This is not always the case, and a lack of legislation is partly to blame. Part E of the England Building Regulations states a minimum airborne sound reduction target for the noise transfer from one room to another. Specifically, it mandates that airborne sound transfer from one flat to another must be reduced by at least 43-45 decibels (dB) through the separating wall or floor.

But the issue of building service noise is not addressed. Verification on site is carried out without the water running, so problems are often identified retrospectively once tenants are in place. This is more difficult, time-intensive and expensive to fix.

Many countries specify that a building's technical services must not exceed an absolute decibel level. For reference, 20dBA is an acceptable sleeping room ambience, and 80dBA is the level of ordinary traffic. It is therefore important for consultants to specify above the UK regulatory standard, and for contractors to consider this at installation. Lower specification builds will doubtfully employ an acoustic consultant, so M&E engineers need to consider noise at the design stage to avoid costly retrospective identification and reparation issues.

Cavity absorptions, acoustic pipe wrap and acoustic pipe are three methods of insulating against airborne noise. While the first two try to absorb sound, the latter minimises the creation of noise and the transfer of vibrations into the building structure, typically using a multi-layer pipe construction, increasing pipe rigidity and enhancing acoustic properties.

Where possible, it is best practice to avoid noise creation in the first place. This starts with the design process – ideally, systems should be designed with minimum changes of direction. Sharp bends in piping can make a

system susceptible to water-initiated vibration as fast-flowing drainage hits the pipes creating ongoing reverberations.

When space is limited and a design void of sharp bends is impossible, it's vital to ensure the elbows and branch fittings are capable of minimising vibration. Reinforced corners will help, while heavier materials can help dampen noise. Although cast iron can mitigate this problem, it is costly in terms of both the material and its handling on site.

Bracketing is another important consideration for M&E engineers, who should ensure use of recommended bracketing without being swayed by cost. While a lesser product could cut cost, it will not necessarily be helpful in the long term.

When the bracketing is supplied as part

of the system, additional aspects have to be considered during installation. When fitting, it is important to avoid direct contact between the pipe and building structure – failure to separate the stack sufficiently from the building fabric is a common problem.

To minimise structure-borne sound transmission to the installation, rubber inserts for walls can be part of a fitting offering a firm and tight grip on the pipe to lower sound into the building structure significantly. Engineers should also select fire collars that have been tested with an extra foam insert creating sound-dampening effects between the pipe and the collar.

Selecting the correct products and installing a complete system with its related components – and tackling potential noise problems during installation – will solve most long-term issues. **C**

**FRANZ HUELLE** is technical manager for building solutions at Rehau



**Elbow (inset) design minimises vibrations at source, and the fire-stop collar (below) minimises acoustic bridges**



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**U**nderground plant rooms can be inhospitable spaces, with tight access hatches and narrow ladders leading to an environment that may have been sealed for years. Life safety equipment – including breathing apparatus and a safety harness – can be cumbersome.

'If a space hasn't been touched in five years, who knows what's down there,' says Chris Lang, product manager at DutyPoint. 'If it's near a landfill site there are various gases that could seep through the ground, or there may be a burst gas pipe nearby. With a ladder access you can't escape quickly.'

Underground pump rooms free up more space, but can be costly to maintain because the risk of flooding, falls from height, and gas leaks have to be mitigated. **Carina Bailey** reports on a prefabricated solution that aims to eliminate the dangers

# CREATING A SAFE SPACE

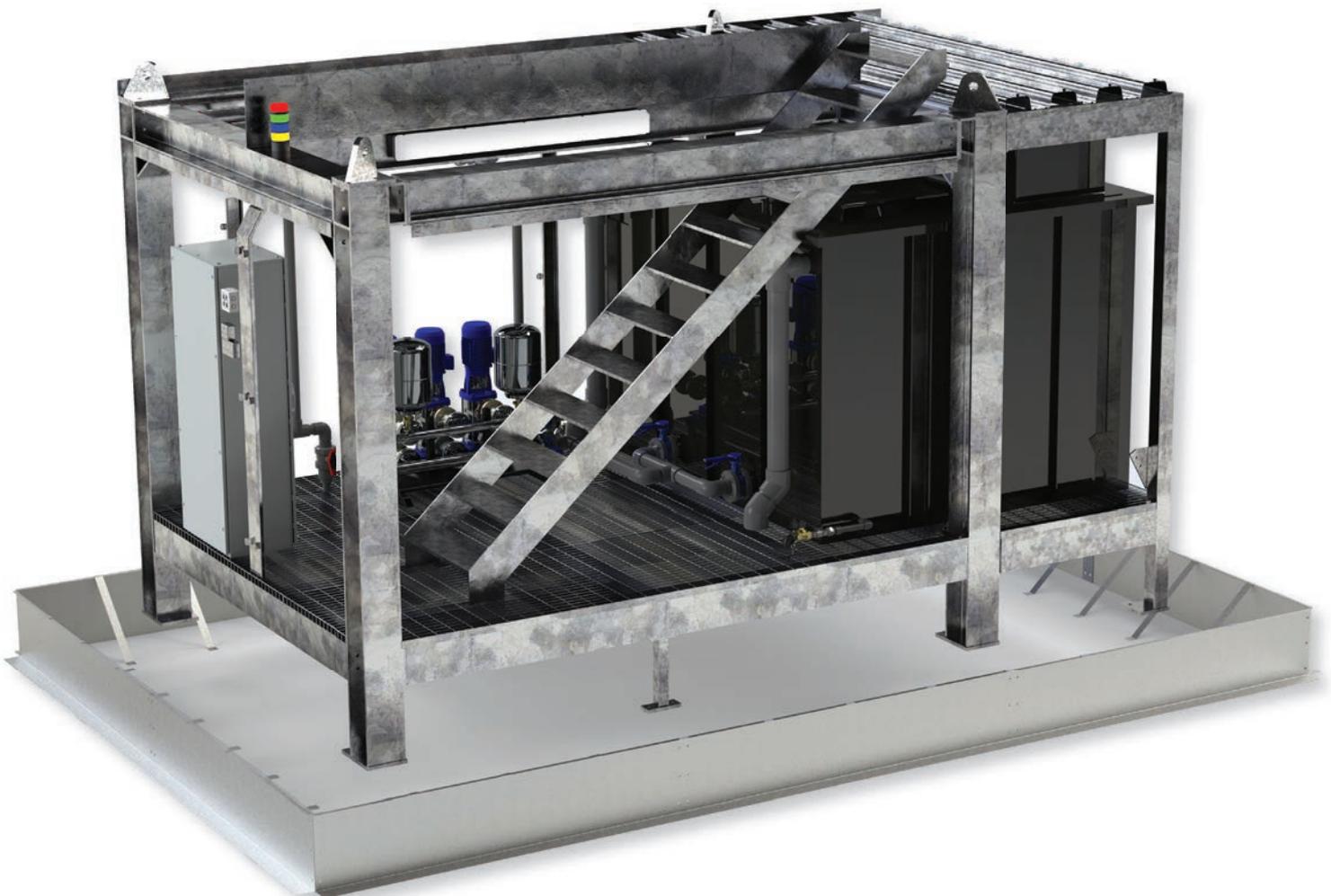
Noxious gases, a lack of oxygen and flood water are just three of the main issues associated with underground plant rooms, making them both dangerous and expensive to maintain.

To eliminate the most common dangers associated with a below-ground environment, Lang and his team have spent two years developing an underground packaged pump room called Optimise.

Another key driver for the development is the space it frees up in buildings for clients.

DutyPoint launched the Optimise unit in August and three underground plant rooms have now been installed in the UK. In simple terms, the installation of the plant room involves craning the unit into an excavated hole, before filling shuttering with concrete and backfilling with soil.

It sounds straightforward, but the development of Optimise was complex, according to Lang. It involved applying for patents to protect a number of design features including a standard staircase rather than a ladder, with an access panel that runs the full length of the staircase.



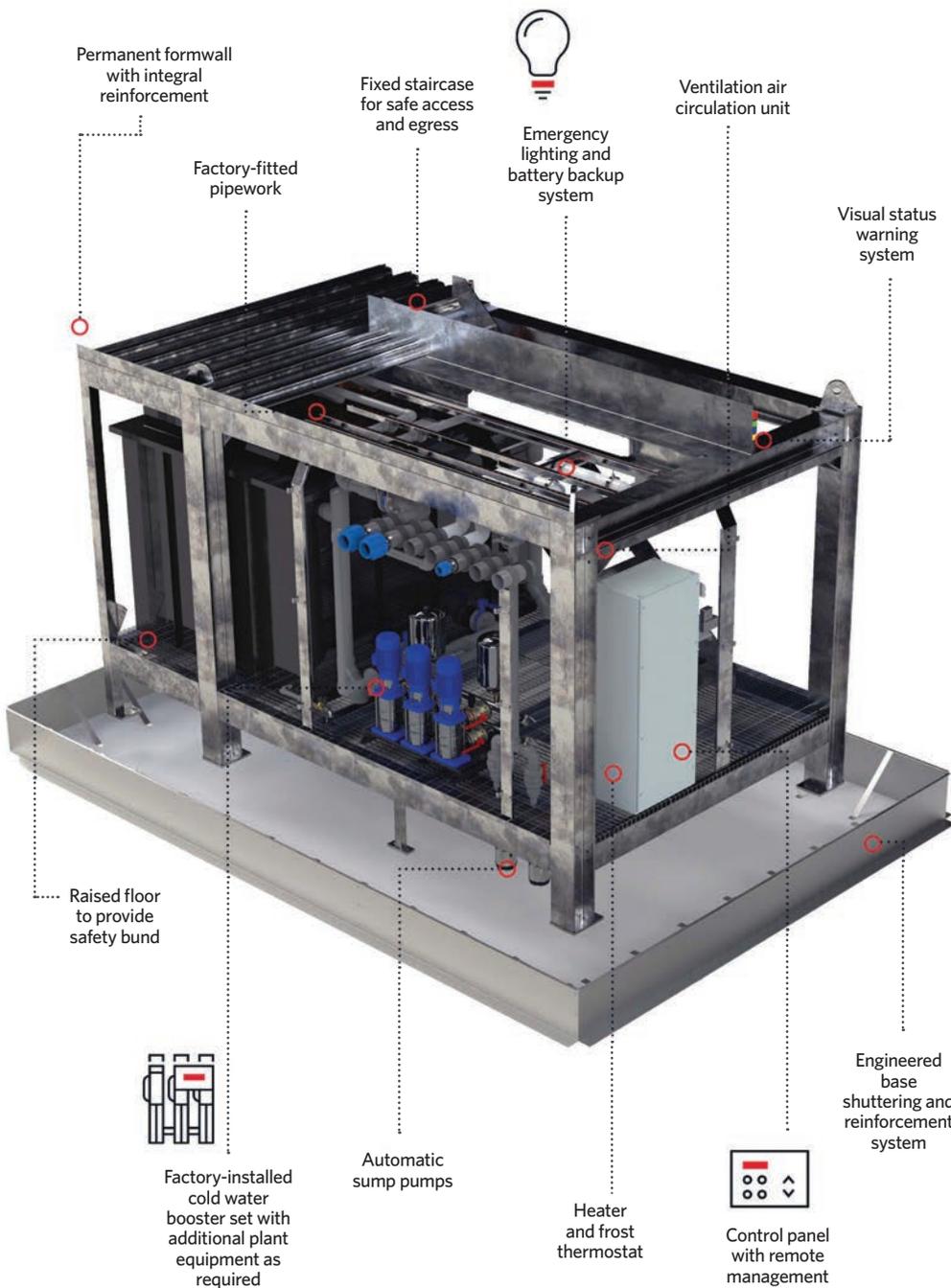
These safety features mean the unit is not classified as a confined space, but is the equivalent of a standard basement in terms of access.

It also features a raised steel-mesh floor with space beneath to hold the entire contents of its water tank – known as a bund – to avoid any risk of drowning should the tank leak or burst.

A mechanical ventilation system prevents oxygen levels from falling too low and ambient temperatures from rising too high. It ensures there is no dangerous build-up of gases, and reduces the risk of corrosion entering the water supply.

A recent Water Regulations Advisory Scheme case study highlighted how vapour from a freshly painted floor dissolved into water inside a cold-water storage cistern with booster pumps.

‘Because there wasn’t enough oxygen, the paint dissolved in the water and caused contamination,’ says Lang.



The advantages of putting pumps underground include a reduction in noise and more control over the temperature of stored water. Stored above ground, water is susceptible to high external temperatures, such as those experienced in this summer’s heatwave. If water is heated to 23°C, there is a risk of legionella bacteria growth.

But staving off frost in winter is a bonus for above-ground facilities that use a building’s heat. All external plant rooms need a separate source of heat.

A major consideration when putting anything underground, according to Lang, is groundwater. In the UK, it’s quite common to have water a few metres from the surface. ‘Anything hollow that you put underground wants to float,’ says Lang. ‘If you put a plastic bottle underwater, it will bounce to the surface. You can multiply those forces by about a thousand [for this type of project].’

‘Because you’re playing with such big forces, you have to get the balance exactly right.’

Lang says there have been incidents in the UK and abroad where underground tanks have burst through the surface shortly after installation.

Another factor to consider with any room of this type, says Lang, is the access required to replace equipment at the end of its life. Pumps, for example can weigh several tonnes and be up to 2m high. Lang says its solution allows for the safe replacement of plant.

### Finding the solution

The pre-fitted concrete shuttering shaves up to six working weeks off the installation time, according to Lang. As the shuttering is placed on the unit at a set size – typically



“There have been incidents where underground tanks have burst through the surface after installation”

other can pull them to safety. This requires specialist training and equipment – such as breathing apparatus, a harness and winch system – which all comes at an additional cost.

In terms of cost, the prefabricated underground plant room, is more expensive, but Lang says there are large savings in maintenance.

‘In rough figures, where a traditional unit might cost £50,000, ours might cost £80,000 because it’s more complex but, it only has to be attended by one person twice a year. That person would not need specialist training,’ says Lang.

Two people with specialist training would be required to attend an underground system classed as a confined space, says Lang. Assuming half-day site visits cost £750, Lang estimates that an Optimise unit could save more than £40,000 in maintenance fees over its lifetime.

‘We are really pleased with the product,’ says Lang.

‘It was one of those projects where we just had lots of “lightbulb moments” – such as, why have people never thought to put in a bund before?’ **CJ**

15.2cm – Lang says exact calculations can be made about the concrete required.

More savings are achieved when the plant room is in use, says Lang. Currently, in underground plant rooms it is normal practice to have two people onsite during maintenance so, should anything untoward occur to one operative, the



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## Predicting the efficiency of water chillers for building comfort cooling

This module considers the main measures used to determine and interpret the operational efficiency of water chiller-based building cooling applications

Traditionally, the basic effectiveness of a refrigeration system has been stated thermodynamically in terms of the coefficient of performance (COP). However, when assessing a water chiller installation, the overall performance will be dependent not only on the underlying refrigeration cycle, but also on the interaction between the components; the heat-rejection medium; the air or water that is being cooled and the losses because of inefficiencies in drive motors, fans, pumps and controls; heat and pressure losses; and energy for the crankcase heater. This CPD article will compare the predominant measures that attempt to provide an interpretation of this operational efficiency.

The energy efficiency ratio (EER) is the term used to describe the basic instantaneous practical energy efficiency of a refrigeration cooling cycle, and provides a ratio of useful cooling energy to (typically) electrical input energy. In SI units, this is a dimensionless ratio and is lower than the cooling COP, as it accounts for the practically inherent 'losses'. This efficiency is usually quoted in terms of 'full load' at the design or specific selection conditions. Typically, this would be efficiency at 100% capacity at an ambient (external air dry-bulb) temperature of 35°C.

Testing standards (such as BS EN 1451<sup>1</sup>) typically mandate that this performance is established for a specific leaving chilled water temperature of 7°C. In reality, chillers operate over a range of loads and ambient temperatures, and it is this time-weighted performance that will determine the energy consumption – and carbon emissions – needed to assess compliance with regulations such as Approved Document Part L of the England and Wales Building Regulations.

In recent years, this average efficiency has most commonly been expressed as a seasonal energy efficiency ratio (SEER) or European SEER (ESEER). The ESEER is provided by the weighted average of performance under four different operating conditions, with a constant leaving chilled water temperature of 7°C.

$$\text{ESEER} = 0.03 \times \text{EER}(\text{@ } 100\% \text{ load}) + 0.33 \times \text{EER}(\text{@ } 75\% \text{ load}) + 0.41 \times \text{EER}(\text{@ } 50\% \text{ load}) + 0.23 \times \text{EER}(\text{@ } 25\% \text{ load})$$

The weightings attempt to give an approximation of the fraction of the operational period that the comfort cooler will operate at that load.

An example of such a calculation is shown in Table 1 for a particular chiller servicing an office. The specific values of EER at the different loads are provided by the manufacturer from tests undertaken to BS EN 14511.

The requirements<sup>2</sup> developed under Lot 21<sup>3</sup> of the European Commission's Ecodesign Directive<sup>4</sup>, which came into force earlier this year, set the required chiller efficiency when used for controlling the environment >>



Example of commercial air-cooled chiller

» for people (comfort chillers). This introduces a variation on the calculation method of the SEER that employs BIN temperature-based analysis and takes account of other operational factors.

There are two versions of the Ecodesign SEER for comfort chillers: SEER (12°C/7°C) for chillers used in systems that employ terminals such as fan coils and air handling units; and SEER (23°C/18°C) for chillers used in systems having chilled ceilings or floors. The minimum required efficiency is the same in both instances, even though operating at a higher chilled water temperature will result in a better efficiency ratio. However, the chillers must be compliant with the requirements corresponding to their intended use or to the application for which they are marketed. If a manufacturer declares both applications, the product has to be compliant with both applications, and if it conforms at one set of conditions (for example, 23°C/18°C), but not the other (in this instance, 12°C/7°C), it may only be marketed and applied to operate at the higher temperature.

To comply with the Ecodesign directive, the comfort cooler must meet the minimum efficiency performance standards (MEPS) for seasonal space cooling energy efficiency (SSCEE). The SSCEE relates performance to primary energy use, and is determined by dividing the SEER by the conversion coefficient (CC) that reflects the estimated 40% average EU electrical generation efficiency (so CC = 2.5). The required SSCEEs are shown in Table 2.

However, these factors are unlikely to be useful when attempting to predict real levels of chiller efficiency in a particular location – such as in a UK town – in order to determine the annual energy consumption (and CO<sub>2</sub> emissions) and, hence, Part L compliance. More realistically, there are likely to be multiple chillers operating to meet varying loads, and the load profiles and ambient temperatures used in determining the ESEER and Ecodesign SEERs may not be representative of a particular UK location.

The England and Wales non-domestic building services compliance guide gives a number of approximations that can be used to determine appropriate data for the SEER calculation for the cooling plant used on a building. This includes appropriate adjustments for systems with free cooling or heat recovery. For a single chiller, in the absence of reliable part-load data, the default position is to use the full-load EER of the unit at the project design conditions. Where part-load data is available, and where the building is an office, a more representative approximation may be made by using the

Outdoor ambient temperature	Load %	Fractional time	EER (from manufacturer)	Fractional time x EER
35°C	100	0.03	3.15	0.09
30°C	75	0.33	3.92	1.29
25°C	50	0.44	4.04	1.66
20°C	25	0.23	5.08	1.17

**Table 1: Example of ESEER calculation** **ESEER** **4.21**

Chiller type	From January 2018		From January 2021	
	SSCEE	SEER 12°C/7°C or 23°C/18°C	SSCEE	SEER 12°C/7°C or 23°C/18°C
Air-cooled < 400kW	149%	3.8	161%	4.1
Air-cooled 400 to 2,000kW	161%	4.1	179%	4.55
Water-cooled < 400kW	196%	4.98	200%	5.08
Water-cooled 400 to 1,500kW	227%	5.75	252%	6.38
Water-cooled 1,500 to 2,000kW	245%	6.2	272%	6.88

**Table 2: Minimum efficiency performance standards for chillers, as defined by the Ecodesign Directive**

same weighted calculation procedure as the ESEER, assuming that the leaving chilled water temperature is 7°C at each part-load operating point.

The non-domestic building services compliance guide suggests that multiple-chiller systems may be evaluated using a plant seasonal energy efficiency ratio (PSEER) value that may be calculated based on the sum of the energy consumptions of all the operating chillers. It indicates that this should include all the factors that can influence the combined performance of the multiple-chiller installation, including the:

- Degree of oversizing of the total installed capacity
- Sizes of individual chillers
- EERs of individual chillers at actual operating conditions
- Control mode used: for example, parallel, sequential, dedicated low-load unit
- Load profile of the proposed building
- Building location (as this determines ambient conditions).

The PSEER value is then used as the SEER in the Simplified Building Energy Model (SBEM) calculation that is used for assessing Part L compliance.

Calculating a PSEER does not necessarily require an hour-by-hour dynamic model of the building. A good approximation can be made using simpler, BIN temperature-based analysis that could be undertaken with a spreadsheet tool using part-load EER data. However, considering the number of coincident dependant parameters, this might be more readily achievable using software tools that are available from manufacturers. These can provide the performance of each of the individual chillers within the system that are working together to meet the varying load, at the actual load calculated for each BIN temperature. This requires detailed part-load EER data that is only likely to be available in the manufacturers' extended data sets. Such software can determine the number of chillers operating by considering the control sequence selected (parallel unloading or sequenced), and



Mixed-use developments will require careful consideration to develop meaningful load profiles

can then calculate the individual fractional loads.

If the chillers are not of equal size, the sequence in which they are bought on line can be set to reflect the actual system setup.

The building load profile could be introduced to such a model or – as is often needed when options are being evaluated – a profile can be simulated. This can make reference to historical weather data for the location, and the proposed hours of operation, to generate a realistic ambient temperature profile for the building. The load profile can then be defined in terms of the variation in the ambient temperature and the specified maximum and minimum operating load.

Given the assumptions made in generating the building load profile, this would not determine ‘exact’ system performance.

However, it certainly complies with the stated intent of the non-domestic building services compliance guide ‘to calculate a PSEER which matches the proposed installation more closely than the simplifications [using the SEER formula]’.

Such methods do not have the potential resolution of an hour-by-hour dynamic

model. However, as building cooling load profiles are, at best, an approximation, the more detailed hour-by-hour calculation is unlikely to offer any significant improvement in accuracy. Different systems may be compared – such as air-cooled versus water-cooled – and PSEERs can be generated that match the proposed installation.

The examples below have been prepared by a chiller manufacturer<sup>5</sup>, using detailed EER data for its chillers applied with a BIN temperature-based chiller system operation programme. They illustrate PSEERs calculated for a variety of common chiller technologies and system configurations. They are both for a London office, with weekday operating hours of 7am until 6pm, and Saturday operation from 9am until 1pm, using Heathrow weather data for the systems, with a constant 6°C leaving chilled water.

The first in Table 3 applies two air-cooled chillers in parallel, with a peak cooling load of 1,000kW, minimum load 200kW, with the load directly related to ambient temperature.

This indicates no direct – or simple – correlation between unit EER, unit SEER and PSEER. This is because the PSEER is dependent not just on the inherent efficiency of the particular chiller technology, but also on the specific application.

PSEERs can be similarly calculated for water-cooled systems, as in Table 4. This considers a similar application but, this time, featuring two water-cooled chillers in parallel, a peak-cooling load of 3,000kW and a minimum cooling load of 600kW. There is one cooling tower per chiller, with a variable-speed tower fan with 0.014kW design power input per kW heat rejection. There is constant flow condenser water, with a piping dynamic loss of 100kPa and overall pump/motor efficiency of 75%.

Although the resulting EER, SEER and ESEER provide standardised values of efficiency, they are not necessarily good indicators of ‘real’ system efficiency. The PSEER calculation recommended in the non-domestic building services compliance guide is more likely to provide a prediction that more accurately reflects the specific application, both for multiple and single chillers. It is not just dependent on the chiller technology, but also on the specifics of the application, and is required to make meaningful comparisons between air-cooled and water-cooled systems. Meaningful PSEERs can be determined using simplified, BIN temperature-based models.

© Tim Dwyer, 2018.

■ With thanks to Carrier UK technical sales team for the extensive examples and core materials.

■ Turn to page 62 for further reading and references. >>

Chiller technology	Unit EER @ 35°C	Unit SEER 12°C/7°C	PSEER	PSEER vs SEER
AC fixed-speed scroll	2.86	4.40	5.35	+21.6%
AC fixed-speed screw	2.91	4.15	5.62	+35.4%
AC variable-speed screw	3.19	5.01	6.35	+26.7%

Table 3: Example SEER and PSEER calculation outputs for air-cooled chillers

Chiller technology	Unit EER @ 30°C ECWT	Unit SEER 12°C/7°C	PSEER	PSEER vs SEER
WC fixed-speed screw	5.65	5.79	5.9	+1.8%
WC variable-speed screw	5.96	8.00	7.2	-10%

Table 4: Example SEER and PSEER calculation outputs for water-cooled chillers



# » Module 132

October 2018

**1. What is the leaving chilled water temperature that is noted in the article as typically mandated in standards?**

- A 3°C
- B 5°C
- C 7°C
- D 9°C
- E 11°C

**2. What weighting factor is applied with the EER at 75% load as part of the ESEER calculation?**

- A 0.03
- B 0.13
- C 0.23
- D 0.33
- E 0.43

**3. What is the seasonal space cooling energy efficiency required by the Ecodesign Directive for water-cooled chillers under 400kW as from 2021?**

- A 161%
- B 179%
- C 200%
- D 252%
- E 272%

**4. Which of the following is not explicitly noted as influencing the combined performance of a multiple-chiller installation?**

- A Building load profile
- B Control mode
- C Degree of oversizing
- D EERs of individual chillers at operating conditions
- E Operational maintenance regime

**5. Which of the ratios was suggested as being able to reflect accurately specific applications for both multiple and single chillers?**

- A EER
- B ESEER
- C PSEER
- D SSCEE
- E SEER

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### References:

- 1 BS EN 14511-2:2018 *Air conditioners, liquid chilling packages and heat pumps for space heating and cooling and process chillers, with electrically driven compressors*, BSI 2018.
- 2 *Commission Regulation (EU) 2016/2281... with regard to Ecodesign requirements for air heating products, cooling products, high-temperature process chillers and fan coil units*, 2016.
- 3 [www.eceee.org/ecodesign/products/lot21-central-heating-products/](http://www.eceee.org/ecodesign/products/lot21-central-heating-products/) - accessed 10 July 2018.
- 4 European Standard and Commission Regulation (EU) No 206/2012 implementing Directive 2009/125/EC.
- 5 Carrier example calculations, Carrier UK Technical Sales Team, July 2017.

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# PRODUCTS & SERVICES

## ▼ Tenant fit-out at 180 Great Portland street for SVC

AET Flexible Space has completed a Cat-B fit-out of underfloor air conditioning equipment on the fifth floor of 180 Great Portland Street, for the incoming tenant, strategic communications specialist Sard Verbinnen & Co.

The building is accredited with the 2008 BCO Award for Innovation because of its sustainable design, with the introduction of underfloor air conditioning playing a major role in opening up the restrictive floor plates and maximising floor-to-ceiling heights.

■ Call 01342 310 400  
or email [aet@flexiblespace.com](mailto:aet@flexiblespace.com)



## ▼ When gravity won't work

In an ideal world, it is preferable to dispose of wastewater and sewage by gravity. However, this can sometimes be difficult because of a building's use and layout.

The experience of the pump system supplier's technical team is invaluable. Working with a specialist wastewater and sewage pumping company to find a system that matches an application can usually save considerable time and expense.

Pump Technology's in-house engineer is always available by phone and, with the appropriate drawings, is almost always able to provide a full specification and price within hours.

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



## Colt goes on the defensive ▼

Building services manufacturer and contractor Colt International has launched a highly versatile, single-bank, extruded weather louvre, designed to offer robust rain defence in tandem with natural ventilation.

The EWL louvre system offers comparable weather protection to a double-bank louvre, but at considerably lower cost. It achieves Class A rain defence up to 3m/s and has been independently tested to EN 13030:2001.

The EWL louvre is extremely aerodynamically efficient, with a pitch of 50mm at 45° to maximise rain defence. This also reduces air resistance, so the size of the plant and the ventilation aperture can be minimised to reduce life-cycle running costs. Rainwater drains efficiently through the mullions onto the sill.

Made from corrosion-resistant extruded aluminium, the louvres are hard-wearing and low-maintenance. They are clipped – rather than riveted or screwed – to structural supporting mullions, which allows for thermal expansion without distorting the pitch of the louvre blades.

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



## ◀ Reha is natural choice for pipework in lochside resort project

Rehau has supplied a portfolio of pipework solutions to help deliver a district heating programme at Piperdam, a luxury resort situated on the banks of Loch Piperdam, in Scotland.

Six years ago, Piperdam's owners collaborated with local installation company Hydroscot Energies on an energy strategy for the resort.

Scott Gaffney, owner of Hydroscot Energies, got in touch with Rehau, the only firm with a UK base, which was critical to the smooth running of the installation programme.

■ Visit [www.rehau.com/gb-en](http://www.rehau.com/gb-en)

## Evinox launches fresh website to showcase heat-network products and services ▼

Evinox Energy has launched its new website – which features a fresh look and feel, plus user-friendly navigation – enabling users to browse through its extensive range of heat-network products and services with ease. These include smart heat interface units (HIUs) and comprehensive support services, such as metering, billing, revenue management, and service and maintenance.

Delivering a fully responsive experience, the new website gives users a seamless transition from desktop to mobile browsing. It has been designed to give heat network information for housing developers, M&E consultants, housing associations, and building managers, covering all stages of a communal or district heating project.

Emma Alexander, marketing manager at Evinox Energy, said: 'We are really excited about the launch of our new site, which we've packed with useful heat-network information, including articles, case studies, best practice and regulation advice, alongside technical information about our ModuSat Smart HIU range and metering, billing and maintenance support services. We love the new look and feel of the site, and see it as the cornerstone of our online marketing strategy, aligning our digital platform much more closely to our brand and product and service offerings.'

The new smart HIU hub on the Evinox website features plenty of technical content and useful information, and includes everything you need to know about Evinox's ModuSat range of HIUs.

■ Call 01372 722277 or visit [www.evinoxenergy.co.uk](http://www.evinoxenergy.co.uk) or [www.evinoxresidential.co.uk](http://www.evinoxresidential.co.uk)





↗ **An introduction to data-centre risk – a new online course from operational intelligence**

Risk is a fact of life in the data-centre environment, and downtime can lead to severe financial and reputational damage. In response to this, Operational Intelligence has created the only online course dedicated to assessing and analysing risk in the data centre. This CIBSE CPD-accredited course uses a case study to raise awareness of data-centre risk to help users apply it to a real-world context.

■ Email [info@dc-oi.com](mailto:info@dc-oi.com) or visit [www.dc-oi.com](http://www.dc-oi.com)



↗ **Viessmann enters UK domestic oil-boiler market with blue-flame condensing technology**

Viessmann is formally adding a domestic oil boiler to its UK product range, having operated in the market for many years as a niche player.

The Vitorondens 200-T floor-standing, oil-condensing boiler features Viessmann's bespoke two-stage Vitoflame blue-flame condensing oil technology. It is future-proofed against tightening OFTEC laws on NO<sub>x</sub> emissions, which come into force this September and are set to become more stringent in the next five years.

Viessmann's marketing director, Darren McMahon, said: 'The exceptionally high standards of the Vitorondens 200-T has been proven in international markets for many years.'

'With the upcoming emissions legislation, the time is now right for the Vitorondens boiler to be more widely introduced into the UK as an alternative to biomass and LPG boilers for off-grid customers, and where renewable options aren't always ideal – for example, in older and less well insulated buildings that need a high-temperature heating system.'

The Vitorondens boiler complies with the OFTEC requirement for maximum flue gas NO<sub>x</sub> emissions of 120mg/kWh.

■ Call 01952 675090 or email [comsales-uk@viessmann.com](mailto:comsales-uk@viessmann.com)

**Grundfos knows the questions to Aske** ↘

The Haberdashers' Aske School, in Elstree, is an independent school for girls aged four to 18. Established in 1875, it is a respected name within the education sector, and its aim is to help each pupil attain their individual potential.

This forward-thinking attitude seeps into many other aspects of the school – for example, its recent building improvement works. Oxford-based building services engineers F G Alden was tasked with delivering a new project and turned to Grundfos Pumps to help it supply the best pump solution.

With energy efficiency a key driver in the school's ambitions, both parties focused on this to deliver the best M&E result. The outcome was a complete, integrated state-of-the-art HVAC and water-boosting pump package.

This included the most advanced pump technological solutions available to the market, such as the Grundfos Magna3 commercial circulators and TPE2 single stage in-line pumps, as well as the Hydro MPC-E booster set.

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



**Rinnai appoints new sales consultant in London** ↘

Rinnai, a UK supplier of hot water heating units and systems for all commercial and residential sites, has appointed Lewis McLeggan as sales consultant for the London area.

McLeggan, who lives in west London, holds a BA (Hons) in business and marketing, and joins the company with a wealth of industrial experience and knowledge.

'This appointment is in line with our commitment to invest continuously in our human resources, in order to deliver customer service excellence,' said Rinnai managing director Tony Gittings.

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



↘ **HygroMatik winner of Plus X Award for Product of the Year 2018**

The new FlexLine series of steam humidifiers, by humidification equipment manufacturer HygroMatik, has won the Plus X Award for Product of the Year 2018.

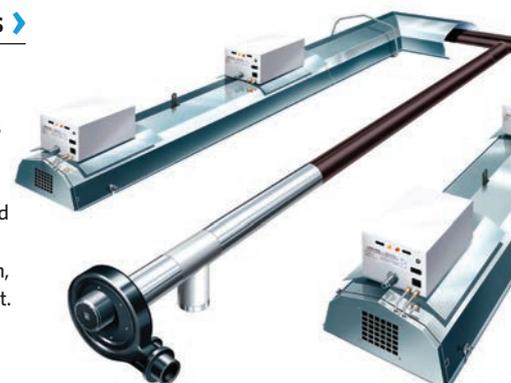
The award has seven seals of approval by which products are judged: innovation, quality, design, ease of use, functionality, ergonomics and ecology. FlexLine was awarded three out of the seven seals for high quality, ease of use and functionality, making it the most awarded product of all those participating.

■ [www.hygromatik.com/en](http://www.hygromatik.com/en)

**Warm air, radiant and heating products are now affected by European regulations** ↘

Warm air heaters are subject to Lot 21 of the Ecodesign Directive, and radiant heaters Lot 20. Minimum efficiencies for warm air is now 72% and radiant heaters 74%. These minimum criteria are applicable for new installations and when replacing existing products. Nortek's heating equipment is highly energy efficient and its ErP-compliant range includes the efficient Nor-Ray-Vac – a gas-fired continuous radiant tube heating system, designed specifically for the building it is required to heat.

■ Email [erp@nortek.com](mailto:erp@nortek.com) or visit [www.nortek-erp.com](http://www.nortek-erp.com)



## LED lighting refurbishments for Harrow Council



Luceco, in conjunction with Harrow Council, has supplied energy efficient LED lighting solutions for school facilities under the remit of the local authority.

Whitchurch Primary and Nursery School required cost-effective LED lighting to replace fluorescent fittings that were no longer fit for purpose.

Luceco suggested an energy-saving lighting solution using the linear Academy luminaire installed to the existing lighting track, which was in good order. This retro-fit solution met the budget constraints and, because of the energy-saving luminaires, made for an attractive return on investment.

Other luminaires installed include Celeste, an attractive circular LED luminaire from Luceco, featuring a 'corona' backlight effect with a direct/indirect light distribution. It can be surface- or wall-mounted or - as at Whitchurch Primary and Nursery School - suspended using a three-point 1.5m suspension kit, creating an attractive pendant.

The lighting refurbishment was partially funded by the Salix scheme.

■ Call 01952 238100, email [uk\\_sales@luceco.com](mailto:uk_sales@luceco.com) or visit [www.luceco.com](http://www.luceco.com)

## Nittan awarded ISO 9001:2015 for high-quality performance

Nittan Europe, a manufacturer of conventional and addressable fire-detection products, has been awarded ISO 9001:2015 certification. This achievement marks Nittan's ability to deliver high-quality products and systems to market.

ISO 9001:2015 is awarded for fulfilling criteria for a quality management system by organisations ensuring a higher-level structure, with an increased importance on risk.

The certification is based on a number of quality management principles, such as strong customer focus, motivation of top management, process approach and continual improvement.

■ Call 01483 769 555, email at [sales@nittan.co.uk](mailto:sales@nittan.co.uk) or visit [www.nittan.co.uk](http://www.nittan.co.uk)



## iVector MKII – the strong, silent type



As part of Myson's heating solutions portfolio, the iVector MKII is a strong contender for almost any commercial project.

New and improved, the latest generation of iVector is quieter and more intelligent than ever before. With an extended range, there are more options available when specifying the perfect iVector solution.

As well as the standard bottom inlet and integrated

controls (Type BC), the iVector MKII comes in a no-controls version (Type BN) and a floor version (Type FC/FN), by special order.

The iVector MKII maintains all the benefits of the previous model with the same great looks and high performance, but now comes with an improved DC motor and aluminium fan, and packed with more functionality than before, making it the most intelligent fan convector Myson has ever designed.

Manufactured in the UK, in Hull, the iVector MKII comes with a two-year warranty and is a popular choice within the commercial sector.

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



## New humidification CPD seminar for FMS

Condair is offering a new CIBSE-approved seminar on humidification for facilities managers (FMs). It provides: an overview of the different humidifier types; the service requirements for each; details of an FM's responsibilities in relation to L8; and troubleshooting tips for humidifier issues.

The CPD seminar is ideal for any contracted or in-house FM team working with, or looking to install, a humidification system. The session is free, one-hour long, and conveniently delivered over lunchtime at a company's site or office.

■ Call 01903 850200 or visit [www.condair.co.uk/cpd](http://www.condair.co.uk/cpd)



## Viega provides fitting solution for new residential development

Viega's press-connection technology has been specified for the Panorama development, a collection of studio suites and one-bedroom flats in the heart of Uxbridge. Installed by Zero Carbon Solutions, the Viega press-connection systems have been used on the hot and cold water services and heating system within the luxury development. Because of tight project deadlines and the need to avoid delays to other trades, the speed and ease of installation of the pipework was key.

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

► **New Clausius ground source heat pump**

The Clausius range of ground source heat pumps (GSHPs) is available through UK distributor ESS.

Using Copeland scroll compressors, the Strong commercial range is available in modules from 50kW to 150kW, to form systems up to 1.5MW. A range of accessories - including pumps, manifolds, pipework and fittings - can be supplied along with the GSHP.

The Clausius range was developed by José Fernandez Seara, after 30 years at the University of Vigo. It offers efficiencies, the latest innovations and contemporary mechanical design.

■ Call 020 8641 2346 or visit [www.essaircon.com](http://www.essaircon.com)



▼ **Rinnai's eye-catching rugby league sponsorship - for all the right reasons**

As a leading manufacturing supplier of commercial hot-water heating systems, Rinnai has cemented sponsorships with similarly industry-competitive partners, including Super League Club the Widnes Vikings. Striking a novel tone, Rinnai's name appears on the backside of players' shorts.

Rinnai is a globally renowned brand name in its field and has taken some major sponsorships, including the Queensland Reds rugby union team, The World Club World Cup event, held in Tokyo in January this year, and the US Nascar competition.

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



◀ **KoolDuct fit for the gods at Zeus Juice**

The Kingspan KoolDuct system has been installed as part of an ISO Class 8 Cleanroom for Zeus Juice UK, offering a lightweight and versatile solution for air distribution.

Monmouth Scientific designs and builds cleanrooms, including air conditioning. Its expertise has been used to create a bespoke facility in Birmingham for e-liquid manufacturer, Zeus Juice UK - its second site to open in three years.

Kingspan KoolDuct panels are manufactured to the highest standards, certified to BS EN ISO 9001:2008

■ Call 01544 387 384, email: [info@kingspaninsulation.co.uk](mailto:info@kingspaninsulation.co.uk) or visit [www.kingspaninsulation.co.uk](http://www.kingspaninsulation.co.uk)

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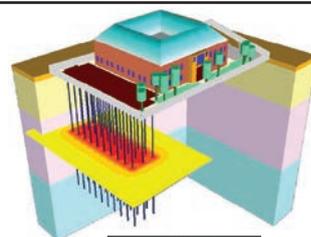
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## **Technical Director - Electrical** **London, £85k + bens**

International multidisciplinary consultancy is seeking an Electrical Technical Director with at least 10 years' experience to oversee cutting edge projects across the globe. Reporting directly to the head of building services, liaising with key clients and leading an exceptional team of engineers. Various project sector experience required, in particular pharma and healthcare. Travel may be required.  
Ref: 4980

## **Principal Electrical Engineer** **London, To £65k + 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, and healthcare. There is ample opportunity to progress to Associate and beyond in this rapidly growing business for someone with the right technical expertise, commercial acumen, and client facing abilities.  
Ref: 5134

## **Technical Director – Mechanical** **London, To £85k + bens**

I am working alongside a well-respected MEP Consultancy who are seeking an ambitious and inspirational Mechanical Technical Director who is passionate about Building Services to join their expanding London office. Leading the project delivery, technical growth and operational development of an exceptional MEP team, the role will see the successful applicant deliver technically challenging, diverse and high-profile projects. Projects include scientific & laboratory, commercial, residential, retail and prestigious hotel projects for well-known clients. Ref: 5140

## **Mechanical Engineer** **London, To £48p/h**

A CIBSE Accredited design consultancy are looking for a senior mechanical engineer to assist them on large commercial / critical systems project in London. This assignment will last a minimum of six months with a strong possibility to be longer. You will need to be degree qualified and ideally be Chartered (but not a necessity). Immediate Start.  
Ref: 5145

## **Mechanical Engineer** **Peterborough, To £36p/h**

This is a fantastic opportunity to work with a leading M&E design consultancy that has been established for over 20 years. Their Peterborough office work on a variety of projects including retail, residential, hotels, and commercial schemes. They require an experienced mechanical design engineer to assist their busy team for an ongoing contract. Ref: 5132

## **Mechanical Technical Manager** **London, £60k - £75k + bens**

Our client is an international consultancy, that are passionate about providing solutions that improve the value, reliability, and efficiency of each individual project for its clients and the broader environment. This is a very exciting opportunity to be part of a mechanical division acting as mechanical technical manager leading large scale, complex projects. Project values from £30m to upwards of £80 million across multiple sectors including; commercial, residential, leisure, retail, and industrial. Ref: 4976

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## **Principal Building Services** **Mechanical Engineer**

Salary: £35,229 - £38,052 Benefits & Grade: Grade M  
Permanent, 37 hours per week Vacancy ID: 009297, Closing Date: 07/10/2018



**Stockton-on-Tees**  
**BOROUGH COUNCIL**

We are seeking to appoint an enthusiastic, efficient and motivated individual to join the Design Services section of Economic Growth and Development.

Reporting to the Design Services Manager, you will be responsible for the delivery and design of mechanical installation services in all types of new and existing buildings for planned mechanical installation replacement schemes and for new build and refurbishment schemes varying from simple low value schemes up to high value complex schemes.

The appointee will take a leading role in the development and management of the Mechanical Design team.

Candidates should have relevant qualifications and experience in the design of mechanical installation services for building related schemes and be able to produce cost effective innovative design solutions.

In addition the appointee will need to be proficient in the use of AutoCAD and demonstrate a sound mechanical design background and knowledge. A knowledge in the preparation and supervision of contracts for mechanical installation works would be an advantage.

Applicants should also be able to demonstrate a flexible and organised approach to their work and have good communication and interpersonal skills. Applicants should have experience of and be confident in the use of Microsoft Office applications and be particularly adept with Word, Excel and Outlook.

For detailed information on this role, please refer to the Job Description and Person Specification.

Please ensure you refer to the essential and desirable criteria detailed in the Person Specification when completing your application as they are used to select candidates for interview.

For a further informal discussion, please contact Gary Laybourne, Design Services Manager on 01642 526910.

An online application form and further information is available from [www.stockton.gov.uk/job-vacancies/](http://www.stockton.gov.uk/job-vacancies/) Alternatively you can contact Xentrall Recruitment Services, Tel: (01642) 526992 or email [recruitment@xentrall.org.uk](mailto:recruitment@xentrall.org.uk)

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Dr Sarah Prichard

# Challenging perceptions

Recently appointed UK managing director at BuroHappold Engineering, Dr Sarah Prichard shares her vision for the company and considers how to make the industry more accessible and inclusive

Since joining BuroHappold as a graduate in 2001, Dr Sarah Prichard has progressed her career by working on technical projects in the UK and internationally. A structural engineer, specialising in the field of building vibrations and dynamics, Prichard is a leading authority and consults widely in this area. Before working in Qatar for more than three years, she also served as a visiting lecturer at the universities of Bath and the West of England.

## What does your role entail?

I am responsible for BuroHappold's UK buildings business, which is split across five offices, with its headquarters in Bath. With multidisciplinary teams – spanning structures, building environment engineering and specialist consulting disciplines, in each corner of the country – I ensure the UK business functions efficiently as one unit. It's my job to support our clients' unique engineering projects, and make sure our teams are inclusive, engaged and technologically savvy, so we can get the best out of everyone. On a day-to-day basis, this translates to time being spent across the whole BuroHappold network. I am also able to use what I learned in my previous role, having spent two years as engineering and operations director, working with the leaders of each office, getting to know individuals and how their teams function.

## What is your vision for change at the company?

It is important to build upon what already exists. People in new roles can have a tendency to think they have to start from scratch, breaking everything down and building it back up again – but that isn't necessary. There are things I want to tweak, but the most important thing is that we continue to move forward with the technological brilliance and client care for which BuroHappold is well known. That way, we can realise the visions of our clients and collaborators.

## How was the experience of working in the Middle East?

The Msheireb Downtown Doha project took me to the Middle East for three

and a half years. Among the local team, there was initial surprise that there was a woman in charge, but – after that initial phase – my gender became irrelevant. The question was, can you do the job? And I could do it – and do so good humouredly.

By demonstrating my expertise on this challenging project, I was able to change perceptions. Many of the local team – even senior contractors – had never known what it was like to work with a woman engineer.

I also learned a valuable lesson; it is equally important with any team to understand their motivations, listen to their concerns, and make the most of my – and my team's – experience.

## How can we encourage the industry to be more collaborative?

Too often, projects are completed in siloes – but collaboration is critical. While it can be difficult to get all parties on the same page, we are demonstrating in our UK business that fostering a feeling of engagement is essential for getting the best out of everyone. Building personal connections across offices is a key part of this, and one of the ways we achieve collaboration in a project context is to make sure we spend time building teams face to face, and have regular, open and constructive dialogue about setting goals and achieving specific tasks or client-focused outcomes for the project.

## How can we make the industry more accessible and inclusive?

It is going to take time for the engineering and wider construction industry to shift away from stereotypes that persist – around gender, for example. But bit by bit we can do that. The key is encouraging women to stay in engineering roles.

When I did my degree, about 10% of the class were women. While the number of women studying engineering is rising, as an industry we need to support women to stay in engineering.

BuroHappold believes in equality of opportunity for all its employees and – through our memberships of inclusion and diversity charities and organisations – we use specific tools designed to challenge our approach and efforts in relation to embedding an inclusive culture throughout our offices.

**DR SARAH PRICHARD** is UK managing director at BuroHappold Engineering

## NATIONAL EVENTS AND CONFERENCES

### CIBSE Young Engineers Awards

**11 October, London**  
Encompassing Graduate and Employer of the Year accolades, which recognise the innovative thinking and skills of graduate engineers, while championing employers committed to developing young talent.  
[www.cibse.org/yea](http://www.cibse.org/yea)

### SLL LightBytes

**18 October, Birmingham**  
**29 November, Belfast**

The 2018-19 series, in collaboration with CIBSE Facilities Management Group.

### Build2Perform Live

**27-28 November, London**

## CIBSE TRAINING

For details, visit [www.cibse.org/training](http://www.cibse.org/training) or call 020 8772 3640

### Sanitary and rainwater design

**2 October, London**

### Design of heating and chilled water pipe systems

**2 October, London**

### Lighting: Legislation and energy efficiency

**3 October, London**

### Electrical distribution design

**3 October, London**

### Lighting design: Principles and application

**4 October, London**

### Emergency lighting to comply with fire safety

**5 October, London**

### Practical controls for HVAC systems

**5 October, London**

### Energy savings opportunity scheme

**9 October, London**

### Electrical services explained

**9-11 October, London**

### Energy efficiency building regulations: Part L

**10 October, Manchester**

### Standby diesel generator

**11 October, London**

### Building services explained

**16-18 October, London**

### Low carbon consultant design

**17-18 October, Birmingham**

### Fire detection and alarm systems for buildings BS 5839 Part 1

**18 October, London**

### Heat networks code of practice

**18-19 October, Manchester**

### Fire safety in purpose-built blocks of flats

**19 October, London**

### Below ground building drainage

**19 October, London**

### Mechanical services one-day overview

**24 October, London**

### Running projects effectively

**25 October, London**

### Mechanical services explained

**30 October-1 November, Manchester**

### Low carbon consultant building operations training

**29-31 October, London**

## CIBSE GROUPS, SOCIETIES AND REGIONS

For more information about these events, visit [www.cibse.org/events](http://www.cibse.org/events)

### South West: BB101 update

**1 October, Exeter**  
Presentation from Joe Clawley, of Breathing Buildings, on the revision to Building Bulletin 101.

### SLL and HCSW: Designplan factory visit

**3 October, Sutton**  
Tour of Designplan's purpose-built, Breeam Excellent-rated building.

### SLL and North West: Circadian disruption and lighting Well

**3 October, Manchester**  
Presentation from international architectural lighting specialist Kam Dhatt.

### SLL: Celebrating 100 years of Munsell: surface colour and its perception

**4 October, London**  
Physicist Professor Malcolm Longair, will discuss the development of colour theory.

### CIBSE Membership application workshop

**5 October, Leicester**  
A workshop to help Associate and Member applications.

### East Midlands: DIALux training

**9 October, Derby**  
SLL and East Midlands CPD event on DIALux Evo software.

### North East: Fire safety

**9 October, Newcastle**  
Presentation by David Mitchelson, of County Durham and Darlington Fire and Rescue Service.

### West Midlands: Safe water in healthcare premises

**10 October, Birmingham**  
Update on key changes to HTM04:01

### East Anglia: Spaces Awards dinner

**11 October, Cambridge**  
Collaborative event for building professionals.

### Southern: Life-cycle assessments

**11 October, Brighton**  
With speaker Patrick Hermon, regional director at eTool.

### South West and SLL: Lighting for emergency situations, based on LG12

**11 October, Exeter**  
This presentation considers the issues raised by current legislative requirements for the designer and end user.

### Southern: BS7671 18th edition of wiring regulations update

**25 October, Eastleigh**  
Presentation by Richard Giddings, technical manager at ECA.

### Scotland: Practical approaches to water safety

**29 October, Glasgow**  
Daniel Pitcher, from Water Hygiene Centre, will present his top tips for water safety.

### Scotland: Health and wellbeing

**1 November, Edinburgh**  
Health and wellbeing in building design and operation workshop, with a presentation by CIBSE's Julie Godefroy.

### Southern: Battery/hybrid home-energy storage

**8 November, Brighton**

### Yorkshire: CIBSE Yorkshire Awards

**16 November, Leeds**  
Celebrating the industry's achievements in the region over the past year.

### Scotland: Annual dinner

**23 November, Glasgow**  
Annual dinner, with networking and entertainment.

### Republic of Ireland: 50th anniversary dinner and awards

**30 November, Dublin**  
Awards recognising building services engineers in Ireland.

## HIGHLIGHTS



Kam Dhatt will speak at the SLL and North West event on 3 October



Julie Godefroy will speak at the Scotland wellbeing event on 1 November

## Façade of the Year Competition

6 December, London

The winners of the annual Society of Façade Engineering international competition will be announced at the Glass Supper event on 6 December, at The Roundhouse, London.

The competition is designed to recognise, reward and promote excellence in the key disciplines of façade design, engineering and application. Three awards will be presented for New Build, Refurbishment and Innovation.

Entries are still open for the awards, which invite individuals, companies and project teams to enter any façade contract, completed between 1 January 2016 and 31 December 2017, that has not previously been put forward for the awards. Entries should demonstrate excellence in technical design and research that has made a significant contribution to façade engineering.

All entries should be received by 15 October, and the shortlist will be announced on 19 November.

For more information visit <http://sfecompetition.org>



One of last year's winners, Tate Modern

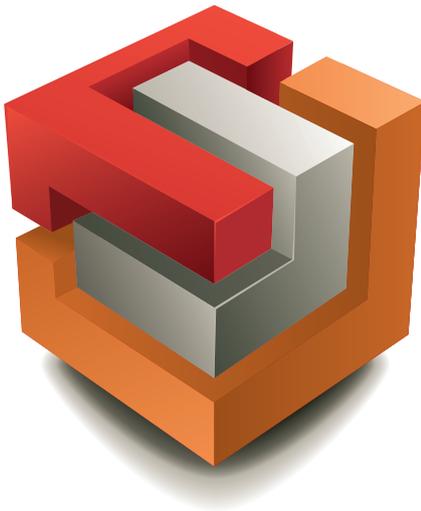


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- Hydrogen as a fuel for the future
- Renovation of domestic buildings
- Daylighting considerations for integrated design
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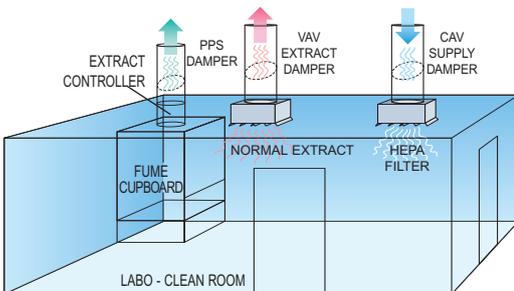


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