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**#Build2Perform**

May 2019

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One of the objectives of *CIBSE Journal* is to bring together the constituent parts of building services, and harness their combined knowledge and expertise to deliver better buildings.

Two disciplines that are not always considered as one are acoustics and ventilation. Too often, designs fail to consider the impact of external noise on occupants when specifying openable windows to meet ventilation targets. Mach Group's Ze Nunes (page 49) says that, if engineers modelled sound as well as airflow, they would achieve an optimal design that minimised external noise while providing adequate ventilation.

In Nunes' paper, presented at last month's CIBSE Technical Symposium, he asserted that modelling helps designers come up with effective ways of reducing noise in naturally ventilated buildings, which means more of them become viable in noisy areas.

CIBSE Building Performance Engineer of the Year Clara Bagenal George has also gone beyond conventional thinking in her symposium paper on the life-cycle of heat (page 12 of the heating supplement). George feels that the current debate on gas versus electric in terms of carbon emissions is too one-dimensional, and wants to understand how specifications would differ if whole-life carbon of various energy sources was taken into account. The results suggest that electric heating isn't necessarily less carbon intensive than gas – at least not yet.

Lift engineering also falls under the building services banner and Jochem Wit's article, on page 32, shows how key the discipline can be to fully realising a project's potential. He explains how an overhaul of the lift strategy enabled the former Shell office tower in Amsterdam to be turned into a popular new destination for the city. By changing the lift architecture and organisation, the A'DAM Tower is now able to accommodate 5,000 daily visitors, rather than the previous 500 office workers.

To prove lift engineering can be as uplifting as other disciplines, one of the elevators in the A'DAM Tower has been revved up to give visitors an unforgettable ride. Not only does the 'experience lift' feature dance music and flashing neon lights, it has also been accelerated to give the feeling that you are being jettisoned into space.

Another bold piece of Dutch engineering has caught our attention this month. The Breeze hotel opens in a few weeks and it's innovative natural air conditioning concept features in a PhD, written six years ago, by former HVAC consulting engineer Dr Ben Bromsema. We will visit the project in detail in the coming months, but it's good to see groundbreaking academic research being realised in a real building. Something that should give speakers at the technical symposium encouragement for the future.

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### Hywel Davies

CIBSE's technical director looks at Lord Deben's remarks to the BEIS Select Committee



### Rosemary Beales

Creating fair and insurable construction business terms for clients and consultants



### Ze Nunes

Modelling sounds and airflow to achieve minimised external noise and adequate ventilation



### Tim Dwyer

Our latest CPD module (No 144) takes a look at ceiling-suspended multi-service radiant panels



# CONTENTS

## News

### 7 News

Fire risk fear in historic buildings; damper testing ignored; financial risks of climate change

### 14 CIBSE news

Ready Steady Light winners; Code of Professional Conduct updated; #IamCIBSE campaign takes off

## Voices

### 16 Feedback

How historical knowledge can be preserved for future generations; and the 'lost art' of specifying chilled water systems

### 17 Gone off track

Hywel Davies summarises concerns about energy efficiency expressed at the BEIS Select Committee

### 18 On good terms

Rosemary Beales outlines how to draw up successfully the terms under which consultants and clients do business

### 65 Q&A

Steve Hunt explains a new multidisciplinary apprenticeship scheme

## Features

### 20 Change is possible

Paddy Conaghan reviews Simon Foxell's *Professionalism for the Built Environment*

### 22 Rise to the challenge

How a Passivhaus Plus home in the Chiltern Hills established the 'building as a power station' concept

### 28 Grid unlocked

Smart tech must be developed and tested to ensure there is available energy to match household demand in an all-electric future, writes Andy Pearson

### 32 COVER FEATURE

#### Lifting me higher

How the lift configuration in Amsterdam's A'DAM tower was redesigned to accommodate a huge increase in traffic

### 36 Window of opportunity

The challenges of building-envelope design

### 38 Cost model

Exposed services design at a central London office



## Technical

**SPECIAL FEATURES**  
Air conditioning, air movement and ventilation

### 41 News

A round-up of air conditioning and ventilation product news

### 42 Mould breaking

Rupert Kazlauciusas looks at the widespread problem of damp and mould in private- and social-rented housing

### 45 Heightened awareness

How draughts and cold spots can be avoided when designing exposed ceilings

### 49 Sound and vision

Acoustics and ventilation should be designed in tandem to ensure optimal performance in naturally ventilated buildings, says Mach's Ze Nunes





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36



## ■ CPD

### 55 Ceiling-suspended multiservice radiant panels

The radiant heating aspects of multiservice panels and the practicalities of meeting the acoustic and lighting needs of building occupants

## ■ Classified

### 59 Products

A round-up of systems and services for the industry

## ■ Jobs

### 64 Appointments

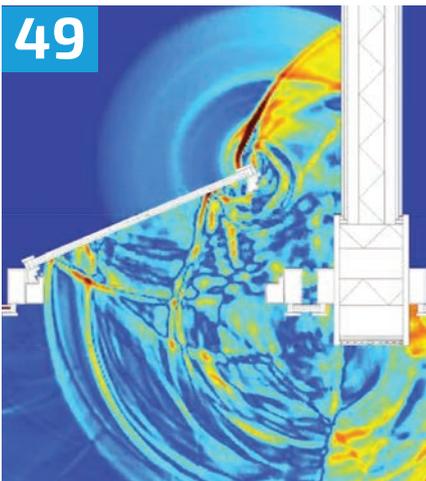
Jobs at [jobs.cibsejournal.com](http://jobs.cibsejournal.com)

## ■ Events

### 66 Looking ahead

CIBSE AGM; SLL LightBytes; Facilities Show; CIBSE training; CIBSE groups, regions and societies

49



EDUCATION



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## NATURALLY POWERED HOTEL TO OPEN IN AMSTERDAM



The sun, wind and cascading water are used to ventilate and cool, and supply hot water to almost 200 rooms at the Breeze hotel, in Amsterdam, which will open soon.

The hotel is the brainchild of the Amstelijs/Dutch Green Company in association with Borghese Real Estate and Bronconsult.

Dr Ben Bronsema, of Bronconsult, came up with the 'earth, wind and fire' concept in 2008, and made it the subject of his PhD.

Elaborating on this, ventilation in the hotel is controlled by natural processes – the air is set in motion by cascading water droplets and by sunlight that heats the air in a vertical column.

Sunlight is also used to heat water for the showers and heating in rooms.

## Palace of Westminster vigilant after Notre Dame fire

### Fire protections 'constantly reviewed' at home of UK Parliament

The government has reassured that fire safety is a top priority during the restoration work on the Houses of Parliament, following the catastrophe that struck Notre Dame Cathedral in Paris.

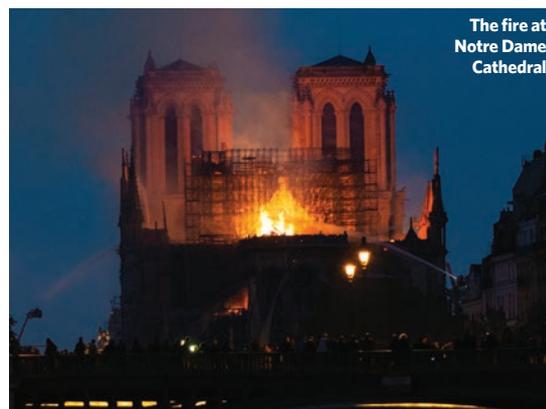
A government spokesman said it was vital to learn 'any lessons that emerge from the fire at Notre Dame'. Fire safety is 'a key priority for parliament, and protections are constantly reviewed and updated, including... in planning for the future restoration and renewal of the Palace of Westminster', they added.

After a fire destroyed most of the medieval building in 1834, an additional budget for a fire safety strategy at the Palace of Westminster was sanctioned by Parliament. The main structural materials were stone and cast-iron to counter the risk from numerous smoke flues.

Henrik Schoenefeldt, senior lecturer in sustainable architecture, University of Kent School of Architecture, said compartmentation between sections of the Palace was included in the design. 'The ceilings on the west side were separated by three layers of clay tiles, bonded together with lime mortar to form arches between iron beams, to create fire barriers,' he said.

However, a lot of the historic fire-proofing strategies were removed during various modifications of the building, or not followed through consistently. As a result, the network of ventilation shafts and floor voids unintentionally created conditions for fire and smoke to spread through the building, said Schoenefeldt. A fire-safety improvement programme has been ongoing, around sittings of parliament, to implement the necessary upgrades.

He added: 'My plea to people working with historic buildings is to have a heritage-led approach, so the historic reasoning behind a building – and how it was designed – is the starting point to address contemporary issues.'



The fire at Notre Dame Cathedral

### Owners ignoring damper testing

Many building owners and managers are still putting their occupants at risk by failing to have fire and smoke dampers tested correctly, according to specialist damper-compliance firm Indepth.

Despite growing awareness of fire-safety issues, many building operators remain confused about their responsibilities, the company said. 'Ventilation ductwork is a major potential weak spot because it contains critical fire-safety equipment that is out of sight and, therefore, regularly overlooked,' added Indepth managing director Richard Norman.

'Under UK standard BS9999, dampers should be tested at least once a year, and in ventilation systems – which are likely to accumulate dust more quickly – or in high-risk buildings, tests should be carried out even more regularly.'

The Regulatory Reform (Fire Safety) Order, which came into force in 2006, stipulates that a 'responsible person' must ensure all components of the fire-safety system in a building are kept in 'efficient working order' and 'good repair'. They must do a fire-safety risk assessment and put in place a maintenance regime. Failure to do so can result in a £10,000 fine and two years in prison for the designated responsible person – as well as closure of the building.

## IN BRIEF

### Nuaire fan out of this world

Nuaire claims to be the first ventilation company to be specified on an 'outer-world project' with one of its products selected for the International Space Station (ISS).

A window-mounted X5 fan module with built-in anti-gravity shutters will provide air changes for the astronauts on board the \$150bn station. Nuaire reported one astronaut as saying it would be 'nice to get some air movement through the station, as it can get quite stuffy at times. Hopefully, it doesn't get too draughty.'

In anticipation of more demand from outer space, the company has set up a 'galactic enquiries' team.

### Trade bodies launch new pre-qual system

Build UK and the Civil Engineering Contractors Association (CECA) have launched a pre-qualification system to cut bureaucracy and reduce the cost to contractors of tendering for jobs.

The trade bodies say the current system is extremely complex and costs the industry up to £1bn a year. Multiple schemes mean the sector's 180,000 specialist contractors produce two million pieces of paper every year to get onto tender lists. They plan to produce a Common Assessment Standard based on existing questionnaires, including BSI's PAS 91, which will cover 10 key areas and include desktop and site-based assessment standards.

### 'Farcical' approach to payment condemned

The government must legislate to solve the issue of late payment in construction and related sectors, according to Nick Howlett, chair of the Federation of Environmental Trade Associations (Feta).

He told Feta's annual lunch that 'relying on voluntary codes of practice is farcical'. 'We applaud the government's initiative to force companies to report their payment stats, but we await any signs they are prepared to do anything about the underlying problem,' he said.

Howlett's remarks come after a warning from the Cabinet Office to large contractors that failing to pay their supply chains on time would result in them being barred from bidding for public sector work.

# Brexit forces construction to depend more on public sector

## Developers spending less because of economic uncertainties

The construction industry is increasingly reliant on public sector spending in the face of falling confidence among private clients, caused by Brexit, market analyst Glenigan has said. According to its latest figures, the sector's largest three clients in 2018 were the departments for transport, health and education.

The Department for Transport has topped Glenigan's rankings of the industry's top 100 clients for the past two years – but, while it let a similar number of projects in 2018, the overall value of its spending fell by 37% compared with the previous year.

The 285 contracts awarded by the Department of Health in 2018, however, were worth 15% more than a year earlier and included more large construction projects.

The Department for Education rose six places to third in Glenigan's top 100, as total construction spending increased by 74%. Together, these government departments were

responsible for letting £5.2bn of construction contracts. 'As commercial spending is hit by continuing economic uncertainties, including Brexit, leading developers are spending less. As a result, they are sliding down [our] ranking of the industry's top 100 clients, and being overtaken by government departments,' Glenigan said.

Spending at the Ministry of Defence shrank 59% last year, while contract awards at the Environment Agency and Home Office also reduced. There was a 144% surge at the Ministry of Justice, however, as new prison projects were procured.

The devolved governments in Wales and Scotland had previously featured among the top 100 clients, but their construction spending shrank by 61% and 10% respectively last year, according to Glenigan's contracts data.



## EU is 'wide open' to illegal refrigerants

The European Union is at the mercy of criminals illegally trading refrigerant gases and needs to introduce a licensing system urgently, according to a new report. Non-governmental organisation the Environmental Investigation Agency (EIA) said the aim of the F-Gas legislation to scale back use of global warming gases was being undermined by poor enforcement and that a thriving black market was now being fuelled by rising HFC gas prices.

'The EU's doors are wide open to large-scale, illegal HFC trade, driven by quick profits, low risk of punitive measures and the absence of a system allowing customs officials to determine if an HFC import is legal or not,' said EIA campaign head Clare Perry. 'A functioning licensing system is urgently needed and member states need to significantly and demonstrably strengthen enforcement.'

In its report, *Doors wide open: Europe's flourishing illegal trade in hydrofluorocarbons (HFCs)*, the EIA also called for changes to legislation that would prohibit use of disposable cylinders. It reported that customs data revealed HFC use exceeded the F-Gas quota by more than 16% last year, which – it said – was equivalent to 'the annual CO<sub>2</sub> emissions from more than four coal-fired power plants'.



Mark Carney

## Financial risks

In its report, the NGFS sets out three climate-related financial risks that companies, banks and governments need to fight against.

**Physical:** The immediate problems caused by increasingly frequent climate and weather-related events, such as droughts or cyclones, which affect crops.

**Transition:** For example, when a business moves away from carbon-intensive industries and technologies in a 'sudden or disorderly' way, their business models and asset valuations can take a hit.

**Liability:** When people or businesses claim compensation for losses suffered from either the physical or transition risks, which can have an impact on insurers.

# Banks warn of financial risks posed by climate change

**'We cannot ignore the obvious risks before our eyes', said open letter**

As environmental protestors continued to disrupt cities across Europe, the heads of two major central banks warned that whole industries could be wiped out if they fail to prepare for climate change.

Bank of England governor Mark Carney and France's François Villeroy de Galhau released an open letter warning that 'if some companies and industries fail to adjust to this new world, they will fail to exist'. The letter, published on 17 April, was also signed by the 34-bank coalition Network for Greening the Financial System (NGFS).

The 'catastrophic effects of climate change' are already affecting the planet, from 'blistering heatwaves in North America to typhoons in south-east Asia and droughts in Africa and Australia', say the banks. They warned that 'these events damage infrastructure and private property, negatively affect health, decrease productivity and destroy wealth'.

However, April's letter said the transition to limit the global temperature rise to well below 2°C – as stated in the Paris climate agreement in 2015 – brings its own risks. One of these – an abrupt transition to a green economy without proper planning – 'could also have an impact on financial stability and the economy more broadly' the signatories said (see panel, left).

They added that an orderly scenario, with clear policy signalling, 'would allow adequate time for existing infrastructure to be replaced and for technological progress to keep energy costs at a reasonable level'.

Companies should 'integrate the monitoring of climate-related financial risks into day-to-day supervisory work, financial-stability monitoring and board risk management', they suggested.

The banks also called for more collaboration within the financial sector, with companies sharing information about how they are dealing with climate risks. 'Climate change is a global problem, which requires global solutions, and in which the whole financial sector has a crucial role to play,' they said.

## LGIM's tough line on climate change

The world is facing a 'climate catastrophe' unless it moves faster to cut carbon emissions, Legal & General Investment Management (LGIM) warned last month. In its latest *Active Ownership* report, which shows the firm's voting record across a range of issues, LGIM highlighted climate change as one of the biggest threats facing the global economy.

It has vowed to take a tougher stance on companies not pulling their weight in the climate fight. Last summer, LGIM published a blacklist of eight companies that it said had failed to engage with it over climate change. It also promised to vote against the chairs of their boards, across the entire equity holdings, where the companies were seen to take 'insufficient actions on climate risks'.

## EXTINCTION REBELLION BRINGS LONDON TO A HALT

Climate protesters gathered around a boat at Oxford Circus, London, during a coordinated protest by the Extinction Rebellion group last month. Organisers said protests had been held in more than 80 cities across 33 countries. In central London, more than 1,000 climate-change activists were arrested since the protests began on 15 April.

Extinction Rebellion is demanding that the UK government 'tell the truth about climate change', reduce carbon emissions to zero by 2025, and create a citizens' assembly to oversee progress.



## Arup launches 'Cradle to Cradle' design guide

Arup has published a *Guideline for Building Services Design* inspired by the Cradle to Cradle concept, to help building services designers incorporate 'circular design principles' into their projects.

The guidance describes 'a holistic framework' for the design of systems and buildings that deliver a 'positive balance' by eliminating waste production and embracing the circular re-use of materials. The publication also covers material selection and construction methods.

## Architects urged to tackle gender pay gap

The gender pay gap among architects is almost double the UK average, according to RIBA.

While it narrowed by 3% last year, the gap was still 15.4% – compared with the UK average of 8.6%. In a number of high-profile architectural practices, the gender pay gap increased in 2018.

RIBA has issued new guidelines on discrimination and called on its members to sign its pledge 'Close the gap – improving gender equality in practice'.

**IN BRIEF****Mitton forms modular partnership**

Mitton Group has agreed a partnership with modular and portable building company Enviro Building Solutions to provide mechanical and electrical services for the latter's projects.

Enviro has been designing and constructing modular buildings for the healthcare, education, retail and commercial sectors for more than 30 years. The demand for its modular solutions is on the increase and, with projects becoming larger and more complex, the company decided it needed to collaborate with an M&E specialist.

**BFM topic guide launched**

BSRIA has launched a free-to-download topic guide on soft landings and business-focused maintenance (BFM).

It stresses the importance of customising building maintenance schedules to focus on the specific requirements of the business in question, identifying critical assets and then shaping maintenance activities to support those functions.

The topic guide aims to inform those involved in the design, construction and operation of a building about how an effective BFM regime can be developed and achieved through the soft landings approach.

# Offsite construction is key to solving school-places demand

**Wider use of modular construction is required, researchers say**

The UK must build more than 600 new schools in the next two years to meet soaring demand in the primary and secondary sectors, according to research by procurement firm the Scape Group.

It said more than 385,000 additional pupils would enter the primary and secondary school system in England by 2021/22, creating demand

for at least 12,000 new classrooms. The biggest rise in demand is predicted to be in London, the South East and the South West, but the whole country will experience a 5.5% rise in its school-age population.

There will be a rise of at least 3% on current pupil numbers in every region of England by 2021/22, according to Scape, with Birmingham and Manchester needing to build the equivalent of 53 new schools in two years.

Scape said wider use of offsite modular construction will be essential to keep up with the demand for school building projects and ensure the process is cost-effective. Chief executive Mark Robinson said local authorities were feeling the strain: 'We must focus on delivering a strategy and solutions that not only provide high-quality, modern spaces for teaching and learning, but also offer local authorities cost certainty, value for money and timely delivery.'

A campaign to promote modular construction of schools was launched by the Education and Skills Funding Agency in 2015, but only 70 have so far been built using offsite methods.

## Apprenticeships down 26% since levy

The number of new apprentices has fallen by 26% since the launch of the Apprenticeship Levy in April 2017, according to Department for Education statistics.

During the 2017/18 academic year, 375,800 apprenticeships were started – a fall of 24.1% compared with 2016/17, and 26.2% lower than the number recorded in 2015/16. This places in doubt the government's stated aim of creating three million new apprenticeships by 2020. The government has also admitted that £2bn raised by the levy remains unspent.

All businesses with an annual payroll of more than £3m pay 0.5% of their wage bill into the levy to fund new apprentices. They can use that money and receive a further 10% government contribution to finance training of their own apprentices. For companies with payrolls of less than £3m, the government will pay 95% of the cost of training an apprentice. A recent rule change has also led to employers being able to pass on 25% of their levy funds to smaller companies in their supply chain.

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## Heat networks suffering from poor water quality

Around one in six district heating and cooling systems could have significant issues with water quality, according to a major survey of 185 heating and cooling systems in the UK.

The study, presented by Jon Greaves, national technical manager at Hydro-X Water Treatment, found that 28 networks had major problems with poor-quality water. This was leading to plant failure, pipe replacement, inefficient heat transfer, and a shortening of the system's life.

Twelve systems had poor-quality water at handover, while four experienced full loss of system water because of corrosion and scaling. Incorrect dosing with a high-PH solution led to the corrosion of aluminium plate heat exchangers in three of the latter systems.

Greaves revealed that four combined heat and power (CHP) systems and two biomass boilers had never been switched on and had not been decommissioned properly.

He identified a number of key findings across design, pre-commission and management, including no consideration of the metallurgy of the system, no pre-commissioning cleaning, and system leaks not being monitored.

## District heating industry needs regulator

A leading figure in the UK industry has called for a regulator to ensure heat networks operate successfully. Phil Jones, former chair of the CIBSE CHP & District Heating Group, said the UK government could map out a path for the industry. 'People don't have enough certainty to invest in innovation if there is no direction of markets,' he said.

Jones was speaking at a session on fifth-generation heat and cooling networks, which are being piloted in Plymouth by the city council and BuroHappold. He said that such networks, which balance heating and cooling between buildings, could be viable across the UK. More details will appear in a future issue of *CIBSE Journal*.

# Engineers urged to be more people-centric



## Designers' commitment to end users debated at symposium

Engineers should be trained to be more people-centric, according to delegates at a debate on whether engineers design for the needs of occupiers.

Hoare Lea's Ashley Bateson said engineers must understand how designs affect end users. Eimear Moloney, associate director at Hoare Lea, agreed, and said modules on the psychology of

building users were already on some building services courses.

IERC's Tony Day said communication across the supply chain was an issue. 'We must have a common understanding of what we want to achieve,' he said.

Design engineers need to learn more about the kit they specify, Day said: 'They need to be able to explain to a maintenance technician how it's been designed to operate.'

Past ASHRAE president Richard Rooley said engineers had a responsibility to get on site and ensure buildings are easy to commission, while Moloney said designers were thwarted by 'a broken system' that always 'put engineers one link away from end users'.

Bill Bordass agreed that the issue was systemic. 'Designers don't focus on outcomes - they design on compliance and just focus on getting the project done,' he said.

## Shell: 'Give control to occupants'

Engineers won't be able to deliver healthy buildings unless they get 'emotional buy-in' from the client, according to symposium keynote speaker Stuart Shell.

BranchPattern senior associate Shell said buildings that offered physiological and psychological benefits were perceived by clients as being more of a risk, so designers have to explain the benefits in more human terms.

End users should be given control of their buildings with features such as openable windows, he added: 'The occupants should be the locus of control, not building automation systems.'

Designers often 'got lost in the weeds' because of the pressures imposed by contracts around schedules and costs, said Shell, who believes standards are being interpreted in a way that prevents buildings from being designed for end users. 'We've focused on meeting standards that create a defence for designs,' he said.



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## Date announced for 2019 Build2Perform

The 2019 Build2Perform Live event returns on 26 and 27 November, at London Olympia. The programme is being finalised and is expected to be released in June. Again free to attend, the event is expected to feature 70 technical sessions across two days. There will also be a busy exhibition of key sector providers, all in one place to address your needs.

Book the dates in your diary, follow #Build2Perform for live updates, and visit [www.cibse.org/b2plive](http://www.cibse.org/b2plive) for further details

## Membership Application workshop

The next closing date for UK ACIBSE and MCIBSE applicants is 1 August 2019. It can take an average of three to four months to prepare the application documents, so May is the perfect time to get started on preparing and writing your application.

Join our interactive CIBSE membership application workshop in London on Monday 13 May, to get to grips with the application criteria, the items you will need to submit for 1 August and how to prepare for your interview. CIBSE interviewers will give you in-depth application support and guide you through the process, from start to finish. For details, visit [www.cibse.org/workshops](http://www.cibse.org/workshops)

## CIBSE AGM

The CIBSE AGM will be held on 7 May 2019 at The Royal Society, 6-9 Carlton House Terrace, London, SW1Y 5AG. It will be followed by incoming president Lynne Jack's address. Members should have received a calling notice. Further details at [www.cibse.org/agm](http://www.cibse.org/agm)

# CIBSE updates Code of Professional Conduct

## New version includes guidance on security

As a professional engineering institution, CIBSE sets high standards for its members, who commit to abide by the Code of Professional Conduct when they join. This code is set up to uphold the dignity and reputation of the profession, and to safeguard the public interest in matters relevant to the art, science and practice of building services engineering. Members reaffirm their commitment to the code each year, through renewal of their membership.

In 2019, CIBSE's Professional Conduct Committee undertook a review of the code to ensure it remains relevant. The updated version includes additional guidance based on the Engineering Council's statement on security. This sets out six key principles to guide engineers and technicians in identifying, assessing, managing and communicating issues about security.

The code is supported by the best practice outlined in the guidance and principles provided by the Royal Academy of Engineering, Engineering Council and Construction Industry Council. These principles outline the types of behaviour that will assist adherence to the CIBSE code of conduct.

## Royal Academy of Engineering Statement of Ethical Principles

This statement was produced through discussions with engineers from a number of engineering institutions and

with philosophers specialising in applied ethics. It is intended to be a statement of the values and principles that guide engineering practice and the codes of practice published by the participating engineering institutions.

For details visit [bit.ly/CJMay19raeng](http://bit.ly/CJMay19raeng)

## Engineering Council Guidance on Whistleblowing, Risk, Sustainability and Security

The Engineering Council has produced guidance on risk, sustainability, whistleblowing and security that CIBSE members should review in conjunction with the CIBSE Code of Conduct.

For details visit [bit.ly/CJMay19engc](http://bit.ly/CJMay19engc)

## Construction Industry Council's Essential Principles for Built Environment Professionals

The Essential Principles guide is an initiative that emerged from the Built Environment Professional Education project in March 2017. It contains six principles to guide, support and motivate all built environment professionals when making decisions for clients, employers and society that affect the achievement of an inclusive environment.

For details visit [bit.ly/CJMay19cic](http://bit.ly/CJMay19cic)

The full version of CIBSE's Code of Professional Conduct can be found at [www.cibse.org/codeofconduct](http://www.cibse.org/codeofconduct)





## Dpa and UCL impress at Ready Steady Light

Teams have three hours to create lighting installation in SLL competition

The 17th annual Society of Light and Lighting Ready Steady Light event took place in March. Held in partnership with Rose Bruford College, the competition challenged 11 teams to create an exterior lighting installation in just three hours, using a limited selection of kit.

Dpa lighting consultants won the Best Technical Solution award, judged by the SLL, and they also won the Peer Prize, which was judged by the teams.

UCL team C won the Artistic Award, which was judged by the IALD.

The SLL judges were: SLL president Iain Carlile; SLL vice-president Bob Bohannon; and SLL coordinator Juliet Rennie. Judging the IALD Artistic

Award were: IALD past-president Kevin Theobald; head of design management and technical arts for Rose Bruford College Nick Hunt; and founder of Dark Source Kerem Asfuroglu.



Team dpa lighting consultants won the Peer Prize and Best Technical Solution Award

## Entries open for Young Engineers Awards 2019

The CIBSE Young Engineers Awards 2019 are now open for entries. The awards, comprising the Employer of the Year and Graduate of the Year, celebrate the best young talent in the industry, together with the employers who support, mentor and develop them.

The Employer Award has categories for small, medium and large employers, and an overall winner. Employers are asked to show how they place young engineers at the centre of their business and invest in their careers. Judges will look for evidence of innovative methods of motivating young engineers and encouraging them to fulfil their potential.

The Graduate Award, jointly presented by CIBSE and ASHRAE, is in its 24th year and has long been the most sought-after accolade for young building services engineers. Finalists are challenged to show off their presentation skills on a given topic in front of a panel of industry judges.

This year's winner will enjoy a fully paid-for trip to the ASHRAE Winter Meeting in Orlando, Florida, next February. Two runners-up will receive generous cash bursaries from The Rumford Club and every other finalist will receive £100 from the Manly Trust.

Any engineer who has graduated in a building services-related field, either under or post graduate, in the past two years is eligible to take part.

The awards will take place on 10 October at the Institution of Mechanical Engineers (IMechE) in London. They are sponsored by Andrews Water Heaters, Kingspan Industrial Insulation and Swegon Air Management, supported by CIBSE Patrons and organised by the CIBSE ASHRAE Group in conjunction with the CIBSE Young Engineers' Network (YEN).

To enter visit [www.cibse.org/yea](http://www.cibse.org/yea)

## #IamCIBSE campaign takes off as social media audience mounts

The #IamCIBSE campaign, launched last month, is fast gathering pace. Already there are 400 likes on #IamCIBSE posts across CIBSE's social media platforms, and more than 700 views on the #IamCIBSE blog posts.

The campaign aims to raise the profile of individuals working in the global building services industry and celebrate their achievements, while highlighting the wide range of areas that CIBSE covers.

We have five blogs from members published so far, including from Peter Noel (pictured), electrical engineer at the National Portrait Gallery, whose role enhances visitor enjoyment. He says: 'Every single portrait has to be lit in a certain way to enhance the visitor's experience and has to be at a certain level to allow for conservation requirements.'

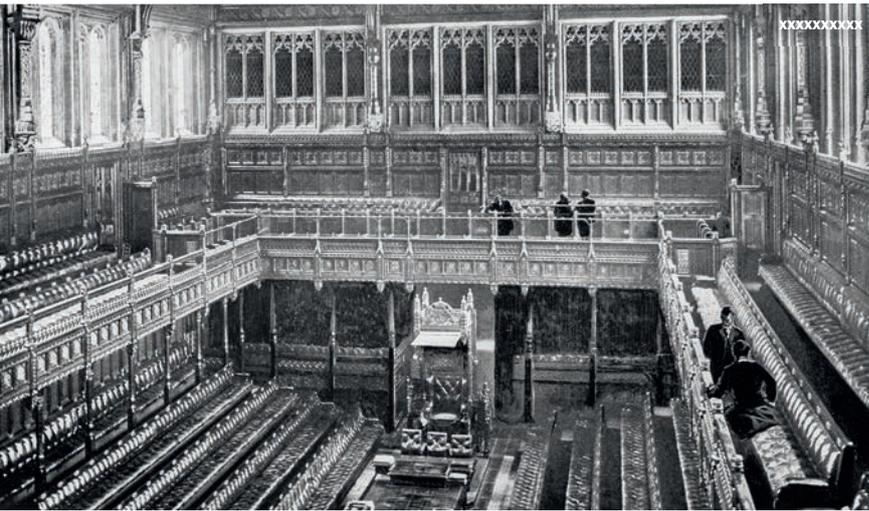
Another blog, from Andrew Griffiths, a graduate mechanical building services engineer at Arup and a member of YEN, highlights the part he plays in creating more sustainable building services.

It's an incredibly positive and engaging way for our member community to shout about their achievements and show the difference our industry makes.

Get on board: visit [www.cibse.org/IamCIBSE](http://www.cibse.org/IamCIBSE) to explore the campaign and get involved.



Peter Noel



## CIBSE LinkedIn Group considers how historical knowledge can be preserved for future generations of engineers; and the 'lost art' of specifying chilled water systems

### Remembering the past

For my current research project in parliament, I am studying material going back to the 1830s and it is still of relevance today. It offers critical insights that are informing the forthcoming restoration and renewal of the Palace of Westminster. Aside from information on the operation and performance of buildings in the past, this historic material teaches us about the role of institutions in creating, storing and re-using knowledge of buildings in use. This is the subject of my recent article in *Building Research & Information*, which explores the post-occupancy history of the House of Commons from 1854 to 1952, and how institutional structures were critical in avoiding loss of knowledge ([bit.ly/CJMay19POE](http://bit.ly/CJMay19POE)).

**Henrik Schoenefeldt**

The results of part-government-funded research should be made public. It is not just academia that 'forgets' research – it is industry that fails to hear enough about the benefits of research.

**Chris Woods**

Robots never forget!

**Bertie Dixon**

### Refrigerants – have we lost the art?

Maybe I'm getting old, or cynical, but have consultants lost the art of recognising the benefits of chilled water systems and low-GWP refrigerants? I've just looked at two specs that ask for a refrigerant that will be in short supply in a couple of years, and have cast my eye over a spec from consultants that proclaim to be #carbonneutral and #carbonsaver, but both specify a VRF on R410A. It may be easy guys, but it's not right.

**Simon Pallant MCIBSE**

When I was at a major consultancy, I spotted the M&E team doing this on more than one occasion. It's easy to specify and relatively cheap, but is definitely not right.

**Alan Kiff**

I don't want this to turn into a general dig at consultants – there is some great work being done by many. I just think, regarding refrigeration systems, so much more could be achieved and is achievable.

**Simon Pallant**

I am a consultant, and I didn't take your comments personally, or even as a general dig at consultants. I think what you are saying is correct and needed saying. There are far too many generalist consultants that dabble in cooling systems and treat it as a box-buying exercise.

**Stephen Gill MCIBSE**

I get frustrated that, within building services engineering, cooling is not given the attention it deserves and, as such, some great potential design innovations are being missed.

**Simon Pallant**

I totally agree. Cooling is such a large consumer of energy in buildings, but building services engineers tend to be the last to implement the innovations that are taking place in this field.

**Stephen Gill**

Too few clients are challenging their consultant's lazy copy-and-paste specifications.

**Maxwell Evans**

Copy and paste, copy and paste, copy and paste. Repeat until told otherwise.

**Mark E**

A lot of consultants have a spec that they use for years (aka copy-paste) and don't bother to update until it is too late. The problem is that, when you point it out, they double down and don't want to hear about it.

**Manolis Theofilos**

There will be a lot of building owners/managers paying over the odds for HVAC consumption and refrigerant in a few years because the 'art' had been lost on many.

**Simon Pallant**

I am not sure many consultants ever had the art of recognising the benefits of chilled water systems and low-GWP refrigerants in the first place.

**Stephen Gill**

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# Gone off track

As protestors caused chaos in Westminster, Committee on Climate Change witnesses claimed we were way behind with our energy-efficiency policies to meet current carbon dioxide emissions targets. Hywel Davies explains

A distinguished group of witnesses gathered in late March to give evidence to the Business, Energy and Industrial Strategy Select Committee on energy efficiency. First up was Lord Deben, former Environment Secretary, now chair of the Committee on Climate Change (CCC), accompanied by Jenny Hill, of the committee staff.

Drew Hendry MP asked whether the government was on track with its policies to meet its own Energy Performance Certificate (EPC) targets, as well as the recommendations in the 2018 progress report by the CCC.<sup>1</sup> Last June, the CCC identified the need for ‘concrete policies [on energy efficiency in existing buildings] to deliver the ambition on commercial and public buildings’, and to ‘deliver the government’s ambition on retrofit (EPC band C by 2035)’.

Hill said the UK government is ‘currently not on track’. Progress has slipped in relation to the EPC C target for homes, and we are still waiting for the 2018 action plan and a package of incentives targeting owner-occupier homes, which are two-thirds of the total residential market. She noted that, in spite of recent requirements not to let properties with an F- or G-rated EPC, we are also behind in setting trajectories for private-rented sector standards to rise to grade C – or better – by 2030, and in targets for the social-rented sector.

Lord Deben was less restrained, saying: ‘It is way behind. There is no policy to solve these problems and to meet these issues. We have just passed what was a very disappointing piece on rented accommodation with a ceiling of £3,500 [the maximum landlords have to spend on energy improvements under The Energy Efficiency Regulations 2018] which is less in reality than what they promised to do about six years ago... It seems the government will have to change this fundamentally if they are to have any chance whatsoever of doing this or of meeting their fourth and fifth carbon budget.’

Hill noted that current insulation rates are only 5% of peak market delivery in 2012. In a later session, Philip Graham, chief executive at the National Infrastructure Commission (NIC), had a lively exchange with Antoinette Sandbach MP about the rate of installation of improvement measures. The NIC, in its recent report calling for energy efficiency to be a national priority, had



“Lord Deben is calling for the government to just get on and do something about energy efficiency”

made an assumption that 9,000 measures are being installed per week, but Sandbach claimed there was an average rate of only 2,400 insulations a week in 2017 and an average of 3,500 in 2018. What they did not disagree about was the need for 21,000 installations a week, or a million a year – a huge increase on current levels of activity.

Hendry asked how soon housing emissions might start to fall. Lord Deben highlighted the fact that the government still has not raised the standards for new buildings. ‘At the moment, we are building more trouble every year. Until they change that, it will be another way in which housing emissions will not reduce. I do not think there is a date on it, except that it is way, way beyond the point at which they have to meet the fourth carbon budget, which is a statutory requirement.’ He called for ‘zero-emitting houses’, saying ‘it is true that new houses are, in general, better than old houses, although they still emit much more than they ought to. Until we get towards zero-emitting houses, we are making the problem worse all the time.’

Hill argued that a range of actions were needed. ‘The ones we have highlighted

in the latest progress report and our recent housing report,<sup>2</sup> include tackling the performance gap, overhauling compliance and enforcement, skills and finance.’

After noting the delay between adopting new standards for energy-efficient homes and their practical implementation on a building site near you, Lord Deben said ‘local authorities have less and less ability to check whether houses are built to that standard’. He added: ‘I would like to see more resources for local authorities to do the checking. If housebuilders knew they were going to be checked – and there were serious results if they did not build to the standards – there would be a change. I would also like... certain obvious things that every local authority had to have signed off before the houses were passed.’

A theme is emerging about enforcement and the handover of information on completion: Lord Deben is echoing the concerns of Dame Judith Hackitt, and calling for the government to do something about energy efficiency in existing buildings. A very interesting backdrop to the current review of Part L of the Building Regulations.

## References:

- 1 Reducing UK emissions 2018 Progress Report, [bit.ly/CJMay19CCC](https://bit.ly/CJMay19CCC)
- 2 Back to the future, *CIBSE Journal*, [bit.ly/CJMay19Fit](https://bit.ly/CJMay19Fit)

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

# On good terms

Terms under which consultants and clients do business must be relevant, insurable and fair, says Rosemary Beales, of the Association for Consultancy and Engineering, who outlines the ingredients for a successful outcome

Do you really know what you are signing up to when your proposal is accepted by a client? Has any agreement been signed? What terms and conditions cover the delivery of services, and are they clearly defined? These questions are fundamental for those offering consultancy services, regardless of their client.

Whatever the value or complexity of the services commissioned and delivered, the business case for clarity on the proper allocation of risk and responsibility is irrefutable – and working within a clear legal framework is part of this.

The Association for Consultancy and Engineering (ACE) promotes the use of standard terms of engagement to assist the delivery of services and has highlighted the pitfalls inherent in many contractual terms, especially bespoke conditions. Even if the parties believe they understand what they have agreed to, it may – if tested – differ significantly from what they initially thought. This can prove costly financially and in terms of the relationship between consultant and client.

The Supreme Court case *MT Hojgaard A/S v E.ON Climate and Renewables Robin Rigg* [2017] held that an obligation contained in technical documents relating to the service life of certain foundations, which were part of the Employer's Requirements and included a 'fitness for purpose' obligation, had contractual effect. Despite the contractor exercising reasonable skill and care, as required by the contract, and complying with specified standards, the court held that there was a fitness for purpose obligation in relation to the foundations.

Consistency and clarity across all documents are essential, and the whole contract must make the obligation clear. Standard terms can provide a sound basis, but extreme care must be taken to ensure any other documents forming part of the agreement do not conflict with the provisions of the standard terms. This is not always simple and advice needs to be taken if there is any concern, not least in relation to insurance.

*Malcolm Charles Contracts v Crispin* [2014] (TCC) arose from an adjudication. The judge referred to the case of *RTS v Molkerei Alois* [2010] where it was emphasised that just because one party believed there was no binding contract, there was no guarantee a court would take the same view. If, on the basis of evidence, a reasonable person would



**"The business case for clarity on the proper allocation of risk and responsibility is irrefutable"**

consider the parties to be in agreement and intending to create a binding contract – and there is sufficient certainty for the contract to be enforceable – then a court can conclude that a contract exists.

Despite the lack of execution, the course of interaction between the parties led the court to enforce the adjudicator's decision in favour of the contractor. The case highlights the need for the proper execution of a contract that is both clear and unambiguous.

For standard terms of engagement to remain relevant to the profession, they need to be kept up to date. In 2017, ACE published a new form of professional services agreement that can be used across the UK, a sub-consultancy agreement, and a schedules of services, ensuring industry professionals have access to terms and conditions suitable for today's world.

Recognising new developments – such as procurement legislation, technological advances and project management, often involving several parties – the documents are clearly written and help everyone understand their roles and responsibilities.

These schedules facilitate the use of BIM, offering a useful tool to all those delivering a wide range of services. They better provide for the identification of the services to be delivered, including 'additional services', and mirror the sequence of the RIBA Plan of Work, which is seen as beneficial by many users. With core and optional deliverables at the end of each work stage, the schedules offer welcome clarity and choice to all parties.

The professional services agreement is designed to be 'user friendly' and the guidance notes, while not a legal interpretation or part of the agreement, enable users to gain a broad understanding of its provisions, and assist in its completion. It includes a more balanced apportionment of risk, with consultant's obligations, client's obligations and joint obligations clearly listed in sequence, rather than scattered throughout the agreement – the objective being to allocate risk to the party best able to manage it. A limitation of liability clause is included, and there are clearer provisions for agreeing caps on liability.

It is our hope that use of the ACE professional services agreement will give confidence to clients and consultants that the terms under which they do business are relevant, insurable, balanced and fair – the essential ingredients for a successful outcome.

**ROSEMARY BEALES**  
is contracts adviser  
at the Association  
for Consultancy and  
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# Change is possible

Simon Foxell's *Professionalism for the Built Environment*, published by Routledge, looks at the history of the building professions and presents arguments for change. Hoare Lea's Paddy Conaghan reviews the text

**P**rofessionalism for the Built Environment is no light read, but it is a thoroughly worthwhile one. It contrasts the evolution of the first construction professions of architecture, civil engineering and surveying in Britain with those in France, Germany and the United States, and argues for still more change.

To declare a potential conflict of interest, Foxell is a friend of mine. Although a practising architect, he's been exploring this subject for more than two decades, and I welcome his closely researched and reasoned book as an imaginative response to questions posed recently by Paul Morrell (*Collaboration for Change*) and other commentators on the fitness of our professions for the 21st century.

Partly a comprehensive history of the construction professions to date and partly a polemic about the need for change, the book has already received outstanding reviews for its arguments for change. So it seems appropriate to start here with some observations on it as a work of history.

The historic narrative would stand by itself as a fascinating book. It starts in the 12th century, but the pageant of often notable individuals sketched by Foxell begins properly in the 17th century, portrayed as they appeared in their time, giving them substance and character – and not always to their advantage.

It maps how the professions evolved in each country – the twists and turns, and unexpected consequences encountered along the route. Much appears counterintuitive; for example, how the French system of specialised state education for engineers and architects came to produce elitism more pernicious to the advancement of other talented people than the snobby, self-serving, pupillage model used in Britain; or how governmental regulation of the professions abroad often led to more chaotic outcomes than the serendipity of self-governance practised by the British.

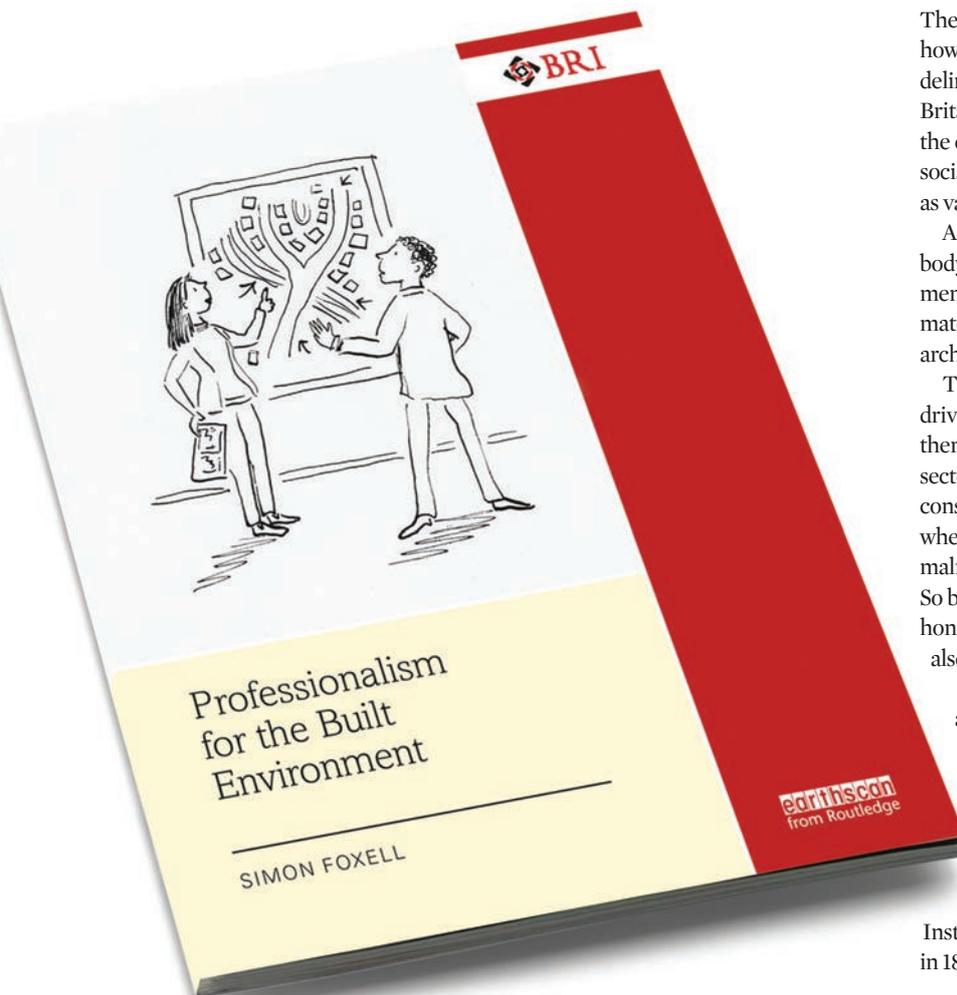
## British experience

The book comes to focus on the British experience, and how the three construction professions emerged and delineated themselves. At the start of the 18th century, Britain had only three recognised 'learned' professions – the clergy, law and medicine. None guaranteed wealth or social standing for members, and all would be lampooned as variously self-serving, ignorant and callous.

As each centred on educating and building a distinct body of knowledge, with a semblance of regulating their members' conduct, the unpopular term 'profession' well matched the respective aims of the putative alliances of architects, engineers and surveyors.

The founding of construction professions was, inevitably, driven by some self-interest. As Foxell explains, however, there was a strong case for sound practitioners in each sector to come together as reputable bodies, because construction then (as now) was an expensive enterprise, where rogues enjoyed much scope for profitable malfeasance and sometimes caused devastating failures. So by setting up and regulating 'closed shops' of competent, honest and knowledgeable practitioners, the new groups also fulfilled a public service.

The fledgling bodies adopted precepts of altruism and public duty that the earlier learned professions had ignored. Certainly, creating buildings, roads and canals intrinsically benefited mankind more than serving writs or applying leeches, but their high principles were also targeted at securing the Royal Charters needed to become professions. Even so, the Charters would be some time in coming – the Institution of Civil Engineers in 1828, RIBA (or IBA then) in 1837, and the Surveyors' Institute (now RICS) in 1881.



**Towards change**

Foxell charts how our professional institutions became the professions we know today – setting their curricula, invigilating entrants and overseeing the conduct of members, while also developing and curating bodies of knowledge. As each professional institution remains a self-governed ‘work in progress’, his thesis is that further and quite nimble change is possible only with the will of members. Foxell also argues that significant change is urgently required, with a persuasive description of multiple factors amounting to a ‘perfect storm’ that professional institutions will not survive if they continue to work in siloes, hoard knowledge and operate anodyne codes of conduct, blind to a fast-changing world.

The author’s view is essentially optimistic, however; he sees that professionals and their institutions have the means to reverse society’s general distrust of experts and

**“By setting up ‘closed shops’ of competent, knowledgeable practitioners, the professions fulfilled a public service”**

to demonstrate that the higher aims of professionalism are more relevant than ever to dealing with huge global challenges.

The book sets out detailed proposals for change. Building on the pressure from Morrell’s *Collaboration for Change*, it appears to have influenced the upcoming RIBA Code of Conduct (still a ‘final draft’ at the time of writing), which advances some of Foxell’s proposals as member obligations on new and pressing issues, including: the environment; building performance; communities and society; equality/diversity; whistleblowing; and modern slavery. The Code demands not only integrity, but also some measure of courage.

As a footnote, in Foxell’s comparisons of the construction institutions (drawn from their published data), CIBSE fares quite well, but with more gaps than I had supposed. CIBSE has since updated its Code of Conduct, which – when read with the Engineering Council’s and Royal Academy of Engineering’s further guidance – fills most of these.

You may not agree with all that Simon Foxell writes or that all his concerns are yet evidenced. But, having read the book, I see that what I once took as his quirks and prejudices may actually be critical foresights borne of insightful extrapolation of precedents.

Reviewed by **Paddy Conaghan**, consultant at Hoare Lea, RAE Visiting Professor at Heriot-Watt University



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# RISE TO THE CHALLENGE

A Passivhaus Plus home in the Chiltern Hills establishes the 'building as a power station' concept and shows the viability of an electrical grid powered by renewable energy. **Andy Pearson** reports

**W**

hen Justin Bere's clients said they wanted a low-energy home, the architect convinced them that Passivhaus (PH) would meet their aspirations. 'We went on a PH tour of Switzerland and Austria, and they both got the Passivhaus bug,' Bere says.

Then, while bere:architects was developing the design for their home, the Passivhaus Institut launched Passivhaus Plus, a new certification category that recognises the production of onsite renewable energy by passive buildings. When Bere told his clients about the enhanced category, they decided a Passivhaus Plus home would better meet their aspirations – and it did.

Finished in October 2015, Lark Rise was the first completed Passivhaus Plus scheme in the UK. This pioneering, ultra-low-energy, all-electric contemporary home incorporates a large photovoltaic (PV) array and a powerful battery, making it one of the most advanced, high-performance homes in England. Two years of monitoring show that the scheme generates more than twice as much energy as it consumes in a year and exports to the National Grid around 10 times the energy that it imports each year.

With credentials as impressive as this, it was no surprise that the scheme won the Residential Project of the Year category at this year's CIBSE Building Performance Awards. The judges described the house as 'a groundbreaking development that, if adopted more widely, would challenge the need to fulfil energy demand through additional Grid capacity'. The 175m<sup>2</sup> detached home's energy performance is all the more impressive given that the two-storey Passivhaus faces north-west, with limited opportunity to exploit

## PROJECT TEAM

**Architect:** bere:architects

**Mechanical and electrical services:** Alan Clarke

**Ventilation detailed design:** Green Building Store

**Structural design:** Techniker

**Design and installation of the PV solar array:** Darke and Taylor

**Battery sizing:** Energelio

Passivhaus Plus certification was granted by the Passivhaus Institut, Darmstadt, Germany, in November 2017; the certifying agent was Kym Mead, of Mead Consulting.





passive solar gain. Lark Rise is on the edge of the Chiltern Hills, in Buckinghamshire, and the home's less-than-optimal orientation is the consequence of a planning requirement for the home to be cut into the sloping site, to minimise its visual impact. The main south-facing entrance is on the upper floor; the reception spaces and kitchen are located on the upper floor as well, to benefit from the views out to the north-west, and there are two bedrooms on the ground floor.

Even with a highly insulated fabric envelope, Bere was concerned that the building's north-west orientation would prevent the house from absorbing sufficient solar energy to perform effectively as a Passivhaus. His concerns were heightened by his client's wish for the entire north-west-facing façade to be glazed. 'At the outset, we worried that this orientation would be seriously detrimental to performance and even to Passivhaus certification,' admits Bere.

He overcame the challenges posed by using super-clear glass ( $g$ -value 0.62) on the façade, to fully exploit the minimal solar gains from even an overcast winter day. The proposed design was run through the Passive House Planning Package (PHPP) spreadsheet, and this showed that the scheme should work. Seeking further >>



The architect is in discussion with Newcastle University and Imperial College to use the building as part of their EV-to-Grid research projects

» reassurance, Bere spoke to Mr Passivhaus himself, Wolfgang Feist. ‘I said: “Is this really going to work?”, and he replied: “PHPP never lies”,’ says Bere. In fact, Feist said the building’s orientation was ‘potentially beneficial’ because it would result in the house having extremely stable summertime temperatures.

Temperature stability is further improved by the exposed thermal mass provided by the building’s concrete structure. The half-buried building is an innovative hybrid of in-situ concrete retaining walls below ground, combined with a high-performance, prefabricated, timber-panelled solution above ground. ‘Because we had to cut into the slope, we needed a strong reinforced concrete retaining wall,’ explains Bere. The scheme also incorporates eight reinforced-concrete columns, which rise up through the first floor to help the roof structure to resist wind loads on the timber top floor.

In line with the scheme’s Passivhaus Plus aspiration, the roof has 62m<sup>2</sup> of solar photovoltaic panels (PVs), which deliver a peak electrical output of 12.43kW on a sunny day. The PVs’ output means that, on an annual basis, electricity production is about 2.5 times higher than the home’s electricity requirement. Inconveniently, maximum energy consumption in the home

is in winter, while maximum output from the PVs is in summer – resulting in an electricity surplus between the months of March to October. Initially, the plan was to export this excess power to the local electrical grid. However, the infrastructure was old and the local energy supply company imposed a 4kW energy export limit, which meant the grid was unable to accept the quantities of power generated by the array.

Rather than pay to upgrade the local electrical infrastructure, a battery was installed to store some of the surplus energy. ‘Because we went Passivhaus Plus – and because the local grid connection was inadequate to handle output from the PVs – we put in a battery,’



# 8 months

Approximate length of time per year that the building imports no energy from the Grid



# 4 months

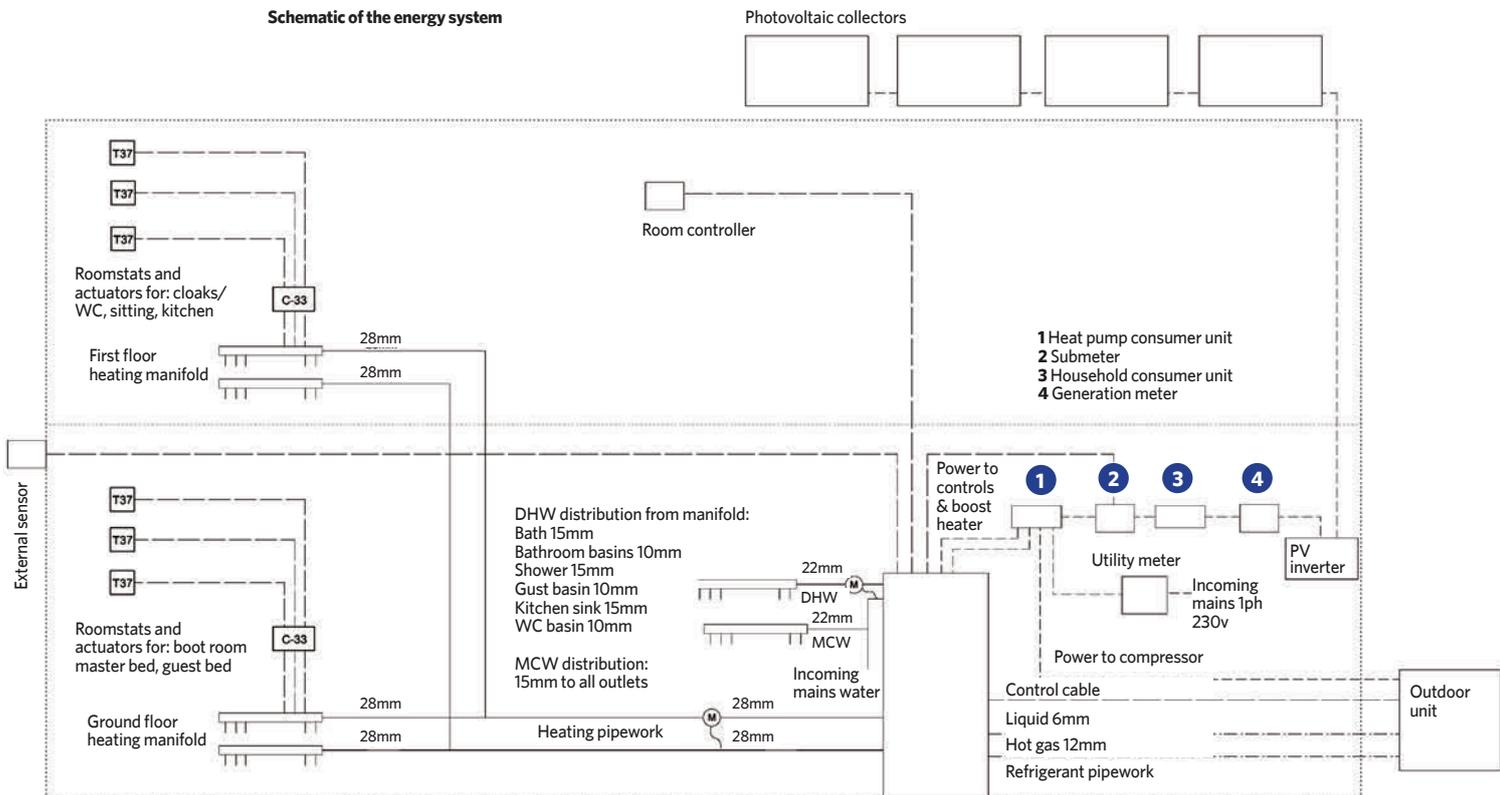
Length of time per year when it is nearly zero, despite less-than-optimal use patterns



# 62m<sup>2</sup>

The area of solar PV panels on the roof, which deliver a peak electrical output of 12.43kW

Schematic of the energy system



**“The half-buried building is a hybrid of concrete retaining walls below ground and a high-performance, timber-panelled solution above”**

says Bere. To get the balance between generation and storage right, bere:architects commissioned PHPP design engineer Energelio to model a range of scenarios to optimise the size of the PV array and battery storage.

After a self-consumption energy study, Energelio calculated that a 13kWh battery would be the optimum size for the display output and the energy demand of the house. This enables a 78.6% self-consumption ratio, which ensures the house is very close to meeting its winter energy demand for all occupant uses, including plug loads, cooking and lighting. ‘For approximately eight months of the year, the building imports no energy from the Grid; for the remaining four months, it is nearly zero, despite less-than-optimal use patterns of the occupants,’ says Bere.

The combination of extremely low energy demand, PV and battery has helped create a home that not only produces significantly more energy than it uses each year, but also almost eliminates the critical winter energy gap in renewable energy supply relative to demand.

‘By reducing the stress caused to the Grid in peak-demand scenarios by approximately 80% compared with a normal house – and by storing energy that could be supplied to the Grid to help it meet peak-demand events – the house is designed to complement today’s National Grid, but also, importantly, to demonstrate the viability of a future Grid powered by renewable energy,’ explains Bere.

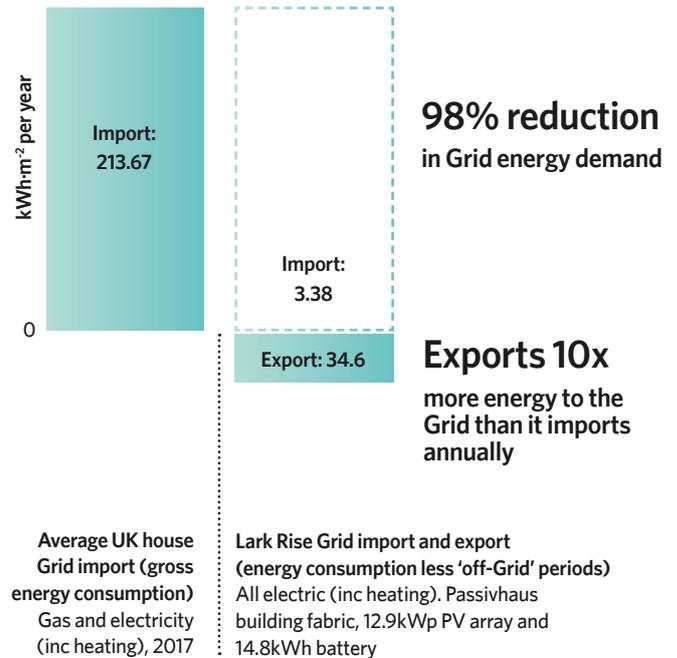
As a general rule, the designers found that 1kWh of battery storage per 1kWp of PV seems to work. It is a rule of thumb that the Passivhaus Institute acknowledges: ‘I spoke to Wolfgang Feist and he said that, on a Passivhaus, that ratio seems to work,’ Bere adds.

Unsurprisingly, given the size of the PV array, all services for the house are electric-powered. Space heating and hot-water demand are met using an air source heat pump (ASHP) with an integrated hot water tank.

All the home’s energy and heating systems are fully automated. Excess energy generated by the PVs first supplies the plug loads in the house. Surplus energy is then used to charge the battery and to boost the ASHP to heat water in the DHW tank. When this storage buffer is full, the system exports surplus energy to the Grid. An electric vehicle (EV) charging point has been fitted to the house. ‘We are currently in discussion with Newcastle University and Imperial College to use the building as part of their EV-to-Grid research projects,’ says Bere.

Domestic hot water is supplied at a temperature of 49°C. Originally, the hot water was commissioned to be heated to 55°C, but Viessmann convinced Bere to reduce the supply temperature to maximise efficiency of the heat pump. ‘I set the temperature at 49°C and didn’t mention it to the occupants; when I asked them a little later if they were aware of the difference, they said they were not,’ says Bere, who adds that the heat pumps run a weekly high-temperature sterilisation cycle to reduce legionella risk. For the remainder of the week, any bacteria that might remain cannot multiply at 49°C.

An MVHR unit with summer bypass provides controlled ventilation. The building has been designed to be as simple as possible for the occupants to operate. The MVHR system runs



The import and export of Grid energy for Lark Rise compared with an average UK house





**“The extremely low energy demand, PV and battery almost eliminates the winter energy gap in renewable energy supply relative to demand”**

» continuously, providing ventilation that can be temporarily boosted if desired. For most of the year, however, the occupiers adjust the ventilation by simply opening windows. The windows have a secure, inward-opening, tilt-and-turn feature to help the occupants feel safe when windows are providing enhanced summer ventilation.

A final airtightness test and MEP system commissioning visit from an independent services engineer – not the design team services engineer – ensured the building was handed over to the client operating ‘as designed’.

Heating, hot water, lighting, sockets, cooking, ventilation, PV production, and Grid energy import and export are all metered. Real-time and recorded data can be accessed 24/7 from a mobile phone, along with graphs of total energy consumption, production, battery storage and Grid energy export and self-consumption energy levels, plus data on the state of battery charge.

Monitoring data has been used in post-occupancy evaluation discussions with the building occupants and to give them building-operation advice. ‘The occupants have been interested in, and are happy to contribute to, our research,’ says Bere.

A performance-monitoring report is available from bere:architects’ website at [www.bere.co.uk/research/lark-rise-monitoring-report](http://www.bere.co.uk/research/lark-rise-monitoring-report) If the rollout of this concept is scaled up, money spent on new



and retrofit buildings such as this will significantly reduce national peak energy demand, says Bere.

‘If we can reduce peak energy demand, then we can reduce the need for new power stations. Instead, the many billions of pounds saved on building, operating, fuelling and, eventually, decommissioning each power station can go into creating and converting more buildings like this, thereby producing more savings in power station expenditure and more low carbon jobs – a really healthy feedback loop.’

‘Lark Rise firmly establishes the “building as a power station” concept and demonstrates the viability of a future electrical Grid powered by renewable energy,’ says Bere. ‘It shows how the ‘Smart Energy Revolution’ has the potential to enable the UK to be fuelled entirely by renewable energy.’ **CJ**

**ENERGY DATA**

The annual energy demand of Lark Rise is negative because it produces far more energy than it consumes each year:

**Breakdown of energy balance:**

- Gross demand: 32.23kWh-m<sup>2</sup> per year (5,640kWh per year) (monitored) (all electric, for all uses including heating)
- Gross generation: 10,978 kWh per year of renewable electricity (modelled)
- Grid export (after self-consumption): 5,338kWh per year (modelled, with monitoring ongoing since battery installation)
- Grid import (to cover small winter gap): 592kWh per year (modelled, with monitoring ongoing since battery installation)

**Breakdown of energy consumption:**

- Heating: 22% - 7.11 kWh-m<sup>2</sup> per year
- DHW: 10% - 3.38 kWh-m<sup>2</sup> per year
- MVHR: 9% - 2.89 kWh-m<sup>2</sup> per year
- Power sockets: 25% - 8.05 kWh-m<sup>2</sup> per year
- Cooking: 5% - 1.61 kWh-m<sup>2</sup> per year
- Miscellaneous: 9% - 2.89 kWh-m<sup>2</sup> per year
- Lighting: 19% - 6.11 kWh-m<sup>2</sup> per year

**For space-heating consumption, we can benchmark Lark Rise's 7.1kWh-m<sup>2</sup> per year (monitored) (renewable electricity) against:**

- Standard UK home (DECC 2017 ECUK Overall and Domestic Data Tables) (85m<sup>2</sup>): 124kWh-m<sup>2</sup> per year
- AECB Silver domestic heating requirement: <40kWh-m<sup>2</sup> per year
- Passivhaus requirement: <15kWh-m<sup>2</sup> per year
- Bere Architects’ Camden Passivhaus: 12.9kWh-m<sup>2</sup> per year (gas)

For annual net energy requirements (consumed v generated), we can benchmark Lark Rise's negative ‘demand’ of -35kWh-m<sup>2</sup> per year against a typical 85m<sup>2</sup> UK home (+213.67kWh-m<sup>2</sup> per year) and against other ‘eco’ homes such as the Bedzed development (+90kWh-m<sup>2</sup> per year), the Long House (+80 kWh-m<sup>2</sup> per year), the Bioregional One Brighton apartments (+72 kWh-m<sup>2</sup> per year), and the Princedale Road Enerphit retrofit (+62.5 kWh-m<sup>2</sup> per year).



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# GRID UNLOCKED

If electric vehicles and batteries are to herald an all-electric future for homes, smart tech must be developed and tested to ensure there is always available energy to match household demand. **Andy Pearson** reports

**L**ark Rise, the focus of this month's *CIBSE Journal* case study, demonstrates that the 'building as a power station' concept is possible. Equally importantly, Lark Rise – by managing its peak electrical demand – indicates that, if the concept were to be rolled out nationally, an electrical Grid powered by renewable energy is viable.

'It shows how the smart energy revolution has the potential to enable the UK to be fuelled entirely by renewable energy,' says the building's architect, Justin Bere.

A Grid powered by renewables has the potential to turn electricity pricing strategies on their head. Currently, gas, oil and coal power are a significant proportion of the UK's generating capacity. All these fossil fuels are commodities, traded on financial markets, with the cost of electricity based on the cost and quantity of fuel used in its generation.

Wind and sun, however, are not tradable commodities; they do not cost anything, so users are effectively charged only for the use of the infrastructure, which will change the relationship householders have with their power supplier.

'The system we had 20 years ago was that demand was what it was, and National Grid turned things on and off to meet demand,' said John Fox, practice manager, business model innovation, Energy Systems Catapult, at this year's Futurebuild event. 'Renewables cannot be switched on and off; for that reason, we have to make demand follow supply and harvest energy when renewables are providing, and try to minimise energy use when that is not the case.'

What this means in practice is that a householder who can be flexible with their electrical demand can have a significant impact on their carbon intensity and, potentially, the price they pay for power.

Without battery storage, any impact is likely to be limited – people may be happy to run their washing machine or dishwasher overnight or during the day, but how many

will be prepared to move the time of their evening meal or turn off their television to avoid the evening peak? It is an evening peak that could be made worse by the rapid growth in electric vehicle sales, which could result in large peak-load increases.

Currently, electric cars make up a relatively small proportion of all vehicles sold in the UK, but their numbers are growing rapidly as they become more affordable, battery technology improves and cities introduce clean air initiatives, such as London's Ultra Low Emissions Zone, which came into force on 8 April. The expectation is that Building Regulations will require all new homes



to have an electric vehicle charge point, potentially adding to demand on the Grid.

At the moment on a big housing development, 'the diversified peak electrical demand averages out at approximately 1.5kW for each house', says Barny Evans, head of sustainable places, energy and waste at WSP. That means that, if a scheme has 1,000 homes, the peak electrical demand will total 1.5MW. However, if every property has a 7kW electric vehicle charge point without diversification, each house would require 8.5kW of electrical power – or a whopping 8.5MW for the entire 1,000-home development. 'There will have to be some form of diversification, otherwise there will be a huge problem,' Evans warns.

The electrical demand for a home currently peaks at around 6pm

**"Supply of electricity may depend on whether the sun shines or wind blows, and peak supply will almost certainly not coincide with peak demand"**

## MOBILE BATTERIES

Ovo Energy is trialling a system of turning cars into power stations with its vehicle-to-Grid (V2G) project funded by government body Innovate UK. The energy supplier's V2G charger has been developed to store electricity in a homeowner's Nissan LEAF car battery at times when Grid electricity is more likely to have been produced by renewable sources, and sell it back to the Grid when it is in demand.

The charger works with an app on the car-owner's phone, which tells Ovo when they plan to use the vehicle and their chosen minimum battery-charge level to allow it to be ready for use. Any electricity exported from the car that the house does not use is sold back to the Grid; Ovo claims sales of electricity could even cover the cost of charging the car.

The 'car as a power station' concept might even be an additional source of revenue for taxi companies, or businesses with a large number of company vehicles parked in their car park. Car batteries offer flexibility; if a householder can flex their demand and peak, they can impact their carbon intensity and, potentially, costs. The means of achieving this are 'quite complex', but digitalisation is starting to make it easier, with systems such as MyLight System and Victron Energy's HUB 4 system – both of which were considered for use at Lark Rise.

The MyLight System is designed to optimise energy flow in the house so that domestic hot water and electrical appliances are used when solar electricity production is at its maximum. At the heart of the system is a central control unit that monitors solar production and the home's electrical consumption data. Its software uses the weather forecast and smart algorithms to anticipate photovoltaic production and trigger the home's electrical equipment, via smart plugs, to run at the most efficient time. The system also includes machine learning, to anticipate the householder's habits for further savings.

Victron Energy's HUB 4 is a Grid-parallel energy-storage system, designed to work with battery-storage systems. It includes a Carlo Gavazzi energy meter to measure import/export to the system, so it knows when to charge or discharge the battery to increase self-sufficiency, and a control panel to monitor the system remotely via a browser or app.

or 7pm – and if the majority of electric vehicle owners arrive home from work and plug in their car to charge, the peak electrical demand will increase significantly. 'When you use energy may start to have more of an impact on your bill than the amount of energy you use,' says Evans.

It is a problem that, potentially, will be made worse by an electrical Grid increasingly reliant on renewables, notably solar and wind. As a consequence, the supply of electricity may vary depending on whether the sun shines or the wind blows – and, with our current infrastructure, peak supply will almost certainly not coincide with peak demand.

It is also worth considering that when the renewable energy contribution to the Grid is at its peak, the carbon intensity of the Grid will be at its lowest – so shifting demand will have a significant environmental upside. >>

» Domestic battery storage can offer some flexibility in matching the demand profile of a home with the Grid and with onsite generation, as bere:architects successfully demonstrated with Lark Rise. But, currently, domestic-scale batteries are expensive.

One solution to providing battery storage – particularly for new developments with multiple homes – is community battery for energy storage, a concept being trialled at the Trent Basin housing scheme in Nottingham.

The scale of its battery installation enables it to supply or absorb power from the National Grid under a frequency-response-type contract, which – in the case of Trent Basin – is, potentially, a significant revenue driver, and a means of helping to offset the cost of the battery system. (See article ‘Battery packs a punch’ in January 2018 *CIBSE Journal*).

The growth of electric vehicles could, however, mean they are part of the solution rather than being part of the problem. There could be 1TWh of electric storage in vehicle batteries by 2035, says Evans, who



Greater EV uptake is likely to result in an increase in peak electrical demand

believes it would be ‘a game changer’ – particularly when 100GWh of battery storage will allow the whole of the UK to be powered off-Grid for a couple of hours. (See panel, ‘Mobile batteries’)

Lark Rise – this year’s CIBSE Building Performance Awards Residential Project of the Year – is, perhaps, a foretaste of how all new homes might be designed to work with a Grid powered by renewable energy. It shows that, with creative design, it is possible to mitigate demand on the UK electrical infrastructure – and after Chancellor Philip Hammond’s announcement, in his Spring Statement, that gas heating is to be banned in new houses from 2025, it might prove to be a benchmark for all new homes. **CJ**

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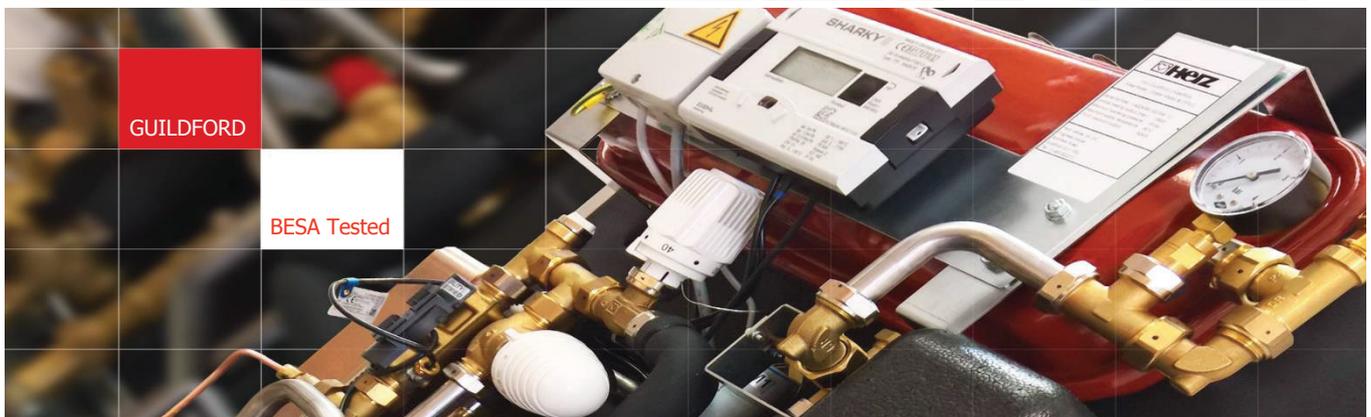
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# LIFTING ME HIGHER

The lift configuration in the newly refurbished A'DAM tower in Amsterdam has been radically redesigned to accommodate a huge increase in traffic.

**Jochem Wit** explains how this was achieved through a combination of technical, architectural and organisational measures



**T**he A'DAM Tower in Amsterdam is a collaborative hub for the Dutch music industry – and, more specifically, for the thriving dance-music scene. This is clear to the eyes and ears of anyone who takes the lift to the new observation deck when it is in 'experience mode'. The journey is accompanied by pounding dance music that rises to a crescendo as a glass elevator accelerates towards the 20th floor. There is also a stunning visual display that uses LED lighting in the lift shaft, to give occupants the impression they are speeding through a futuristic tunnel into outer space.

The A'DAM Tower is a refurbishment of the former Shell Overhoeks office, which became Amsterdam's tallest building – and a city icon – when it was completed

in 1972. A new podium and crown were added when the tower was remodelled between 2014 and 2017, increasing its height to 94m. It now includes offices for those in the music business, a boutique hotel, events spaces, a revolving restaurant, and the observation decks on the 20th and 21st floors, known as the Lookout.

The tower is now open 24 hours a day and is an important part of the regeneration of Overhoeks, a former industrial zone separated from Amsterdam's historic centre by the IJ river. Its redevelopment resulted in a huge increase in the number of people using the tower. Originally designed for 500 office workers, the project figures for the reworked building were up to 5,000 daily visitors. For this to be achieved, the lifts strategy had to be radically reworked.

## LIFT ORGANISATION AND ARCHITECTURE

To allow an increase in lift traffic, the following changes were made:

- Different types of users were allowed to use the main lifts, and the flows were merged into combined lobbies and shared lifts together
- The uncoupling of external delivery times and internal distribution times for the hotel, Lookout and Loft, by disallowing simultaneous external and internal goods deliveries
- The use of dedicated lifts during specific time windows. For instance, for dedicated Lookout service, special events – such as conferences, launches and weddings – and goods distribution
- The positioning of the reception desks for the hotel and the Lookout on the first floor, separated from the office reception on the ground floor. This was done to optimise people flow, to concentrate shuttle traffic, and for security and commercial reasons.





**“The office was originally designed for 500 office workers – figures for the A'DAM tower were up to 5,000 daily”**

The height of the original tower was approximately 80m and it had four traction lifts, each with a nominal load of 1,275kg and a nominal speed of 1.75m/s. It also had conventional group controls.

The tower can now accommodate approximately 900 people, and the enlarged 45° rotated crown an additional 600 people. To transport these flows, a rigorous change in the lift layout and function was required, as well as an unconventional mixing of flows to accommodate the dense and diverse traffic patterns. Fortunately, the client and main users embraced the idea of mixing different user groups in the lifts, because it enforced the sharing character of the building.

**Technical modifications**

A number of technical changes were applied to serve the new functions. Existing lifts were replaced by new ones with higher nominal speeds, and the nominal load of the main shuttle lift for the Lookout was increased. Its acceleration rate also increased whenever the sound and lighting effects came on in ‘experience’ mode.

The lift group in the existing core was expanded – with an extra car that serves the hotel levels in the bottom half of the tower – while the service range of the existing lifts was expanded to the new

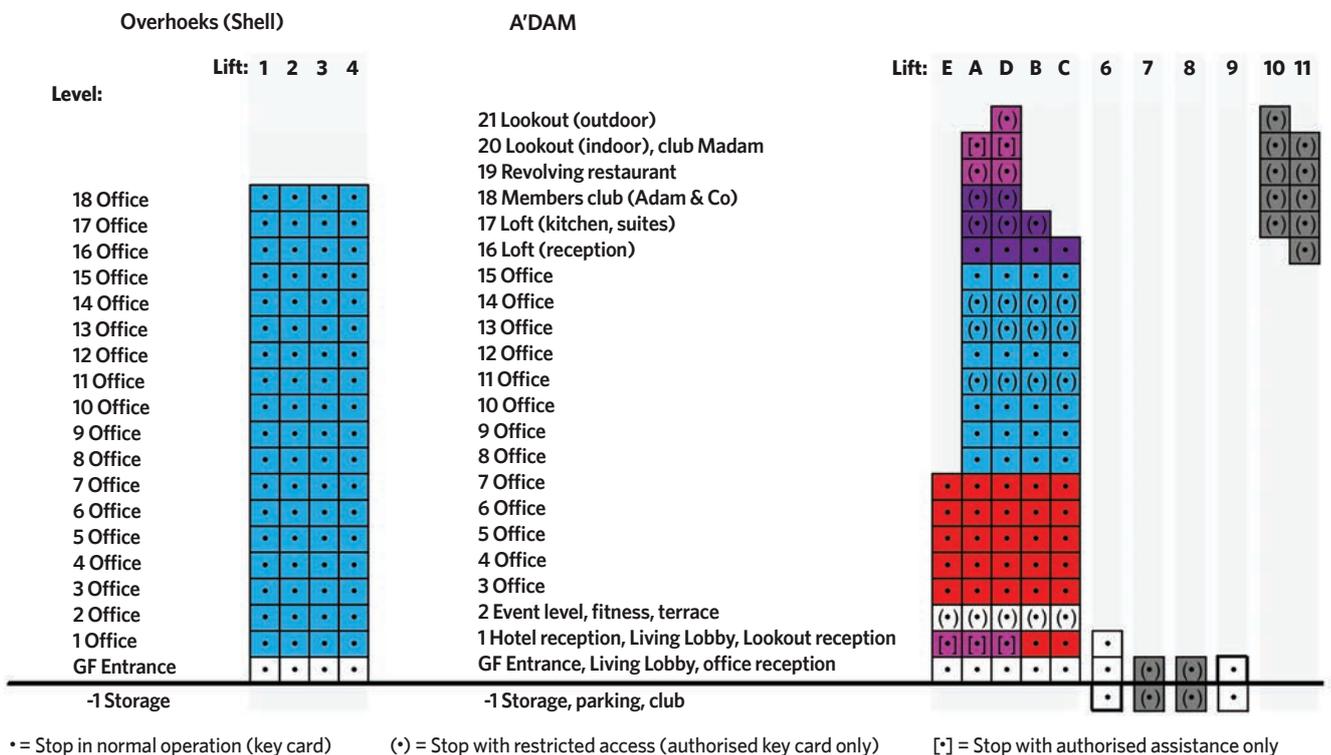
crown levels (see Figure 1). The new group of five lifts was equipped with destination controls for reasons of capacity, control intelligence and easy integration with access control systems.

To optimise the available capacity in the new five-group, six local lifts were added in the podium and the crown for wheelchair access, parking and goods storage. These lifts limit the number of cycle stops and reduce the number of main entrance floors in the central core. Only 13 out of 21 upper floors are served by the main lifts in normal operation; the rest are accessible only by key-card authorisation (for mobility impaired users and goods), stairs or local lifts.

To emphasise the exuberant and welcoming character of the tower, and to maximise the travelling experience, the lifts have different – and in some cases extravagant – finishing.

To support the traffic handling even further, additional organisational and architectural arrangements were required, such as the mixing of different types of users in the main lifts (see panel, ‘Lift organisation and architecture’).

Originally, anticipated traffic profiles in the A'DAM tower were based on the potential traffic density with a maximum population, several years after



**Figure 1: Vertical lift diagram of A'DAM Tower – before refurbishment (left) and after**

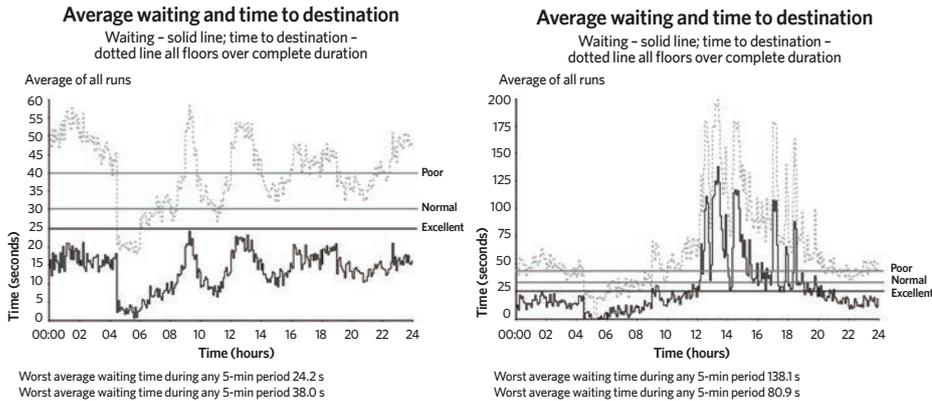
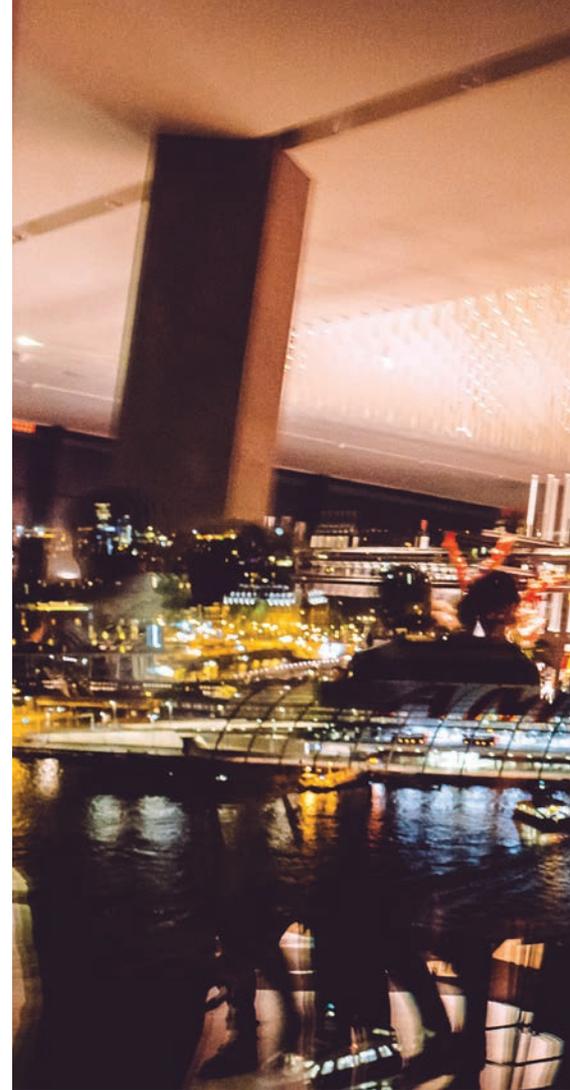


Figure 2: Waiting times without (left) and with (right) Lookout traffic - all lifts A-E available, no dedicated Lookout shuttle

» commissioning. With Lookout traffic included, the amount of traffic increases from a maximum of around 85 users per five minutes during a relatively short morning peak, to 100-150 during a prolonged period in the afternoon. This forecast activity does not include any traffic for special events, which is supposed to take place in the dedicated Lookout shuttle. The anticipated maximum number of daily transports studied was approximately 9,000 excluding the Lookout visitor movements, and more than 16,000 with those included.

To analyse the effectiveness of the initial design modifications, numerous traffic simulations were performed to identify the potential waiting time during the day. In Figure 2, the resulting waiting-time predictions are shown with and without the Lookout traffic, but without a dedicated Lookout shuttle (see Figure 3).

The service without the Lookout traffic will be excellent; the combined service - including this traffic - will be only moderate to poor in the afternoon. Isolating the



intense Lookout traffic in a dedicated shuttle lift is advantageous for all users in the afternoon, especially during the Lookout peak hours.

Based on these results, it was concluded that the transportation capacity should be sufficient for normal busy day operation. The technical and organisational modifications and broader opening hours give a potential capacity boost of more than 800% compared with the initial lift system.

It was forecast that the average waiting time over the whole day would be approximately 30-40 seconds - but only if the dedicated Lookout shuttle is available to assist in the combined office and hotel morning peak between 8am and 10am (restricting the Lookout opening hours to after 10am). Lookout visitors were forecast to have an average waiting time of 30-50 seconds and it was predicted that some users would experience higher waiting times on levels with a (intentionally) reduced number of lifts.

It was calculated that the highest waiting times would be during the office lunch peak and hotel evening peak, when several public restaurants are open simultaneously and the Lookout shuttle is in operation for the observation deck.

It was recommended to have a dedicated time window for goods transportation for

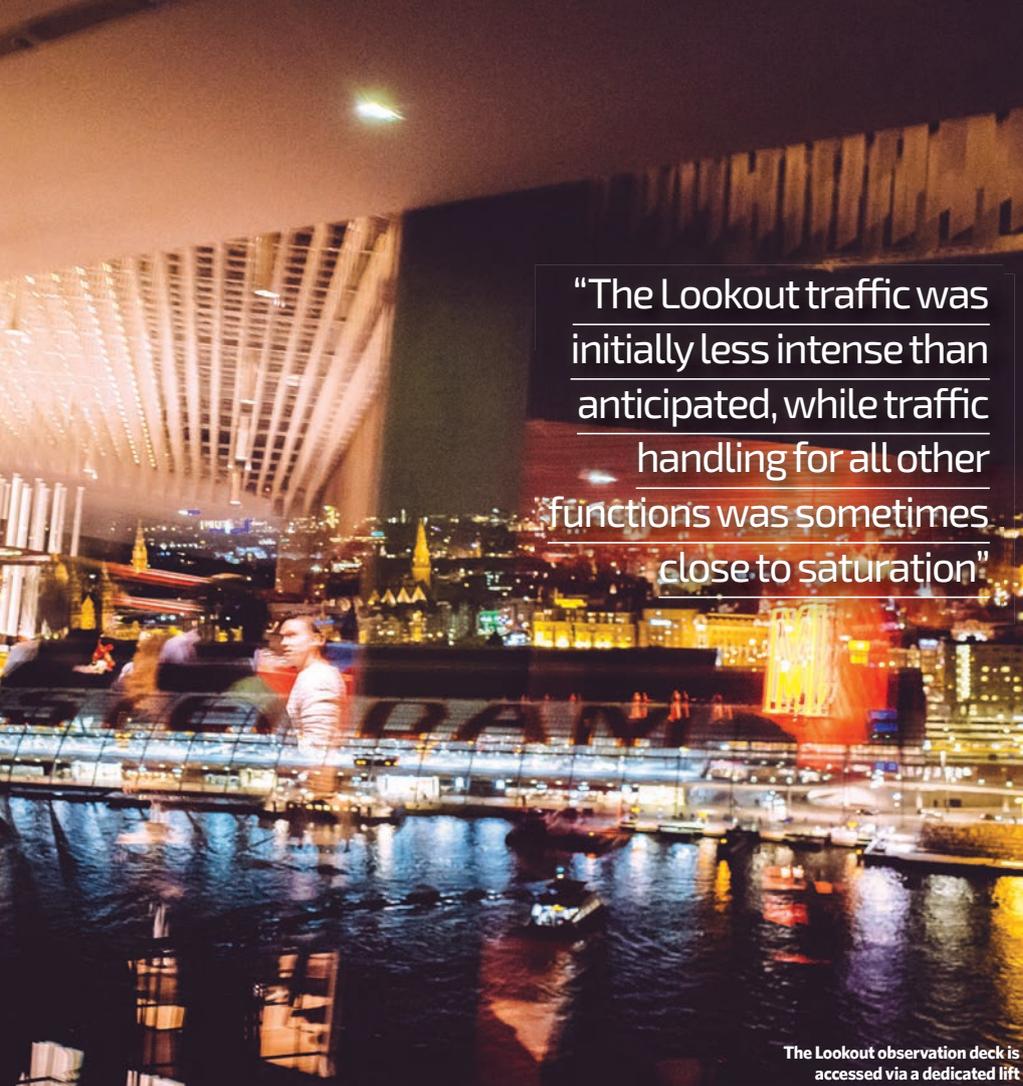


The paper on the A'DAM Tower was presented at the 9th Symposium on Lift and Escalator Technologies. The next symposium will take place on 18 and 19 September in Northampton. More details at [liftsymposium.org](http://liftsymposium.org)

## OBSERVATIONS AND RECOMMENDATIONS AFTER COMMISSIONING

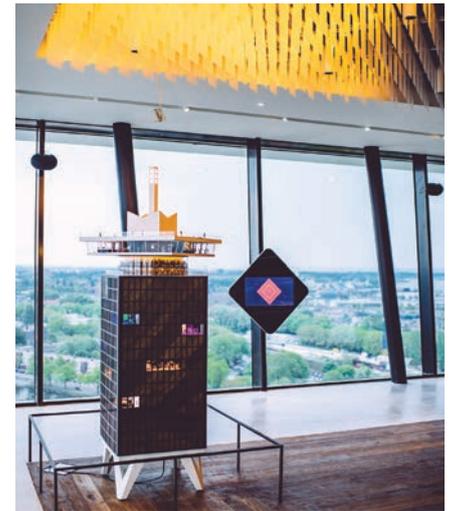
- There was an improper degree of authorised travelling to/from limited access levels and insufficient separation between the tower and the crown section. *Solution: revoke incorrectly issued authorisations*
- Excess inter-floor traffic between the kitchen and food-serving floors, and between local office floors. *Solution: encourage use of stairs, as intended*
- The revolving restaurant and some events were being served directly through the main lifts. *Solution: reinstall Lookout shuttle operation for these trips*
- Lifts could be called from the 21st floor directly, although this stop was intended for authorised transportation. *Solution: enforce strict authorisation*
- Doors were often held open by users - and even physically blocked for goods. *Solution: use nudging techniques*
- Lifts were cleaned and serviced/modified during peak hours. *Solution: Change service hours*
- A large amount of ghost passengers (travellers without destination calls) was observed: about 10-20% depending on the time of day. *Solution: re-instruct personnel to place destination calls correctly*
- The volume of transported goods to/from the food and beverage functions in the crown turned out to be substantially higher than indicated. *Solution: extend the goods transportation window.*

Based on the above potential for improvement, a few modifications were made on client request, such as allowing limited direct access to the revolving restaurant, instead of by stairs from the Lookout, and between the Loft and Lookout floors for VIP combination tickets.



"The Lookout traffic was initially less intense than anticipated, while traffic handling for all other functions was sometimes close to saturation"

The Lookout observation deck is accessed via a dedicated lift



than anticipated, while traffic handling for all other functions was sometimes close to saturation. This was not caused by a higher overall traffic density, but by deviations from the original setup, such as unauthorised travelling to limited access levels. (See panel, Observations and recommendations after commissioning.)

The tower has been a considerable success, with restaurants and hotels regularly fully booked, all offices rented and event facilities crowded almost every week. To evaluate the current traffic-handling quality the earlier traffic measurements were repeated in May 2018. Data from a 12-day period was extracted from the destination control system.

The tower's traffic volume is now at approximately 60% of the anticipated maximum design potential. This is more than four times the original traffic volume handled in the former Overhoeks office configuration. The current quality of traffic handling is excellent and there is room for anticipated further growth in the coming years.

That will be necessary, because attendance is expected to grow due to the recent opening of the North-South metro line connecting A'DAM to the city centre, and the addition of more attractions in tourist attractions in Overhoeks.

The tower functions like a living organism with internal flows evolving according to the changes in use. Thanks to the carefully thought out lift strategy there should be sufficient traffic handling capacity for this to be accommodated. **CJ**

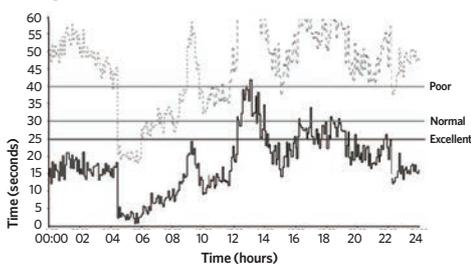
■ **JOCHEM WIT** is transportation and lift logistics consultant at Deerns

■ Please see the full article and list of references at [www.cibsejournal.com](http://www.cibsejournal.com)

#### Average waiting and time to destination

Waiting - solid line; time to destination - dotted line all floors over complete duration

Average of all runs



Worst average waiting time during any 5-min period 24.2 s  
Worst average waiting time during any 5-min period 38.0 s

Figure 3: Waiting times in lifts B-E without Lookout traffic (left) and dedicated Lookout traffic in shuttle lift A (right)

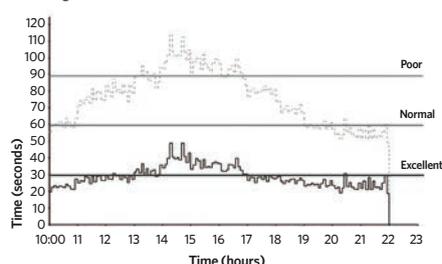
all functions, using the Lookout shuttle in a restricted early morning slot between 6am and 8am. A reliable means of access control in the main lift core was also necessary, to prevent unauthorised users from travelling to or from stops that have been restricted for capacity reasons.

In addition, it was predicted that potential 'lift tourism' – because of the attraction of the tower and interest in the unique lifts other than the Lookout shuttle – would have to be prevented. So an intelligent integration of the lift-destination control system and the building's overall access-control system, through key-card authorisation, was included. A wide range of different authorisation levels on personal

#### Average waiting and time to destination

Waiting - solid line; time to destination - dotted line all floors over complete duration

Average of all runs



Worst average waiting time during any 5-min period 48.8 s  
Worst average waiting time during any 5-min period 64.7 s

cards was negotiated with all user groups. Cards are issued with individual and adjustable authorisations to give customised clearance to otherwise closed-off levels in the tower.

It was recommended that peak traffic for special events be handled in the Lookout shuttle. This has sufficient capacity to allow momentary shuttle rides to the primary event areas on the 2nd and 16th floors.

#### Latest measurements

After the phased commissioning of the tower, traffic measurements were performed to analyse the actual use of the lifts and traffic-handling quality. The Lookout traffic was initially less intense

# WINDOW OF OPPORTUNITY

More stringent regulations – coupled with factors such as embodied carbon, depth of façade, daylight, and overheating risk – make envelope design a challenge. Arup's **Rob Buck** looks at how it might be overcome

**T**he latest version of Breeam (2018) makes attaining Excellent and Outstanding ratings harder to achieve. This is in part because of the greater emphasis now put on the thermal performance of the façade to improve the energy efficiency of buildings.

The level of performance may need to improve further with the introduction of the draft London Plan, which requires a 35% reduction in carbon emissions over Part L, and a 10-15% improvement on energy efficiency.

This, and the recent release of the amendment to the Building Regulations Part B (Fire) and the approved guidance – banning combustible high-performance insulation for buildings above 18m high – has made it harder to meet thermal performance requirements.

When important factors such as embodied carbon, depth of façade, user interface, daylight, buildability, risk of overheating and cost are put into the mix, getting the right balance requires more work. For example, if large areas of glass are introduced to allow for high levels of daylight, this might make it difficult to achieve the required overall U-value, unless designers introduce triple glazing or increase the thickness of the insulation for opaque areas.

A holistic approach at the start of projects is very beneficial in defining the façade concept with the right amount of glazing in relation to other design elements. High-rise residential buildings with an overall façade U-value requirement of  $0.64\text{W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$ , plus a window-to-wall area of around 30%, are common. But with previous building energy targets, it was possible to design façades with overall U-values in the region of  $0.80\text{--}1.0\text{W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$ .

The high-rise nature of these developments means it is wise to consider a pre-assembled approach to the manufacture of the façade, reducing time spent working at height and

improving the quality of workmanship. A unitised curtain walling system, however, has more aluminium framework – which compromises the thermal performance – than a built-on-site approach using a rainscreen system. Detailed design is required much earlier in the development phase of the project to clarify whether an aluminium, thermally broken, unitised approach would meet the thermal requirements. This may require the architect to compromise on their design by simplifying the architecture – for example, by removing features such as balconies that could penetrate the façade, employing triple glazing, and/or increasing the percentage of opaque elements.

## Finding a balance

Enhanced, thermally broken, aluminium systems are now available and can help with achieving higher thermal performance. However, these materials are made from a combustible plastic with a foamed core. In the Building (Amendment) Regulations 2018, combustible thermal breaks are permitted

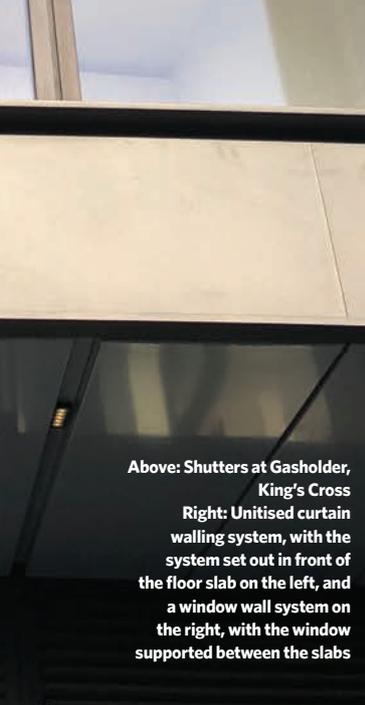
## BENEFIT OF SHUTTERS

In the April 2019 issue of *CIBSE Journal*, Bill Bordass described how the integrated design of the 2+1 window system – a double-glazed inner pane, with venetian blinds on the outside protected by an outer pane of glass – overcame the usually conflicting requirements of daylight without the heat gain. The window can also open to provide natural ventilation.

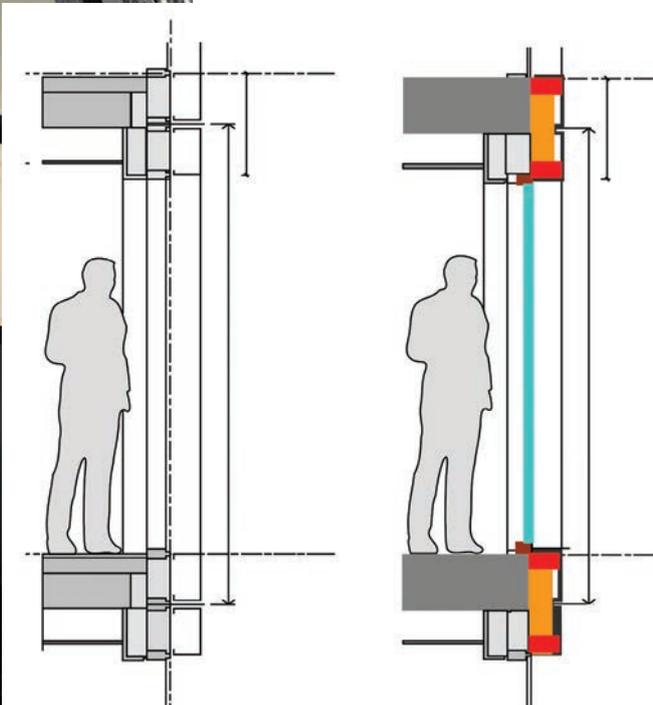
My favourite is the sash window, coupled with an internal shutter system, commonly used by the Victorians. The window, with openings at low and high levels, offered single-sided ventilation, while the shutter system gave solar shading and security. A modern update is to integrate movable louvers into the shutter, offering more flexibility with daylight and ventilation control. Lessons are also to be learned from continental Europe, where external shutters or roller blinds, coupled with an inward opening window, can offer similar benefits.

The system at Gasholders, King's Cross, is a modern example of using external shutters to control heat gain, with internal opening windows to give natural and purge ventilation. The shutters are motorised and require a service agreement. An alternative approach could be to lease the products, with ownership remaining with the manufacturer, who would be responsible for repairing and maintaining the system. Currently, a lack of information is being passed back to the manufacturer to improve product design as, generally, their products are installed and maintained by others. This information would also allow the manufacturer to recycle or reuse the product at the end of its life.





Above: Shutters at Gasholder, King's Cross  
 Right: Unitised curtain walling system, with the system set out in front of the floor slab on the left, and a window wall system on the right, with the window supported between the slabs



on the façade if they are the minimum size required to achieve compliance with Part L of the Building Regulations. As planners require energy improvements beyond those required by Part L, there is a conflict between the requirements of the Part B regulations and the planners. To assess what effect a combustible thermal break would have on the passage of fire through a unitised curtain walling, more research and testing is required.

Approved Document B Vol 2 amendment 2018 states that 'thermal breaks should not span two compartments'. Taking this statement at face value would mean that unitised curtain walling could no longer be installed with the system passing in front of the floor slabs. A window wall system, which spans between the floor slabs, would meet the requirement, but a secondary façade system would be needed to cover the face of the floor slabs, compromising thermal performance, ease of assembly and aesthetics (see below).

It is not certain how these new regulations will be interpreted, but there will be a greater role for fire engineers to assess the detailed façade design and consider the impact on the holistic fire engineering plan, on a project-by-project basis. It is likely that the balance between operational energy efficiency and fire safety will shift substantially. We will probably need to rethink the concept of a 'sustainable façade' and focus less on pushing poor concepts that may compromise fire safety, such as thermal breaks and curtain walling hung off the building, and concentrate on the delivery of strong robust façade systems.

**“There will be a greater role for fire engineers to assess the detailed façade design and consider the impact on the holistic fire engineering plan”**

**Tackling the challenges**

Building Regulation requirements for overheating and purge ventilation are increasingly in conflict with safety considerations, particularly on refurbishment projects where window sizes and position are constrained by existing architecture.

Planners are reluctant to accept a changed building appearance, while clients – and Arup – are keen to future-proof the building and comply with current regulations for the occupiers' benefit. Increased awareness of safety considerations – for example, increasing the height of the window opening above the floor – can be in direct conflict with the desire for larger window openings to achieve better ventilation.

This issue has been exacerbated by the publication of the latest CIBSE weather files, which now include climate-change predictions for future weather data. Overheating calculations based on the future weather data files show a marked increase in overheating risk, which presents a challenge when refurbishing high-rise residential buildings designed and built with relatively small ventilation openings.

Architects and engineers will need to think creatively to propose future-proofed solutions that address these issues. Alternative methods of ventilation, or separating ventilation openings from glazed ones, may be a way forward, but would require flexibility from planners to accept the revised architecture.

It is, of course, only sensible that we pursue both safety and performance. For the best outcomes for the building, open-minded conversations need to take place at the start of a project, supported by in-depth evaluation, with technical and traditionally simple ideas considered.

More than any other part of a building, the building envelope requires planners, clients, architects, contractors, and façade engineers to come together and define solutions that achieve the optimum balance. **CJ**

**ROB BUCK** is associate, façade design, at Arup

Cost model

# Exposed services

In this cost model, Aecom's cost management team examines the capital costs of delivering an exposed services design in a central London office

**C**ategory A office space is popular with developers. The simplest finish, including raised floors, suspended ceilings and basic mechanical and electrical services, requires minimal investment and allows them to target a wide range of potential tenants. This approach is now regarded by some as inflexible and out-dated. Tenants are increasingly demanding more free-flowing, open spaces that encourage collaboration in the workplace. A consequence of this trend is a rise in popularity of high and exposed ceilings, but while these are common in Cat B fit-outs, they are still in their infancy in speculative CAT A developments.

## Cost drivers

The biggest misconception about exposed services is that they are less expensive than a traditional Cat A office fit-out because of the savings made in removing the ceiling grid or tiles. Creating this aesthetic, however, involves a lot of additional work to achieve the perfect 'exposed' look. Traditionally, the ceiling grid and tiles hid unsightly ductwork, pipework and cabling. As the services are now on display, the following need to be considered, all of which represent additional cost:

- **Enhanced treatment to the ductwork.** This could be achieved by a metal wrapping over traditional lagging to give a clean finish. Alternatively, additional time and labour would improve the final installation
- **Installation of suspended or track-mounted lighting, including pendants in lieu of ceiling-mounted lighting tiles and downlights.** Fittings are generally more expensive, take longer to install and require additional design coordination
- **Painting of exposed ceiling and services in**

## ABOUT THE AUTHORS

■ **ALEX GROCCOTT** is an associate and **ANDREW FREEMAN** a graduate surveyor at Aecom's London MEP cost management team



Acoustics is also a cost consideration of exposed services

**a uniform colour** – a far more complex job than simply painting walls.

The 'casual' exposed look is actually the result of a lot of skilled labour

■ **Increased onsite design coordination and labour-intensive tasks.**

This includes the careful and considered routing of electrical conduit to create a uniform and consistent finish and appearance.

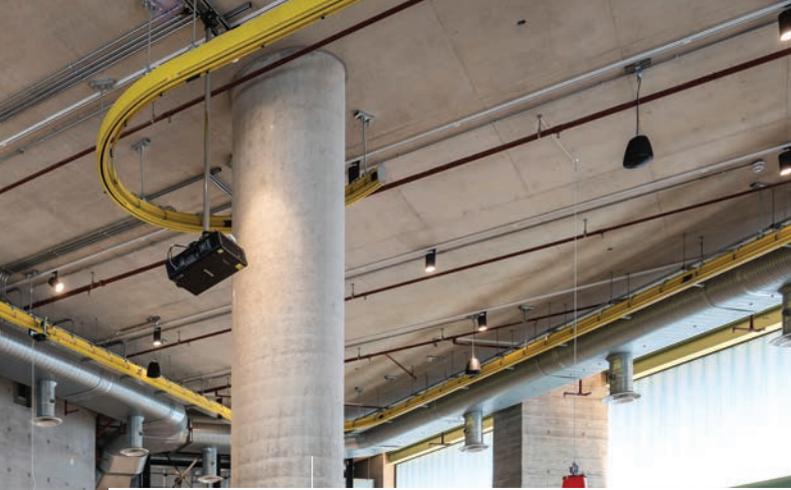
Another cost consideration of exposed services is acoustics. Ceiling tiles absorb sound and keep ambient noise levels from being disruptive. The hard surfaces associated with exposed ceilings, such as concrete slabs, amplify sound and can distract occupants. So it is important to consider the acoustical control options necessary to minimise noise, such as suspended baffles, acoustic panels, and spray-on solutions. The added cost for this depends on the options you choose and the level of design coordination required (for lighting, fire alarms, sprinklers and so on). White-noise systems can be installed to help, but some people find white noise disruptive and annoying.

Exposed services have other hidden expenses, most notably, energy costs. Removing a suspended ceiling will mean an increased volume and area of space for the HVAC system to heat and cool. Research by the Ceilings & Interiors Systems Construction Association found that offices with suspended ceilings achieved 9% to 10.3% greater energy savings than those with exposed ceilings and services. In addition, exposed ceilings required more frequent and stricter cleaning regimes, and periodic repainting that is not necessary with suspended ceilings.

## Cost model

The cost model is based on a Cat A fit-out to one floor of a central London office development, occupied by a single tenant, with a net lettable area of 1,800m<sup>2</sup>. It is purely for mechanical and electrical installations and takes no account of changes to building elements. The exposed services option does not require a suspended ceiling, which would give a saving of about £65/m<sup>2</sup> (£6/ft<sup>2</sup>) (net internal area).

This is only part of the picture, however, with items required to be



added back into the exposed services costs. For example, any exposed concrete surface would need dust sealing/painting at £1/ft<sup>2</sup> NIA. Acoustic panelling would be required to walls, suspended panels and shrouds above FCUs, at a cost of around £40-£50/m<sup>2</sup> (£3.75-£5/ft<sup>2</sup>) NIA. **C**

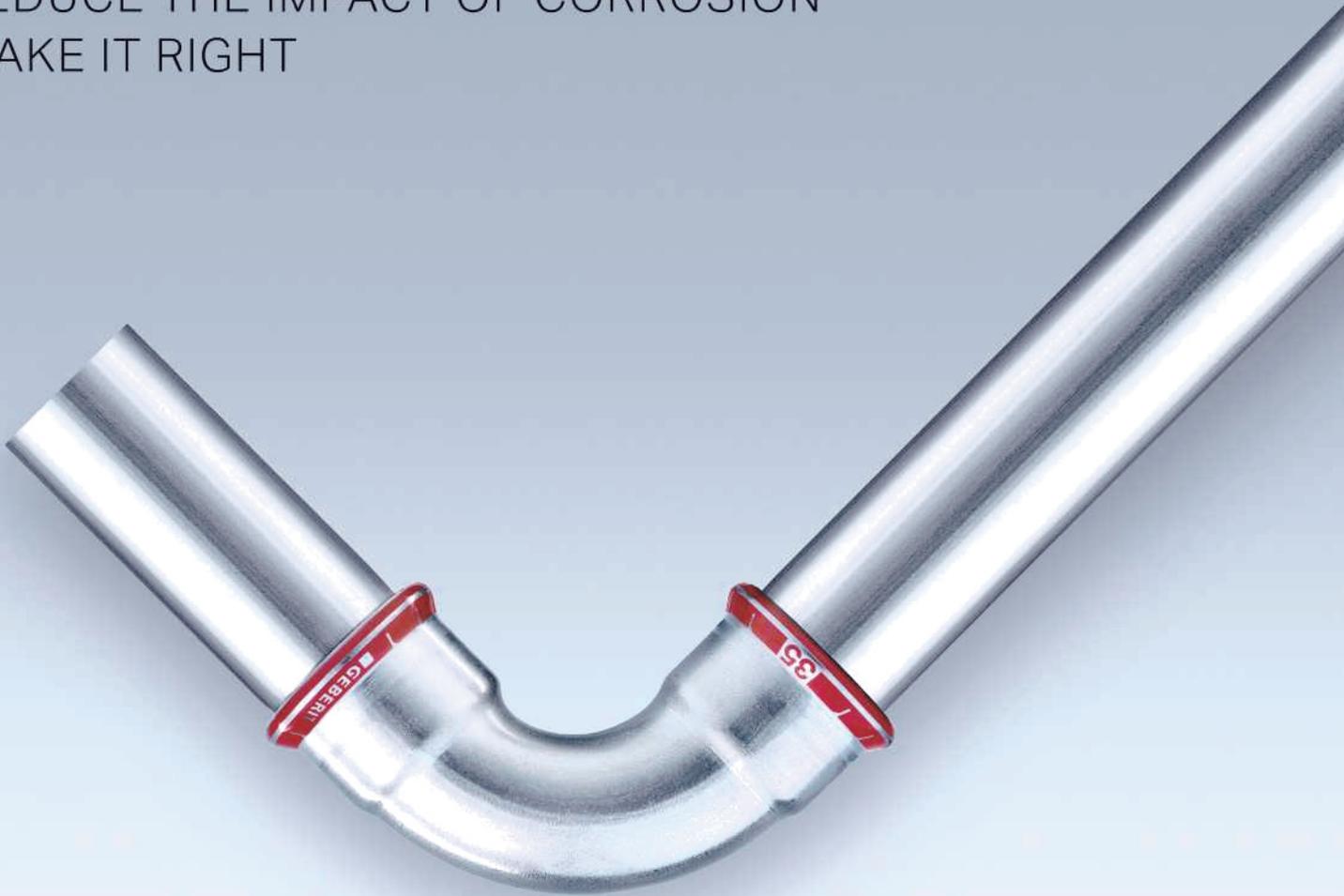
Category A works		Traditional Cat A		
		Based on a NIA 1,800m <sup>2</sup>		
		Total (£)	£/m <sup>2</sup> on NIA	£/ft <sup>2</sup> on NIA
5.6	<b>Space heating and air treatment</b> Installation of four-pipe fan coil units to the perimeter zones and two-pipe fan coil units to the internal zones Including CHW and LTHW distribution pipework, ductwork distribution, plenums, diffusers, grilles and insulation Installation of condensate drainage to fan coil units Includes testing and commissioning and subcontractor preliminaries	£355,000	£197.22/m <sup>2</sup>	£18.32/ft <sup>2</sup>
5.8	<b>Electrical installations</b> Installation of one tenant distribution board, LED lighting, including controls based on a modular wiring system Power to the mechanical services and general earthing and bonding Includes testing and commissioning and subcontractor preliminaries	£220,000	£122.22/m <sup>2</sup>	£11.35/ft <sup>2</sup>
5.11	<b>Fire and lightning protection</b> Sprinkler protection to floorplate Includes testing and commissioning and subcontractor preliminaries	£45,000	£25.00/m <sup>2</sup>	£2.32/ft <sup>2</sup>
5.12	<b>Communication, security and control systems</b> Fire detection system and BMS to fan coil units Includes testing and commissioning and subcontractor preliminaries	£75,000	£41.67/m <sup>2</sup>	£3.87/ft <sup>2</sup>
<b>Traditional C at A MEP total costs</b>		<b>£695,000</b>	<b>£386.11/m<sup>2</sup></b>	<b>£35.87/ft<sup>2</sup></b>

Category A works		Exposed Services Cat A		
		Based on a NIA 1,800m <sup>2</sup>		
		Total (£)	£/m <sup>2</sup> on NIA	£/ft <sup>2</sup> on NIA
5.6	<b>Space heating and air treatment</b> Installation of four-pipe fan coil units to the perimeter zones and two-pipe fan coil units to the internal zones Including CHW and LTHW distribution pipework, ductwork distribution, plenums, diffusers, grilles and insulation Installation of condensate drainage to fan coil units Includes testing and commissioning and subcontractor preliminaries Extra for exposed services, including enhanced finishes to ductwork via metal cladding and enhanced grilles/diffusers	£425,000	£236.11/m <sup>2</sup>	£21.94/ft <sup>2</sup>
5.8	<b>Electrical installations</b> Installation of one tenant distribution board, LED lighting including controls based on a modular wiring system Power to the mechanical services and general earthing and bonding Includes testing and commissioning and subcontractor preliminaries Extra for exposed services, including suspended fittings in lieu of ceiling mounted and increased coordination of wiring to minimise the visual impact	£275,000	£152.78/m <sup>2</sup>	£14.19/ft <sup>2</sup>
5.11	<b>Fire and lightning protection</b> Sprinkler protection to floorplate Includes testing and commissioning and subcontractor preliminaries	£45,000	£25.00/m <sup>2</sup>	£2.32/ft <sup>2</sup>
5.12	<b>Communication, security and control systems</b> Fire detection system and BMS to fan coil units Includes testing and commissioning and subcontractor preliminaries Extra for exposed services, increased coordination of wiring to minimise the visual impact	£80,000	£44.44/m <sup>2</sup>	£4.13/ft <sup>2</sup>
<b>Exposed services Cat A MEP total costs</b>		<b>£825,000</b>	<b>£458.33/m<sup>2</sup></b>	<b>£42.58/ft<sup>2</sup></b>

Comparison of costs between a traditional Cat A and an exposed services Cat A fit-out of a central London office

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## London hotel chiller to save 179 tonnes of CO<sub>2</sub>

**Part-load performance and low noise were key for hotel**

Five-star Biltmore Hotel in London's Mayfair aims to save 179 tonnes of CO<sub>2</sub> after installing new chillers as part of a £60m refurbishment.

Carrier's inverter-driven screw chillers replaced two ageing chillers that had reached the end of their working life at the hotel in Grosvenor Square.

Challenges included limited space on the rooftop and strict controls on noise levels. There were also limitations on power, so careful assessment of start-up and peak loads was required.

John Lam, head of the modernisation team that carried out the work, said: 'The customer was keen to minimise capital costs and maximise return on investment in a package that could be demonstrated to reduce the building's carbon footprint.'

Two chillers - with a combined cooling capacity of 1,460kW - were installed within the 6.8m footprint available. The work included installation of integrated hydronic modules linked to the chiller's variable speed drives, chiller sequencing control and factory-fitted remote monitoring.

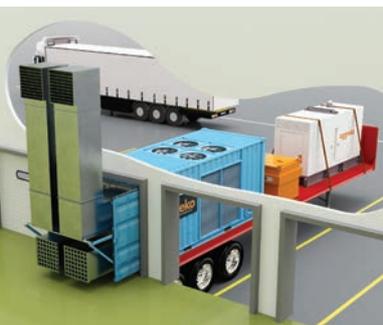


The AquaForce Vision 30KAV used at the Biltmore Hotel

An energy-use simulation highlighted that the building has a peak cooling load of 1,400kW and a base load of 700kW, requiring the chillers to operate for an average of 18 hours a day throughout the week at the 308-room hotel.

It was calculated that the installation would use 20% less electrical power than the old models, delivering savings of 345,079kWh of electricity, equal to an annual carbon saving of 179 tonnes.

## Cold-storage unit adds capacity in peak production



Cold-storage warehouses will be able to recover from breakdowns immediately thanks to a new, temporary air-cooled low-temperature air conditioning (AC) unit from Aggreko.

Delivering 100kW of design cooling capacity at -22°C air outlet temperature, the machine is a 'plug and play' solution, housed in a 20ft container, that ensures stored refrigerated products are safeguarded in an emergency.

Available as an air- or water-cooled unit, it can cool existing cold stores to temperatures as low as -40°C, helping the cold storage and logistics industry to blast-

freeze during peak production or in case of emergency. Interference with any cold-store warehouse is minimised because the unit is installed outside, increasing safety and avoiding costly installation fees.

It also allows for temporary cooling during planned shutdowns, enabling the operation of the cold store to continue while a fixed cooling installation is maintained or upgraded.

The AC unit, which has a built-in management system, also has access to temporary power generators, so warehouses can be supplied with enough energy if no electricity is available from the grid.

## Panasonic wins iF Design Award

Panasonic has received an iF Design Award from the International Forum Design, for its residential floor console air conditioner.

Using R32 refrigerant, the console can operate in heating mode up to -15°C, and cooling mode up to +43°C. By generating hydroxyl radicals (OH), which oxidise chemicals and bacteria in the atmosphere, the unit's technology can work in heating or cooling operation to remove pollen, pollution and fungi from the air. It includes an internal dehumidifier to limit the propagation of mould and bacteria.

A CA controller app allows users to remotely control up to 10 sites, each with 20 indoor units. The unit is available in 2.5kW, 3.5kW and 5kW capacities for multi and single split, and 2kW for multi-split only.

## Air Design launches standard AHU range

Air Design, a brand of air handling unit from Elta Group, has launched Pura, a new range of standard energy-recovery air handling units (AHUs).

Using heat and/or coolth recovery technologies, the standard range of extruded aluminium, pentapost-frame air handling and energy-recovery units are available in double-decked, vertical or side-by-side, and horizontal arrangements, depending on the footprint. They also come equipped with a plate heat exchanger or rotor and an electric heater or low pressure hot water (LPHW) coil for heat provision. For cooling, a chilled water or refrigerant coil can be used. The units have achieved a casing air-leakage classification of L1 for minimum ingress of polluted air and have a filter bypass leakage ration of less than 1%.

## IT range is a cool solution

Mitsubishi Electric has launched the s-MEXT air conditioner, which connects to the manufacturer's power inverter outdoor units to create a full inverter split system. It is the firm's first packaged computer room air conditioning (CRAC) unit.

The units are available in capacities from 6kW up to 42kW for applications where high sensible cooling and close control of temperature and humidity are required, such as small and medium-sized businesses (enterprise data centres) with onsite IT cooling requirements. They are also available in upflow and downflow variants, and occupy a small physical footprint, with pipe runs up to 100m.

# Mould breaking

Rupert Kazlauciusas, at Zehnder Group UK, looks at the widespread problem of damp and mould in private- and social-rented housing

Too many homes in the UK are blighted by cold, damp and mould, as highlighted in a recent episode of Channel 4's *Dispatches*, which revealed the shocking condition of some social housing properties.

The extent of the problem in London was revealed in February, in a report published by the London Assembly Environment Committee titled *Keeping out the chill: fixing London's cold, damp and mouldy homes*. This describes how factors such as low-quality housing, overcrowding and fuel poverty are being compounded by poorly executed retrofits that aim to save energy but fail to address the need for adequate ventilation.

Overcrowded homes are significantly more susceptible to condensation: with more occupants, they have to contend with more moisture. Damp can increase people's exposure to allergens and cause or exacerbate respiratory conditions. As well as a risk to physical health, damp homes have been shown to increase anxiety and depression among occupants. For children, there is a clear link between educational attainment and poor-quality housing.

Ventilation is critical to preventing damp, yet it is often problematic. Windows offer a 'natural' source of ventilation, but can also present security risks or let in too much cold. Extractor fans, meanwhile, offer inadequate ventilation for overcrowded homes because they are designed to the minimum ventilation level of Building Regulations. They are also often noisy or costly to run.

Approved Document F (ADF) of Building Regulations has flowrates for new-build developments to counteract excessive humidity levels in winter and to prevent mould growth. These flowrates won't be met, however, if intermittent fans aren't used, MEV or dMEV units are turned off, filters in MVHR units aren't cleaned or maintained, or constant volume motors in MVHR units aren't used. In addition, there will be an increased risk of damp and mould if units aren't commissioned properly, to the required flowrates.

With continued improvements to airtightness and insulation, it's important the flowrates in the upcoming Approved Document F revision are met and maintained.

**RUPERT KAZLAUCIUNAS**  
is technical product manager MVHR at Zehnder Group UK

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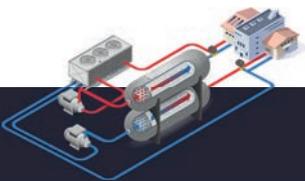
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# HEIGHTENED AWARENESS

The trend for exposed ceilings in offices can have serious consequences for occupant comfort if designers don't take into account the impact they have on air movement. Gilbert's **Roy Jones** explains how draughts and cold spots can be avoided by using special plates added to diffusers

**T**he popularity of open ceilings in commercial buildings is showing no signs of abating, as designers continue to give offices the edgy, industrial look by doing away with fixed or suspended ceilings to expose the building's inner workings.

Traditionally, a ceiling would be in place to conceal the building services – such as ductwork, pipework and wiring – and to house grilles and diffusers, as well as lighting, safety and security systems.

In addition to not having to worry about the aesthetic arrangement of the services, there is a good building services reason to have a ceiling. It plays a key role in controlling the room environment – primarily by offering a surface along which air can be evenly distributed without disturbing occupants.

The consequence of not having a ceiling can be an uncomfortable environment because of cold spots, draughts and the dumping of cold air. We often encounter these conditions where there are open ceilings, which demonstrates that a number of building services engineers are unaware of the problem, or how to fix it.

The presence of a ceiling surface allows air to flow across it evenly. This is known as the Coanda effect – named after Henri Coanda, a Romanian aerodynamics pioneer – and it occurs when airflow is closely projected to a parallel surface. A change in pressure is created at the parallel surface, which allows the airflow to 'cling' to it and project along that surface in an evenly distributed, and known, manner.

In building services, the Coanda effect means air will track horizontally along the ceiling after it has entered the room via diffusers. The principle behind supply air diffusers is to evenly disperse air

without causing any occupant discomfort, and to keep the environment within set temperature and comfort parameters.

The conditioned air will mix with the room air (mixed-flow application) and, if correctly selected, will enter the 'occupied zone' at the required comfort level – usually less than  $0.25\text{m}\cdot\text{s}^{-1}$  and within  $1^\circ\text{C}$  of room temperature for occupied spaces.

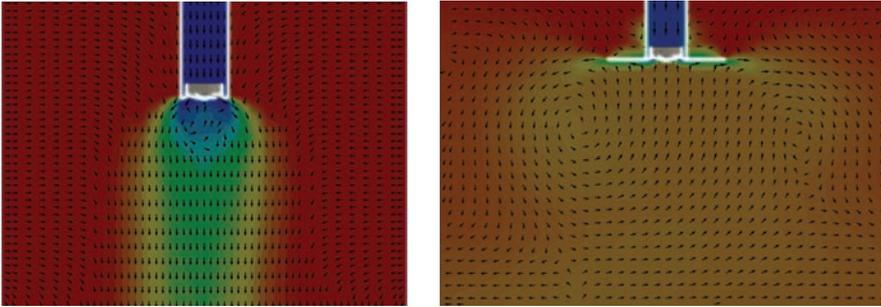
Without a suspended ceiling, there is no parallel surface on which to mount the diffusers, so there is no Coanda effect. As a result, there is no 'fixed flow' ventilation and the conditioned air 'dumps' vertically downwards, directly onto the occupants below. There is nothing for the air to 'cling' to.

If this issue is not addressed at the design stage occupants will complain of draughts and of feeling cold. Fortunately, there is a simple solution. To recreate the conditions necessary for the Coanda effect, a simple plate can be attached to the diffuser.

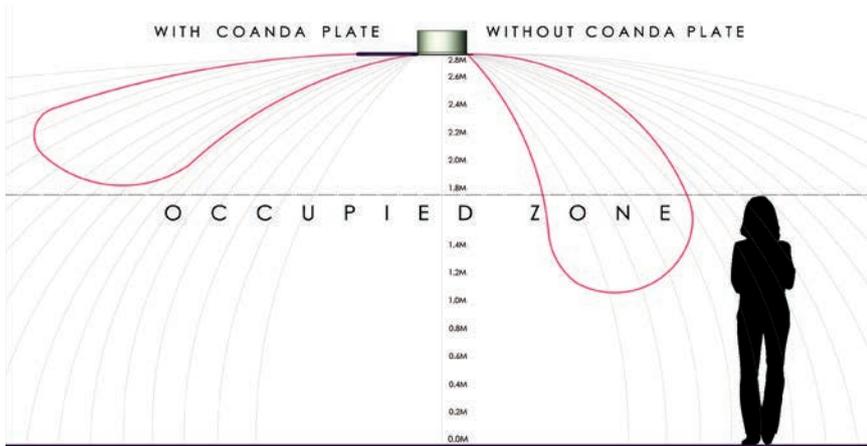
A Coanda plate is an extension of the outer flange of the diffuser. The additional surface of the plate at the point air enters the room will allow it to initially move horizontally and follow the plate. This reduces the possibility of the air dumping and allows the conditioned air to mix with the room air before entering the occupied zone.

Coanda plates work well with swirl diffusers, which are now commonly used in exposed ceilings. They also match the tubular (round) ductwork and can be connected directly without the need to provide ductwork plenum boxes. The swirl diffuser creates a  $360^\circ$  area directional flow pattern, allowing





Typical swirl diffuser throw pattern with 5°C cooling



» the air to cling to the full circumference of the Coanda plate.

As a rule of thumb, a plate that is 300mm larger than the outside flange of a diffuser should provide enough distance for the exiting air to attach to the plate, so achieving the full Coanda effect and horizontal movement of air. Interestingly, our research showed that increasing the size of the Coanda plate makes little difference to the projection of air into the room and provides similar air patterns to standard diffuser data.

We carried out research to find out how big the plate had to be to create the Coanda effect and found that the 300mm 'notional' plate size on multiple diffusers could be reduced drastically in size. We have therefore been able to introduce smaller plates for the swirl diffuser series. We even advanced our plate diffusers to have larger 'run-offs' of outer flange frames, and therefore we can remove the need for additional coanda plates with the slightly larger integrated face plate designs.

Coanda plates are typically manufactured from the same material

(Above, top) Thermal diagram showing how a Coanda plate attached to a diffuser allows the flow of conditioned air to mix with room air to avoid 'dumping' downwards onto occupants

"Increasing the size of the Coanda plate makes little difference to the throw and overall performance"

as the diffuser flange and can be painted any colour. They can be of almost any material, and can be solid, opaque or even transparent. They can even be backlit with LED lighting.

We are looking to develop Coanda plates further for linear and slot diffusers. The required length of Coanda for specific linear products has been initially assessed and will allow the Coanda plates for these to be reduced below the notional 300mm length.

Our research and development department also allows us to size Coanda plates for each individual scenario or application.

Remember, when designing any open-plan ceiling system, the correct selection of diffuser must have a Coanda plate or Coanda run-off if comfort conditions are to be achieved. **CJ**

**ROY JONES** is technical director at Gilberts Blackpool



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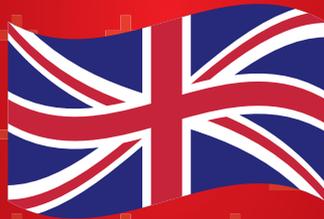


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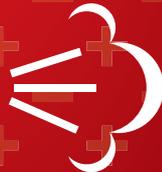


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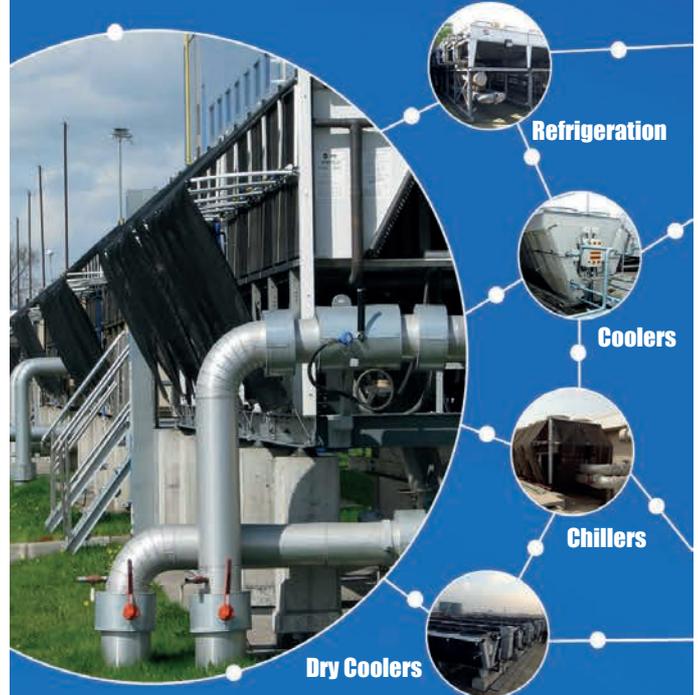
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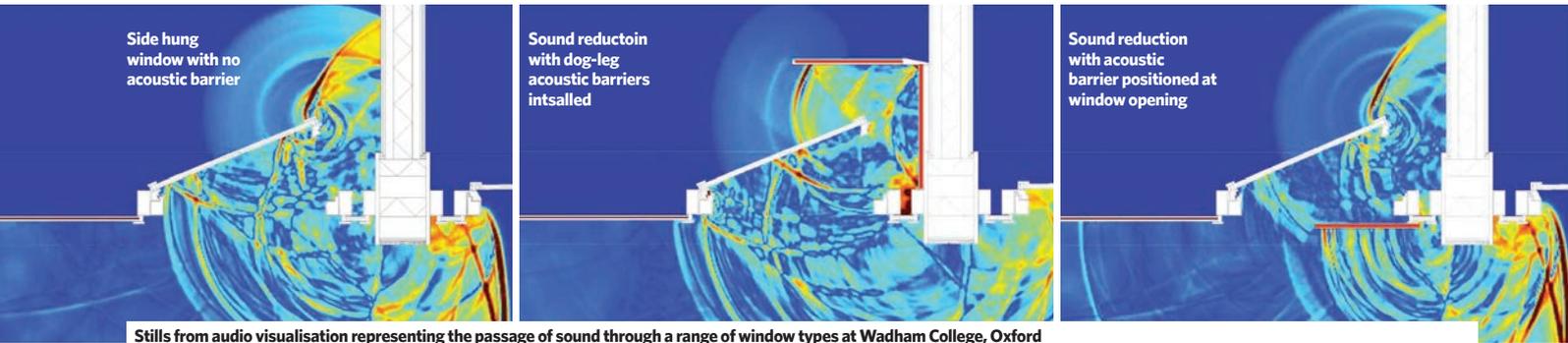
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# SOUND AND VISION

Acoustics and ventilation should be designed in tandem to ensure optimal performance in naturally ventilated buildings, says Mach's **Ze Nunes**, who shares research on software that visualises noise to give designers a sound basis for their decision-making

**A**nyone unsure of the impact that noise has on the built environment should look at the Department for Environment, Food and Rural Affairs' (Defra's) noise map of England.<sup>1,2</sup> It shows average noise levels in five bands, from 55 to more than 75 decibels (dB), and illustrates how much of the nation's built environment is affected by noise.

For those designing naturally ventilated buildings, noise mapping is an important resource. The external noise determines what level of acoustic performance is required in a vented façade to achieve an acceptable internal noise level for occupants. The higher the external noise level, the harder the façade has to work for the same (specified) internal noise level. So it is easier to naturally ventilate buildings on quieter sites. Likewise, if the performance of the façade is enhanced, the external noise levels can be higher for the same internal noise level.

It can be demonstrated, using the noise map, that 20% more land area would be available for naturally ventilated buildings with an increase of 5dB in the acoustic performance of vented façades. This figure comes from an estimation that all noise levels within an urban area are below 65dBA; 80% < 60dBA; 60% < 55 dBA; 40% < 50dBA and 20 < 45dBA.<sup>3</sup>

With most new developments built in densely populated, noisy areas, there is an increasing need for improved acoustic performance. Acoustic ventilation comes at a cost, however, and – if it's too high – energy-consuming mechanical ventilation may be specified instead, to maintain comfortable internal temperatures and prevent overheating. So if windows are still to be used as the main source of ventilation control, buildings with high external noise will require more creative solutions.

Small openings have higher levels of sound reduction than larger ones, but also offer reduced levels of ventilation. To overcome this paradox, this article argues that the acoustics and ventilation requirements should be considered in tandem when designing buildings. It also looks at solutions to restrict noise while ensuring adequate ventilation.

## Ventilation and acoustic performance

As well as there being a link between the open area of a vent and its acoustic performance, the line of sight through a window affects sound reduction. A fully open sash window, for example, will give less acoustic resistance than a side-hung window. Further benefits can be gained by turning the window away from the noise source, or by using a window with a 'dog leg' arrangement.

Napier University carried out research on the acoustic performance of different window types.<sup>1</sup> In 425 tests covering 14 open window types, it found that – depending on the window type and the angle of sound to it – the open windows achieved a sound reduction of 15dB to 24dB for an open area of 0.2m<sup>2</sup>. Smaller openings achieved a sound reduction measurement of between 18dB and 26dB.

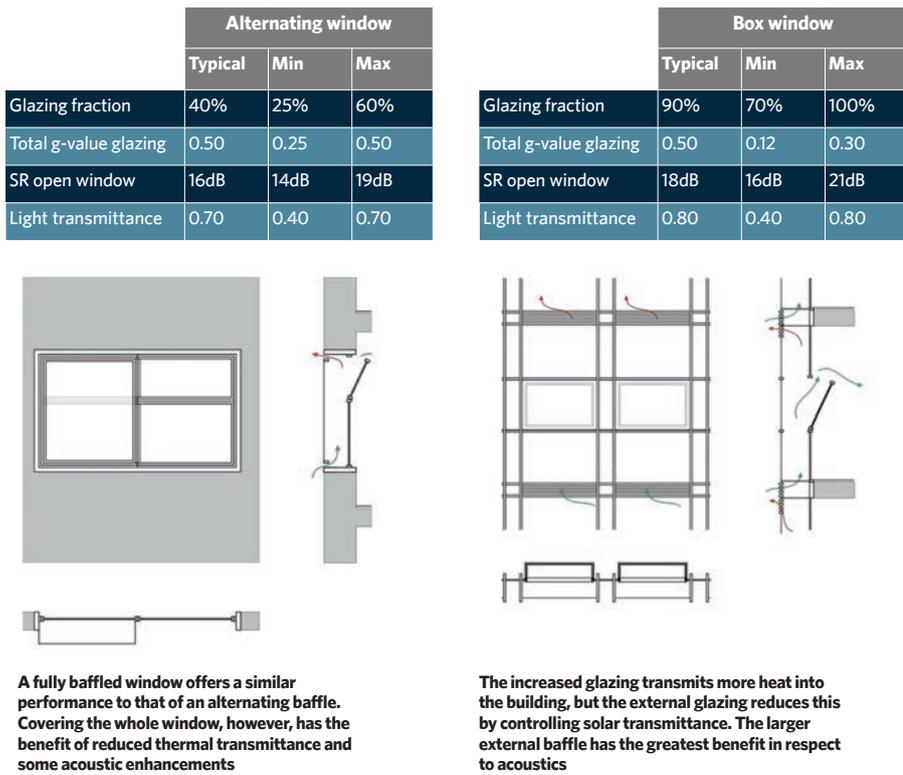
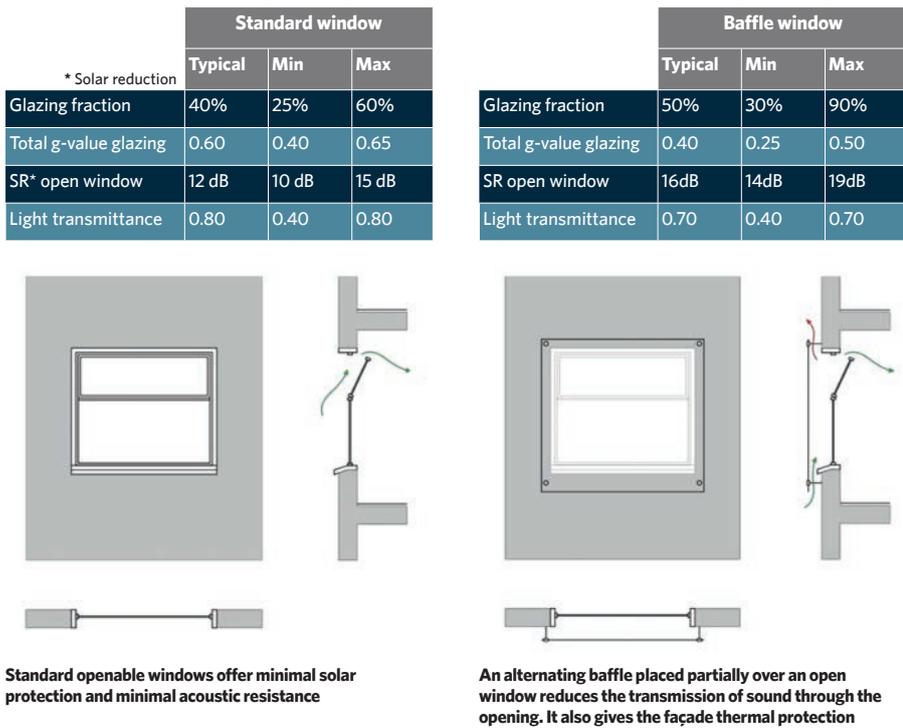
Most consultants assume a window only gives 10-15dB of sound reduction. By focusing on open areas and the line of sight to the noise source, however, it is possible to optimise window selection and opening sizes to minimise solar gain and achieve sound reductions of between 15dB and 26dB. Using Napier and Defra's data, this approach can be said to increase the chances of using natural ventilation on noisy sites by around 40%. >>



Sound visualisation techniques were used for the design of Derbyshire's Wilsthorpe Community School



Figure 1: Relationship between heat gain and acoustic performance



» Various methods to improve acoustic performance while meeting ventilation requirements are discussed below, and there is an explanation of how the modelling of sound can accurately predict the effectiveness of sound-reduction methods.

**Ventilation efficiency as a form of noise control**

The flow across a vent is fixed by ventilation rates needed to offset building heat gains. Openings can be decreased in size, however, if there

is a higher air pressure, because additional airflow will be forced through. A smaller vent will, of course, have an inherently higher acoustic performance. In practice, cross- and stack ventilation make better use of temperature differences across vents because of air buoyancy, which increases the pressure across vents and so draws higher flow rates. Along with fan-assisted ventilation, they can be seen as a type of noise control, therefore, as smaller openings in windows are needed compared with single-sided ventilation, which has lower pressure across vents.

**Site and building orientation – heat and acoustic gains**

It is common to do an orientation heat impact assessment during the early design stages of a building. Typically, south-facing windows have higher heat gains, so are harder to acoustically attenuate than north-facing ones – with lower heat gains – because larger vent sizes are required to offset heat gains.

In the same way, noise levels (acoustic gains) to façades vary depending on whether they have direct line of sight to a noise source or whether they are in acoustic ‘shadows’.

**Enhancing g-values and the acoustics of windows**

A g-value of 1 represents full transmittance of solar radiation, while 0 represents a window with no solar energy transmittance. In practice, most g-values will range between 0.2 and 0.7, with solar-control glazing having a g-value of less than 0.5. Put another way, the g-value times the area of the glass, plus solar orientation, are key factors affecting the total heat gain upon a space.

So the g-value is critical when considering a building’s heat gain and its acoustic design; lower heat gains mean smaller openings, with inherently higher levels of acoustic resistance, can be used to ventilate spaces. It is worth considering the g-value as a form of noise control, therefore. Figure 1 shows how window designs that reduce heat gain have a better acoustic performance. Thermal mass and solar shading can also be used as an effective form of noise control, as shading/cooling reduces either the heat gains or the ventilation to offset these heat gains (see Figure 2). So these design options should be considered when buildings are on noisy sites.

**Acoustic shading**

In the same way that light shadows can be used to reduce heat gains, acoustic ‘shadows’ can be used to control noise ingress. Acoustic shadows are more complex than light ones as the wavelength of sound is massive compared with that of light. This means sound tends



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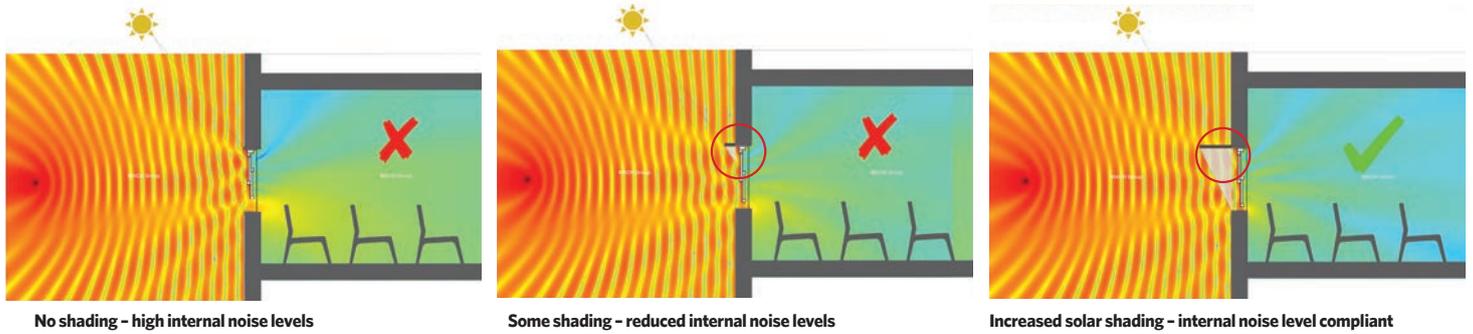
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Figure 2: Solar shading reducing heat gains and subsequent open area of the window – and, thereby, noise levels in classrooms



» to bend around objects, reducing the effectiveness of an acoustic shadow.

A second challenge with using acoustic shadows lies in modelling and estimating the performance of external fins, barriers, balconies, box windows, sound-absorbing bricks and other external acoustic devices.

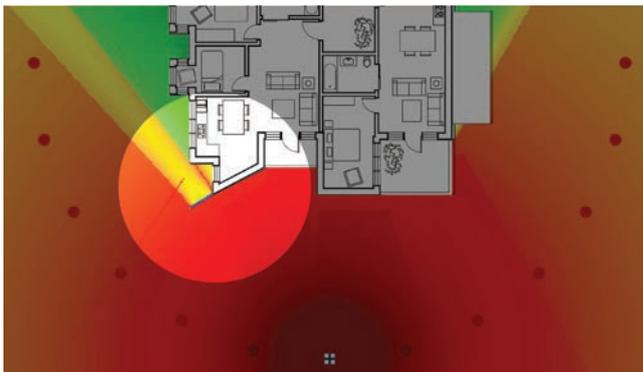
The effects of acoustic shading from balconies are presented in ISO 12354-3:2017 Part 3, *Airborne sound insulation against outdoor sound*, which suggests that balconies can offer up to 7dB of additional attenuation to that of windows. IES software can then be used to assess the shading effects of these balconies, which could be used to further enhance the building's acoustics.

The Hong Kong Housing Authority, in conjunction with researchers, is using mock-up roadside flats to design/incorporate acoustic windows and acoustic-shading fins, to mitigate the impact of traffic noise on affordable housing developments, while still allowing passive air circulation. A range of mitigation options are now being used at King Tai Court, close to Prince Edward Road East, a major east-west thoroughfare in San Po Kong.

## VISUALISING BUILDING SHAPING

The use of sound visualisation has proved to be a useful tool in understanding how a building's form can be used to optimise its acoustics and thermal performance.

Here, an acoustic fin has been extended beyond the building's fabric to protect a key façade containing open windows, thereby offering acoustic protection to this opening.



## Building shaping

Individually designed floorplans and acoustic buffers (circulation spaces, staircases, service facilities, lifts) are often used as a form of noise control. Taking this one step further, building shaping is now being developed to mitigate acoustics and thermal gains. At Tak Pui House, part of Tak Long Estate, in Hong Kong, steps, deep reveals and star-shaped building forms are being used to reduce noise ingress into large-scale housing developments.

## Visualising the passage of sound

Research by Mach Acoustics, with the universities of Southampton and Bath, has led to a new idea being developed, whereby the visualisation of sound is used to show how it flows through openings placed within the façade of a building. This visualisation, along with acoustics and CFD modelling, can be used to design new window forms/shapes that offer significantly enhanced levels of acoustic performance, while still allowing the flow of air through passive buildings.

This process is undertaken on the principle that one can see, understand and so optimise the passage of air and sound through open windows. For example, acoustic screens have been modelled for Wadham College, Oxford (page 49), so that the design team can see how and why different arrangements achieve different levels of acoustic performance. (See YouTube link [bit.ly/CJMay19videosim](https://bit.ly/CJMay19videosim) for a noise simulation on different window types over time, and this article on the web for a visualisation that compares the passage of sound through different types of windows.)

## Summary

Pressure increases across vents – achieved by selecting cross-, stack or assisted ventilation – will result in smaller opening vent sizes and, therefore, enhanced acoustic performance.

Reduced solar gains are also important because lower heat gains require lower airflow rates; this means that smaller openings with higher levels of acoustic resistance can be used. Heat gains can be reduced by means of building orientation, solar shading, balconies, acoustic fins and undulating façades. As in the case of solar gains, acoustic gains are important to consider. Solar gains increase when the building is pointed at the sun. Similarly, façades exposed to or facing noise sources will experience higher exposure to acoustic gains. So it is critical to consider both elements/assessments in tandem.

Finally, the use of visualisation, modern types of modelling and early testing has demonstrated that it is possible to create options that will ensure windows will still be used to provide ventilation controls to today's modern, low carbon buildings. **CJ**

**ZENUNES** is the founder of Mach Acoustics

## References:

- 1 Open data: strategic noise mapping, Defra, 2012, [bit.ly/CJMay19Noisemap](https://bit.ly/CJMay19Noisemap)
- 2 England Noise Map Viewer, Extrium, [bit.ly/CJMay19noisemap2](https://bit.ly/CJMay19noisemap2)
- 3 The future of windows, page 36, Apple Books, [bit.ly/CJMay19Windows](https://bit.ly/CJMay19Windows)



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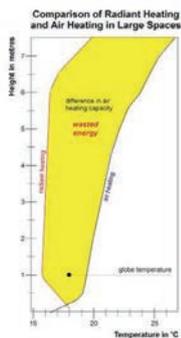
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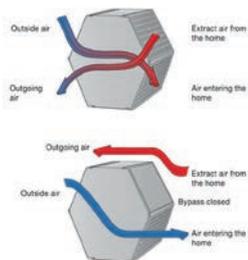


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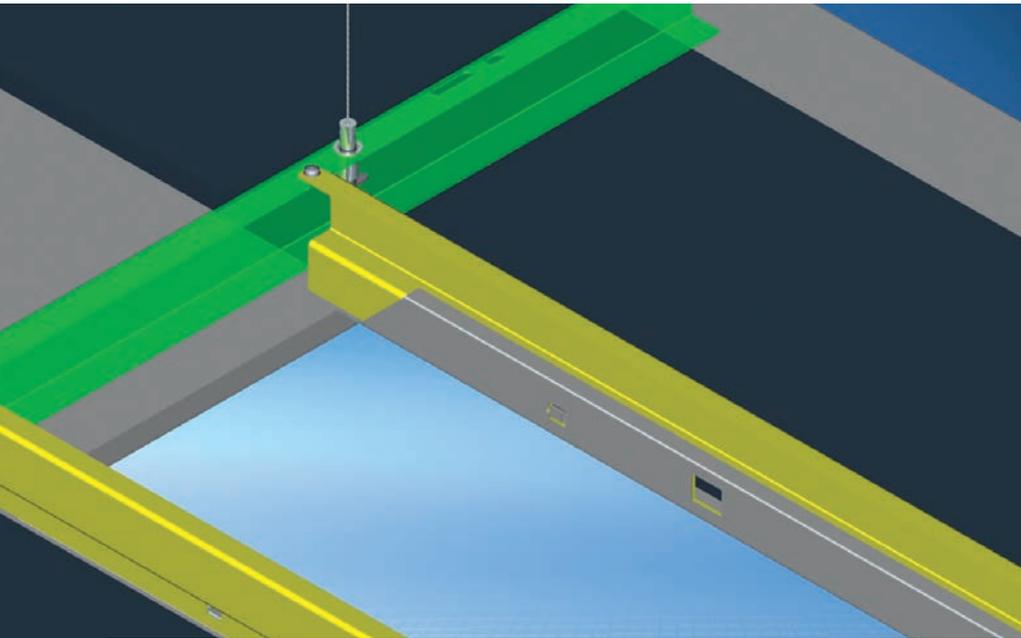
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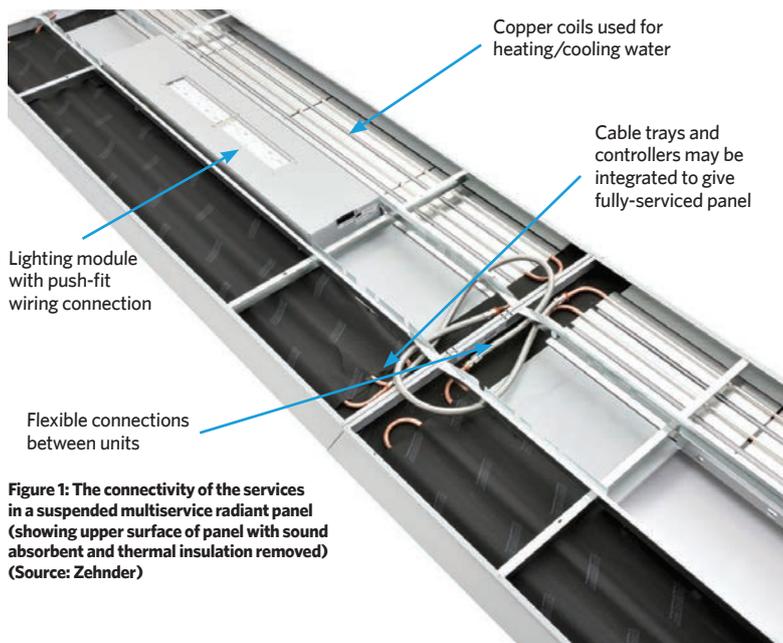


## Ceiling-suspended multiservice radiant panels

This module explores multiservice radiant panels and the practicalities of meeting the acoustic and lighting needs of building occupants

There are challenges in providing flexible working spaces that meet the needs of comfort and wellbeing *and* maximise the usable floor area. The application of ceiling-suspended multiservice radiant panels not only offers an opportunity to deliver heating and cooling, but also to host other services – such as lighting, sprinklers, sensors and acoustic treatment – as part of a modular, low-maintenance system. This CPD article will focus on the radiant heating aspects of multiservice panels, while also exploring some of the practicalities of meeting the acoustic and lighting needs of building occupants.

The prime purpose of a ceiling-suspended radiant panel (also known as a ‘foil’ or ‘blade’) is to heat or cool the space to give a comfortable environment for the occupants. Radiant panels are typically used in conjunction with a separate system,



**Figure 1: The connectivity of the services in a suspended multiservice radiant panel (showing upper surface of panel with sound absorbent and thermal insulation removed) (Source: Zehnder)**

such as a dedicated outdoor air system, that supplies the ventilation air and controls the space humidity. The radiant panels, as shown in Figure 1, are supplied with cool or warm water to offset part or all of the room loads. As with other part-centralised air-based systems, this reduces the distribution energy and space requirements compared with an all-air system, and provides opportunities for local control.

As discussed in the May 2018 *CIBSE Journal* CPD, particularly in respect of radiant systems, the standard measure of comfort, the operative temperature,  $\theta_c$  (°C), is calculated<sup>1</sup> from

$$\theta_c = \frac{\theta_{ai} \sqrt{(10v)} + \theta_r}{1 + \sqrt{(10v)}}$$

where  $\theta_{ai}$  is the air dry-bulb temperature (°C),  $\theta_r$  is the mean radiant temperature (°C) and  $v$  is the mean air speed ( $\text{m}\cdot\text{s}^{-1}$ ) and, if the air speed is taken as being of a similar magnitude to that of natural convection ( $\approx 0.1\text{m}\cdot\text{s}^{-1}$ ), the operative temperature is typically simplified to  $\theta_c = 0.5\theta_{ai} + 0.5\theta_r$ .

The mean radiant temperature – which is directly influenced by the temperature of a radiant panel (and by every other surface exposed to the occupant) – will, in terms of the operative temperature, have equal impact >>

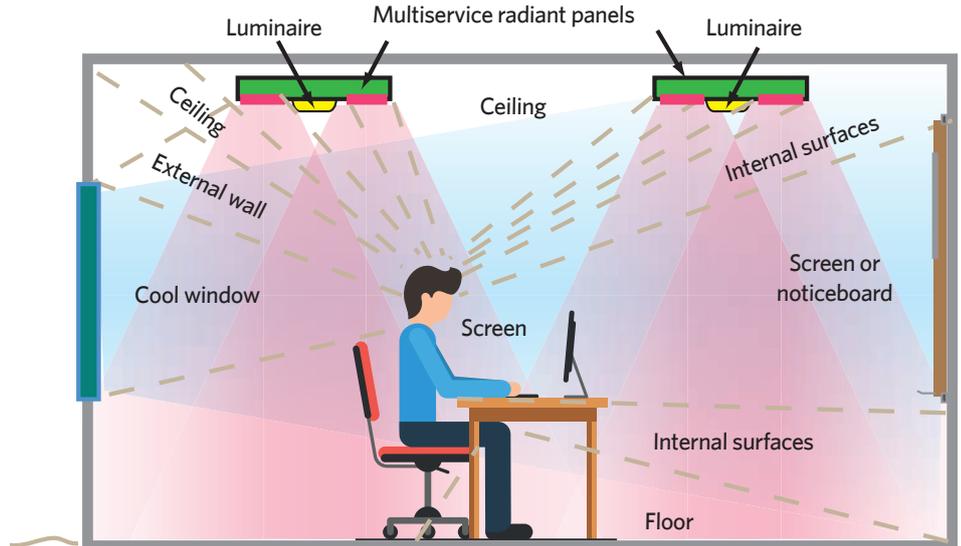
» on comfort to that of the temperature of the air that surrounds the person. The human body aggregates the impact of individual point radiant temperatures, together with all the other parameters that affect comfort. It is this aggregated mean radiant temperature that is combined with (the average) dry-bulb temperature to determine operative temperature. The complex shape and surface types of the clothed human body, as well as the different radiant characteristics (and shape factors) of the surrounding surfaces, make the prediction of comfort particularly challenging, as illustrated in Figure 2. Both CIBSE<sup>1</sup> and ASHRAE<sup>2</sup> illustrate methods to determine the impact of radiant heating on the occupant comfort by evaluating the view (or angle) factor for radiant heat transfer. However, readily understandable worked examples are best seen in Annex B of BS EN ISO 7726:2001.<sup>3</sup>

As discussed in a paper by Manabe,<sup>4</sup> the position of the person in the room – as well as the influence of other people – will significantly affect the relative radiant shape of the human body. Although the paper reports an evaluation method, it is based on six simple planar, isothermal surrounding surfaces that are unlikely to properly represent an application such as an office or a teaching space, as illustrated in Figure 2. In a modern, well-constructed building, the internal surfaces and furnishings are likely to be at a similar temperature to that of the air. The surfaces that are likely to deviate most from the mean air temperature are the external surfaces and those of the heating and cooling devices. The value of  $\theta$ , will alter with the position of the occupant and with the surface temperatures.

From experience of installations, manufacturers are able to give guidance on the practical impact in a room or, if the specific information is available, various scenarios may be assessed with dynamic thermal models.

The asymmetry of radiant temperatures will also affect comfort, regardless of the dry resultant temperature. The guidance that is provided by CIBSE, ASHRAE and ISO 7730<sup>5</sup> is shown in Figure 4. For class 2 (or category B) buildings, ISO 7730 limits the radiant asymmetry for warm ceilings to 7K.

Recently, Safizadeh<sup>6</sup> examined the impact of different radiant uniform ceiling temperatures on comfort for a ceiling height of 3m. This was a laboratory-based experiment, and so restricted, necessarily, in its ability to simulate real applications. However, it was particularly interesting in that – unlike the work that underpins much of the guidance of radiant temperatures for



**Figure 2:** This illustrates the complexity of determining the impact of radiant heat transfer for the evaluation of mean radiant temperature when heating an area such as a seminar room – shown as a much-simplified section that, in reality, is influenced in three dimensions

comfort – it included not only variations in the ceiling surface temperature, but also the impact of temperature and distance of other surrounding surfaces. One of the surprising findings – and contrary to expectations – was that the test subjects considered that their head was the most comfortable, even though it was the closest part of the body to the warm ceiling. Their results indicate that, if the radiant ceiling operates at low average temperatures (below or equal to 38°C across the whole ceiling), they were able to provide conditions of neutrality – neither too warm, nor too cold. In the discussion of the results, they considered that the predicted mean vote (PMV) index does not assess the perceived thermal feeling of the occupants exposed to asymmetric radiation correctly. Specifically, they note that, where occupants are dressed in winter clothing, a radiant temperature asymmetry of 7.5K will still provide neutral conditions.

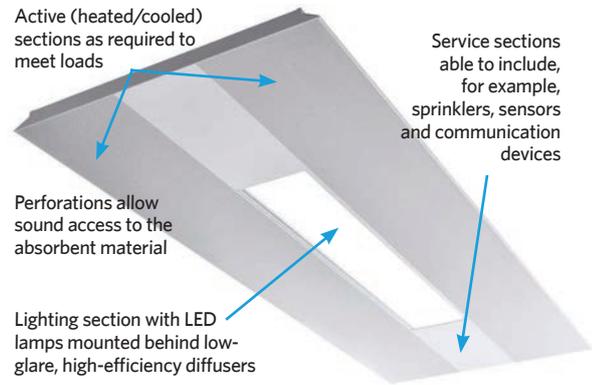
As suggested by the sketch in Figure 2, when applying radiant panels – as opposed to a whole planar heated ceiling – the panel temperature will have a reduced influence on the aggregated radiant temperature on the top of occupants' heads. In the example installation in Figure 3, depending on room design loads, the radiant panel 'active area' could be one or two sides of the panel face (that is, 33% or 66%) of the 2.2m x 0.9m area that, in such an application, would equate to approximately 11% or 22% of the ceiling plane area. The guidance from the UK Education and Skills Funding Agency<sup>7</sup> is that, in an application such as that depicted in Figure 3,



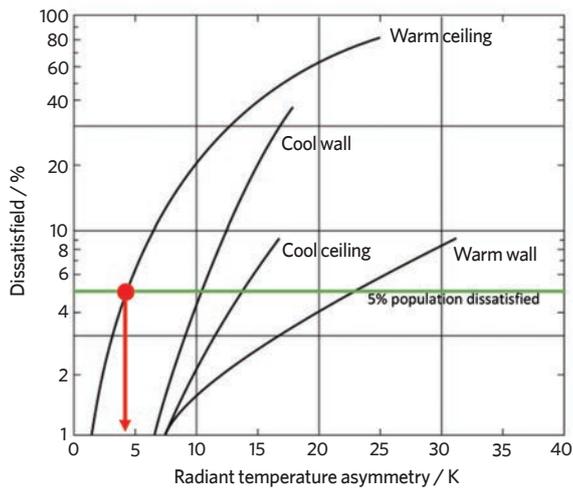
**Figure 3:** Example application of suspended multiservice radiant panels

an average panel temperature of 50°C would be appropriate for normally able-bodied occupants. This would provide more than 300W heating from each of the illustrated panels.

In spaces where speech is important – such as in an office or school – reverberation times of around 0.6 to 0.8 seconds are typical to ensure clarity and high speech intelligibility. By comparison, direct sound will take in the order of 0.06 seconds to reach the back of a 20m room. An occupant in a reverberant room will experience a higher sound level than in a more absorbent room, and speech generated in spaces with reverberation times beyond 0.8 seconds can become increasingly difficult to understand. However, if the reverberation time is too short – such as below 0.3 seconds in larger rooms – the aural environment can sound dull, and this will affect the audibility for those at greater distances from the speaker. The freely downloadable *Acoustics of Schools: a design guide*<sup>8</sup> is an excellent reference for the assessment and design of spaces where speech intelligibility is important. It indicates that, for applications such as classrooms, the provision of high-level suspended panels of acoustically absorbent material can make a useful contribution to limiting the reverberation time.



**Figure 5: An example of the front face of a 2.2m x 0.9m suspended multiservice radiant panel. The central section is dedicated to the lighting unit, with the option to include additional services in the open areas at either side. A perforation across the panel provides a wipe-clean surface, but allows access to the sound-absorbent material (Source: Zehnder)**



**Figure 4: Percentage dissatisfied as a result of asymmetric radiation only, based on work by Ole Fanger (Source: CIBSE Guide A 2016 Fig 1.11)**

The acoustic absorption of multiservice radiant panels is often characterised in terms of equivalent sound absorption area,  $A_R = \alpha \cdot S$  where  $\alpha$  is the absorption coefficient of the absorbent material and  $S$  is the area of the absorber. Practically, the complicated geometry of multiservice panels requires that the panel be tested to BS EN ISO 354<sup>9</sup>, and the equivalent sound absorption area can then be included as part of the Sabine reverberation time calculation,  $RT = 0.16V/A$  where  $V$  is the room volume and  $A$ , the overall room absorption, is the sum of all the products of the room surface areas and their individual sound absorption coefficients,  $\sum S \cdot \alpha$ .

So, for example, a 2,200 x 900mm multiservice panel suspended 800mm from the soffit, similar to that shown in Figure 5, has an approximate equivalent sound absorption area of 2.1 at 500Hz, based on manufacturer’s test data.<sup>10</sup> The same area of plain concrete soffit has a sound absorption area of 0.04. When applied in the Sabine calculation, this will make a significant reduction to the reverberation time in an office or teaching area, so reducing the need for complementary absorbent surfaces.

The lit environment also has a significant impact on comfort and occupant performance. If designed appropriately, it will help prevent fatigue, aid concentration and improve productivity. Beyond the considerations of daylighting, this will be influenced by the position and type of lighting fittings. These will be designed to deliver the required illuminance and distribution of light to the occupied space – including considerations for glare and shading, which are discussed fully in the SLL Lighting Handbook – as well as to ensure appropriate colour rendering and colour temperature.

Colour rendering, and the associated colour rendering index (CRI), determine how faithfully colours are replicated under artificial light sources compared with daylight. The CRI compares a light source’s test performance with a reference source – a value of Ra100 indicates a performance similar to daylight, with Ra80 a typically required minimum. Modern, good-quality LED lamps, which would

integrate into a multiservice panel, should be able to meet this requirement of Ra80. However, the simple CRI may not provide the complete story, particularly for LEDs, because even though they typically have poor red colour rendering, this is not exposed in whole-spectrum CRI evaluation. Skin tones, for example, are influenced by the redness of the blood that flows beneath the skin, so a light that lacks red will make a person look pale, or possibly green. Enhanced CRI metrics, such as the so-called ‘CRI R9’ value, may be used to evaluate whether the LED lamp can render red effectively – a CRI R9 value of more than 50 is normally considered good.

As discussed in the December 2018 *CIBSE Journal* supplement CPD, the modification of colour temperature is increasingly seen as important in maintaining the health and productivity of occupants throughout the working day. With appropriate networked controls and sensors, LEDs integrated into the multiservice panels may be altered to provide, for example, a ‘circadian-friendly’ lighting sequence. Using individual or group control, and driven by ‘smart’ control devices, wireless mesh networked lighting systems can offer lighting regimes that ensure safety and good practice, but that also allow app-based integration to improve the environment for the individual occupant.

The advent of low-cost mesh wireless controllers – together with more compact and reliable micro-electronic sensors and components working with high-efficiency, controllable LED lamps – have transformed the capability of suspended radiant panels to meet the aspirations of a true multiservice device. With appropriate application, these can contribute to comfortable and effective environments in commercial and educational buildings.

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Turn to page 58 for further reading and references. >>



# Module 144

May 2019

» 1. What is the ISO 7730 limit for radiant asymmetry for warm ceilings in a class 2 building?

- A 1K
- B 3K
- C 5K
- D 7K
- E 9K

2. Approximately how much heating is available from the multiservice radiant panels used as illustrated in the article?

- A 200W
- B 300W
- C 400W
- D 500W
- E 600W

3. Which of these reverberation times is most appropriate for a teaching area?

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

4. What is the minimum value of CRI R9 that would indicate that an LED lamp would be considered good at rendering the colour red?

- A 50
- B 60
- C 70
- D 80
- E 90

5. Which of these is not mentioned in the article as being potentially integrated into a multiservice radiant panel?

- A Cooling
- B Humidifiers
- C Lighting
- D Sensors
- E Sprinklers

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#### Further reading:

CIBSE Guide A – particularly sections 1 for comfort and 5.8, which considers heating plant sizing.

CIBSE Guide B4 – section 4.7 provides information on room acoustics.

SLL Lighting Handbook 2018 – this gives detailed explanations of all lighting fundamentals.

#### References:

- 1 CIBSE Guide A, Chapter 1, CIBSE 2016.
- 2 ASHRAE Fundamentals Handbook, Chapter 9, ASHRAE 2017.
- 3 BS EN ISO 7726:2001 *Ergonomics of the thermal environment – instruments for measuring physical quantities*.
- 4 Manabe, M et al, *Shape factor calculation and visualisation for the influence of the thermal environment on the human body*, 8th Int IBPSA Conference, 2003.
- 5 BS EN ISO 7730: 2005 *Ergonomics of the thermal environment. Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria*.
- 6 Safizadeh, MR et al, *Experimental evaluation of radiant heating ceiling systems based on thermal comfort criteria*, *Energies*, October 2018.
- 7 *Output specification – Technical Annex 2F: Mechanical services and public health engineering. Version 7*, ESFA, 2017.
- 8 Shield, B et al, *Acoustics of schools: a design guide*, IoA & ANC 2015.
- 9 BS EN ISO 354:2003 *Acoustics – Measurement of sound absorption in a reverberation room*.
- 10 *Foil – integrated lighting, acoustics and services*, Whitecroft Lighting [bit.ly/2UWandp](http://bit.ly/2UWandp) – accessed 15 April 2019.

## Product of the month

### Hidden extras in new ModuSat XR HIUs

Evinox's 'smart' HIUs offer lower outputs and lower cost communication network connection

**W**ith more than 15 years of heat interface unit (HIU) supply under its belt, Evinox has unveiled its latest range of ModuSat XR 'smart' HIUs.

Evinox ModuSat XR models offer more features, value and performance – but with less space requirements, lower heat network operating conditions, and less time on site to install, commission, support and maintain than ever before. They have smaller, more compact dimensions; offer the ability to deliver high performance at low primary flow temperatures; and feature TCP/IP communications connectivity. The new, lower output models allow cost-effective compliance with the latest industry design standards.

Building on Evinox's BESA-tested range of smart heat interface units, the latest ModuSat XR and XR-ECO twin plate HIUs have been enhanced to provide the same performance, but in a package requiring 27% less space in the home than before. Units are extra compact, allowing for tight installation constraints and helping to minimise the size of prefabricated



**“Models offer more features, value and performance, but take up less space”**

cupboards. The new units have been 'designed by engineers for engineers', with a focus on providing flexible pipework connection options, easy access to key components and simple installation and maintenance.

The range has also been extended to include smaller ModuSat XR and XR-ECO TP 30 units. These are designed to meet the recommendations in the soon to be released CIBSE ADE Code of Practice 1.2, which states that designers should specify a maximum of 25kW output for studio apartments and 30-35kW for one- and two-bed properties. This recommendation has been included to avoid the oversizing of domestic hot water systems, which can lead to increased costs and network inefficiency. The new ModuSat range of HIUs satisfies these new industry requirements.

Ethernet connectivity comes as standard on all ModuSat units, allowing two-way communications for diagnostics, commissioning and support – as well as metering data – to be accessed across shared building infrastructure. Evinox is also providing open protocol access to metering data through a new, customer configurable web-access to the SmartTalk data logger.

Units are currently in operation in hundreds of developments across the UK, including landmark projects such as Battersea Power Station, London City Island, and Wood Wharf at Canary Wharf.

■ Visit [www.evinoxenergy.co.uk](http://www.evinoxenergy.co.uk) or email [info@evinox.co.uk](mailto:info@evinox.co.uk)

### Start-up Adaptarose seeks support from CIBSE community

Adaptarose is seeking support from the CIBSE community to help manufacture the world's-first BS67 smart ceiling rose. All funding raised will go towards tooling, CE testing and manufacturing. Investors will be rewarded with devices from the first manufactured batch. The smart ceiling rose switches lights automatically by overriding the wall switch. No rewiring, building work or maintenance is required.

■ Visit [www.crms.uk.com/ceilingrosemotionsensor](http://www.crms.uk.com/ceilingrosemotionsensor)



### One Aquamatic AMV-DS pump set to boost water for the domestic supply and sprinkler systems

The comprehensive Aquamatic AMV-DS unit has two to eight pumps and meets the requirements of BS 9251. If a BMS signal or the sprinkler control system activates the sprinkler mode, all pumps run continuously at full speed. This unit is supplied with a compliant water tank to feed both the sprinkler and the domestic systems, saving further space and cost.

■ Call 01206 215151, email [marketing@aquatechpressmain.co.uk](mailto:marketing@aquatechpressmain.co.uk) or visit [www.aquatechpressmain.co.uk](http://www.aquatechpressmain.co.uk)



### Pump Tech continues to offer service 'no matter what happens'

As the largest authorised UK stockist of Jung Pumps in the UK, Aldermaston based Pump Technology is working with Jung Pumpen Germany to hold a massive stock of its pumps to support the industry during the Brexit process.

With more than 30 years' experience in this field, Pump Technology, which keeps a comprehensive range of floor-mounted wastewater and sewage pump systems and accessories, is confident that it can continue to offer its usual service no matter what happens.

■ Call 0118 9821 555 or visit [www.pumptechnology.co.uk](http://www.pumptechnology.co.uk)





### Putting Braemar on the map

Following a two-year restoration, the Fife Arms Hotel in Braemar – originally built in the 19th century – recently reopened its doors. With its 46 individually designed rooms and an eclectic collection of 12,000 pieces of carefully sourced local artefacts, historical objects and artwork, this hotel may be located in the coldest part of Scotland, but it aims to have a warm and inviting impact on visitors.

Ensuring that the internal climate and M&E services are able to deliver to exacting standards, the hotel has installed a complete pump solution from Grundfos Pumps, which collaborated with consultants RSP and contractors John G Mackintosh. The collective final selection incorporated a range of energy efficient, variable speed pumps that included both single and twin pump models from the MAGNA3 and TPE ranges of circulators. These are further supported by a Hydro MPC-E booster set, a pressurisation unit, as well as other ancillary items.

With such a unique offering, the Fife Arms is already receiving rave reviews.

■ Call 01525 850000, email [grundfos-uk@sales.grundfos.com](mailto:grundfos-uk@sales.grundfos.com) or visit [www.grundfos.co.uk](http://www.grundfos.co.uk)



### Groupe Atlantic UK brands raise more than £38k for charity

Cancer affects everyone either directly or indirectly, which is why Hamworthy is backing Macmillan Cancer Support across all Groupe Atlantic UK brands.

Groupe Atlantic UK, ROI and North America's group-wide business conference raised £2,643 through charity donations alone, along with an auction during the event and another following in January bringing the final total to £38,594.

■ Call 01202 662500, email [sales@hamworthy-heating.com](mailto:sales@hamworthy-heating.com) or visit [www.hamworthy-heating.com](http://www.hamworthy-heating.com)



### Condair achieves workplace wellbeing charter



Condair has been accredited by the Workplace Wellbeing Charter, the national accreditation standard that recognises an organisation's commitment to improving the lives of those who work there. Condair achieved the standard through initiatives such as the introduction of free staff health MOTs, subsidising gym subscriptions, investing in sit-stand desks and appointing trained mental health first-aiders.

Condair employs 75 people across its nationwide sales and service teams, located either at its headquarters in West Sussex or remotely situated around the UK.

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

### Cameron Forecourt embraces its new home in TSG UK

TSG UK has acquired Cameron Forecourt, bringing two major players in their respective fields together.

Cameron Forecourt's specialisation in commercial fuelling sectors, including haulage, rail and aggregates to name a few, is a great fit for TSG, according to the company, and complements its position in retail fuelling, creating a unique organisation with significant capabilities to serve the fuelling demands of the UK.

TSG has a presence in 30 countries with more than 2,400 field engineers and around 40,000 fuelling sites under direct service. Cameron Forecourt joins the established TSG Fleet activity in the UK, bringing its expertise and experience to the development of this key sector for TSG.

In addition to retail fuelling, TSG UK includes an arm of the business dedicated to construction and tank management, including relining. It is also involved with vehicle wash systems through its partnership with Karcher, and electric vehicle charging through a partnership with ChargePoint.

■ Call +44 (0) 01226 742441, fax +44 (0) 1226 747441, email [sales@cameronforecourt.co.uk](mailto:sales@cameronforecourt.co.uk) or visit [www.cameronforecourt.co.uk](http://www.cameronforecourt.co.uk)



### Capital entrance to Crossrail link

Geze UK has provided a capital entrance to a new station that has been constructed as part of London's new Crossrail network.

Abbey Wood is a pivotal station on the south-eastern stretch of the new Elizabeth line and provides overground and underground rail connections to central London and beyond.

The new station has been developed by architects Fereday Pollard in organic curved lines, using natural materials. Its light and airy feel is enhanced by two Geze bi-parting ECdrive automatic sliding doors that are incorporated in a glazed fascia, over which hangs the eaves of an arched timber roof.

ECdrives have been specifically designed for use in busy areas, making them ideal for a continuous flow of footfall with large numbers of people who need to enter or exit simultaneously. The drive uses Geze's activation technology to open the doors automatically, allowing travellers to access the station's concourse through left- and right-hand entrances, quickly and safely.

A practical and effective entrance was deemed essential for the smooth running of the station, encouraging people to cross the threshold and identify their platform with ease, thereby preventing bottlenecks and assisting the delivery of seamless rail services throughout the day.

■ Call 01543 443000 or visit [www.geze.co.uk](http://www.geze.co.uk)



**UfAC for fabulous Benjamin Street new-build**

AET Flexible Space underfloor air conditioning system fits the design brief at One Benjamin Street, situated opposite Farringdon Station on the corner of Turnmill Street, to provide optimum flexibility when adding or re-arranging fittings for incoming tenant requirements.

M&E consultant Scotch & Partners was satisfied that the system could cater to demand, while offering greater flexibility for future change of use than the originally proposed perimeter heating and cooling systems.

The CAM-V system, with underfloor supply air - where return air is received back to the zone unit at high level - is the best solution for future flexibility as there is no underfloor air baffle to reconfigure should a layout change be considered. Each of the office floors is split into two zones, with a CAM-V33 downflow unit serving each one. A total of 105 recessed Fantiles, which supply conditioned air into the space, are evenly distributed across the six zones.

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



**British Humidification – better together**

Humidity Solutions is now the exclusive UK distributor for the West Midlands-manufactured Vapac range of electrode boiler steam humidifiers.

Humidity Solutions' managing director, John Barker, said: 'The chance to work with what has been the name for electrode boiler humidifiers in the UK over the past 40 years was too good an opportunity to pass by. We are delighted to be the exclusive distributor in the UK and to be able to add our experience, expertise and application knowledge to the brand.'

Humidity Solutions offers free design, site surveys and quotations, with a full range of after-sales services such as installation, technical support, servicing and planned maintenance.

Stocks are based at Humidity Solutions, allowing delivery of standard spares and humidifiers to be supplied from stock. As a result, Humidity Solutions can offer customers a full turnkey solution with peace of mind and support from design all the way through the unit's working life.

Email [info@humiditysolutions.co.uk](mailto:info@humiditysolutions.co.uk) or visit [www.humiditysolutions.co.uk](http://www.humiditysolutions.co.uk)

**Kingspan launches ocean plastic clean-up partnership, and aims to recycle 1bn plastic bottles annually by 2025**

Kingspan has committed to recycling 500m plastic bottles each year by 2023 for use in its insulation with a further target of 1bn bottles each year by 2025. This recycling initiative is part of a broader Kingspan programme, together with the company's 2020 Net Zero Energy manufacturing target, to produce its energy-saving products in a low carbon and environmentally responsible way.

Kingspan has previously been manufacturing insulation using recycled plastic but has now added



recovered ocean plastic to this manufacturing chain, using raw materials from its plant near Barcelona, Spain. This plant already recycles 250m bottles each year and has set a target to quadruple this figure over six years.

To achieve this target, Kingspan has partnered with the EcoAlf Foundation, and the company will proactively help to remove up to 150 tonnes of waste from the Mediterranean each year through the EcoAlf Foundation's network of fishermen. Kingspan will reuse as much of the ocean plastic as it can in its production.

Visit [www.kingspan.com/group](http://www.kingspan.com/group)

**ErP-compliant Preeva EC provides combined heating and ventilation with optional cooling**

Reznor, part of Nortek Global HVAC (UK), is continuing its tradition of manufacturing high-efficiency heating equipment with its Energy-related Products (ErP)- compliant range, which includes the Preeva EC (heating and ventilation unit), which yields combined heating and ventilation with optional cooling.

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

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

The Preeva EC range incorporates an EC plug fan, which provides a wide range of air duties and external static pressures. The addition of the optional mixing box enables air filtration too.

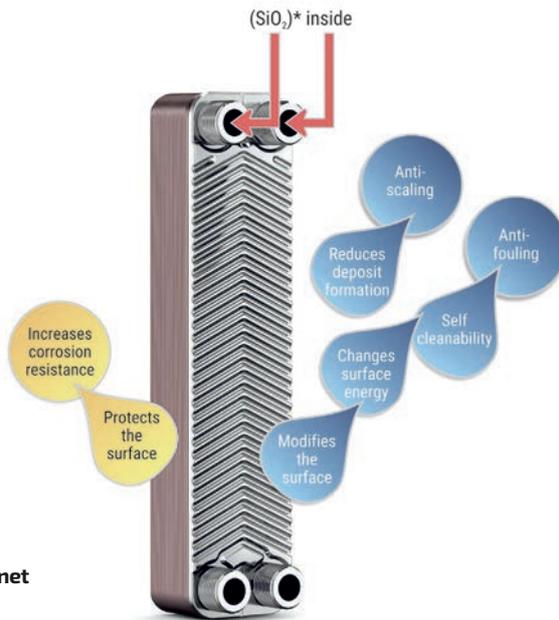
Email [erp@nortek.com](mailto:erp@nortek.com) or visit [www.nortek-erp.com](http://www.nortek-erp.com)



### Swep offers new corrosion resistant range of BPHEs >

Swep's new range of brazed plate heat exchangers (BPHEs) are designed to keep tap water applications running efficiently for longer. The secret is Swep Sealix coating, a SiO<sub>2</sub>-based thin-film technology that increases BPHE corrosion resistance, decreases the risk of fouling and scaling and increases durability. The protective Sealix layer is applied to all inner surfaces of the BPHE exposed to drinking water. This extends the lifetime and operational safety of the unit, reducing maintenance costs.

■ Email [christer.frennfelt@swep.net](mailto:christer.frennfelt@swep.net) or visit <http://de.swep.net>



### Rinnai hot water infinity 1600 low-NO<sub>x</sub> units and systems for commercial and domestic sites

Rinnai, manufacturer of the ErP A-rated Infinity range of continuous flow condensing gas-fired water heaters, has developed what it claims is the most energy efficient range of low-NO<sub>x</sub> hot water heating units available to the UK end user.

The company's low-NO<sub>x</sub> Infinity HDC 1600e external wall mounted unit (together with the interior HDC 1600i version) uses Rinnai's patented pre-mix burner technology with a 14:1 turn-down ratio - which it claims is the largest on the market - of 58.4kW-4.05kW, and is extremely quiet in operation.

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



### Vent-Axia's new low-noise acoustic solutions for MVHR units

Vent-Axia has launched a new range of acoustic solutions for its Sentinel Kinetic mechanical ventilation with heat recovery (MVHR) units. The new Acoustic Top Box and Acoustic Enclosure have been designed to reduce further the already low noise levels of the MVHR units.

For homeowners the most common concern with ventilation systems is that they will create noise. To mitigate this, Vent-Axia has optimised every element of the Sentinel Kinetic range to minimise the generation and transmission of both motor and airflow noise.

■ Call 0844 856 0590 or visit [www.vent-axia.com](http://www.vent-axia.com)



### Kingspan Light + Air makes Germany's towers smoke safe

As part of the expansion of its geographical operations and solution offerings Kingspan Light + Air has moved into Germany through the acquisition of STG-Beikirch.

In its range, STG-Beikirch includes the Smoke Pressure System (SPS), a potentially life-saving solution in fire-related incidents. In the event of a fire, SPS - also known as overpressure ventilation systems - save lives by ensuring escape and rescue routes remain smoke-free for building occupants and firefighters. SPS has been deployed in a number of iconic, multi-functional high-rise commercial buildings in Germany, with more installation projects under way.

■ Email [ciara.maddock@kingspan.com](mailto:ciara.maddock@kingspan.com) or visit [www.kingspan.com/group/who-we-are/light-air](http://www.kingspan.com/group/who-we-are/light-air)

### New Viessmann Vitocell 300-V introduces the energy-efficient unvented DHW cylinders with A+ rating >

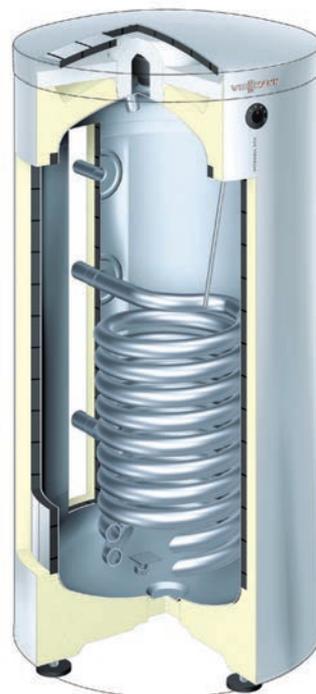
Viessmann has introduced two new floor-standing Vitocell 300-V DHW cylinders, with capacities of 160L and 200L, that it claims are the only domestic hot water cylinders on the market with an A+ rating. According to Viessmann, they are twice as energy efficient in terms of standby losses as the industry norm.

Both new versions of the Vitocell 300-V replace the previous A-rated models, and both are suitable for domestic installations with boiler outputs up to 80kW. Higher domestic hot water demands can be accommodated by combining several Vitocell 300-V cylinders into cylinder banks, with common headers.

The new 300-V combines this energy efficiency with high performance. The indirect heating coil is larger than in most common cylinders and drawn all the way down to the cylinder floor to heat the entire water content. Heat-up time from 10°C to 60°C is just 20 minutes for the 160L cylinder and 24 minutes for the 200L cylinder.

Maximum hot water flowrates are 24L per minute and 34L per minute, respectively.

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



### Cosmogas MYdens: the new generation of gas condensing boilers



Gemtex, the UK partner of Cosmogas, successfully launched the MYdens boiler in the UK in 2018.

The robust titanium heat exchanger and burner both have a 10-year warranty as standard. The exchanger is 100% titanium stainless steel for high efficiency, durability and long life, and has an 11-bar maximum operating pressure, making it suitable for high-rise applications. The design of the heat exchanger at the heart of the MYdens system is the result of intensive research and testing, combined with the know-how of Cosmogas accrued over 50 years. The exchanger has been designed to reach an optimal thermal

exchange along the entire surface of each layer and provide exceptional efficiency up to 109%.

The patented Cosmomix air/gas mixing system offers a wide modulation range, with the MYdens 280T having a burner turn-down ratio of 1:20. The ecologic premix Fecralloy metal fibre burner also provides ultra low NOx levels, the company claims. For 280kW, the compact size requires only 0.42m<sup>2</sup> of space. Cascade header kits allow connection for four 280Ts as standard, providing full modulation from 14kW to 1.12MW, a ratio of 1:80, giving high efficiency with security of supply from 16 burner modules.

The units are compatible with all BMS systems or can operate on their own with the standard built-in cascade controls. Each boiler has a built-in condense neutraliser in the base as standard.

■ Email [info@gemtex.co.uk](mailto:info@gemtex.co.uk) or visit [www.gemtex.co.uk/cosmogas/commercial-range/mydens-t/](http://www.gemtex.co.uk/cosmogas/commercial-range/mydens-t/)

### Elco launches its new Trigon XXL gas condensing boiler range

Elco Heating Solutions has launched the new Trigon XXL range of floor-standing gas condensing boilers at an event at The Shard in London.

Guests were able to view the key components of the new boiler, including its unique modular design. Developed by Elco's extensive R&D team, this concept allows the new boiler to be disassembled into component parts to offer far greater flexibility when siting it in a commercial property where access is tight.

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



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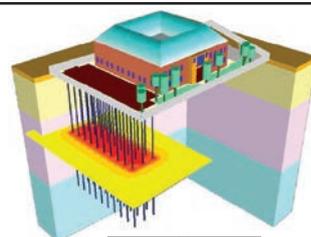
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## Contract Mechanical Engineer

**Oxford, £40p/h**

I have a requirement for a mechanical engineer to work on a temporary contract in Oxford. You will provide designs on mixture of projects which include commercial, critical, and retail projects. The work is predominantly detailed design of HVAC systems, as well as client liaison. This is a long-term contract with an immediate start. Ref: 5440

## Senior Electrical Building Services Engineer

**London, £50k - £55k + bens**

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## Contract Electrical Engineer

**London, £41p/h**

I have a requirement for an electrical engineer on a contract basis. You will provide design from conception through to completion on some of London's leading commercial projects. The work is predominantly LV work and the contract will run for approximately 6 months. Similar experience is essential. Immediate start. Ref: 5441

## Associate Mechanical Engineer

**Central London, £60k - £70k + bens**

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## Senior/Principal Electrical Engineer

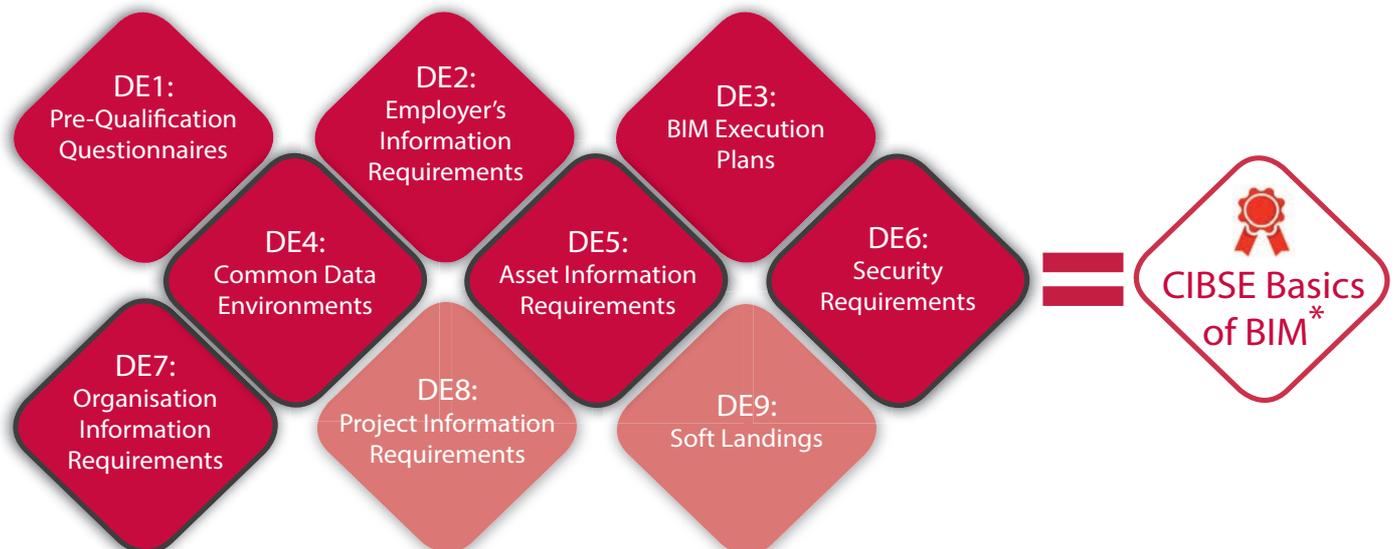
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Apprentices at Steven Hunt & Associates worked on the intermediate care unit at North Manchester General Hospital



Steve Hunt

## Live and learn

A multidisciplinary approach to construction is needed if apprenticeships are to be more effective, says Steve Hunt, of Steven Hunt & Associates

To combat the skills crisis, Steven Hunt & Associates is launching a multidisciplinary apprenticeship scheme this autumn, in partnership with Liverpool John Moores University. Under the Liverpool Apprenticeship Partnership (LAP) pilot, six students from the region will embark on a 24-month placement programme, each spending two months gaining experience across the built environment sector. At the end of the programme, the students will choose which profession they prefer before starting on a full degree apprenticeship.

Steven Hunt & Associates is seeking partners and companies interested in being part of the LAP and in helping to support the framework.

Its call to action follows a new report from the Construction Industry Training Board that forecasts average growth of 1.3% in the sector over the next five years, resulting in a dramatic increase in demand for skilled workers. An extra 158,000 construction jobs will have to be created by 2022. The North West will experience the biggest increase in demand for jobs, according to the report, with more than 5,000 additional recruits needed in the region.

### Why have you launched the LAP?

Steven Hunt & Associates celebrates its 30th anniversary this year, so it is the perfect time to take stock and look at where we are in the industry. The construction sector has a real crisis when it comes to skills shortages and, from speaking to different companies in recent years, this is only getting worse. It is not a problem we can keep ignoring, so I thought it was time for someone to step up and offer a solution. We all have a responsibility to do more to nourish aspiring engineers – so, hopefully, this is just the start.

### Are people working in silos?

The government is doing some great work on new apprenticeship schemes, but we can't simply rely on it to fix this issue; the only way we will improve the situation is if we work together. Everyone – from architects to contractors – needs to have a voice in this conversation.

### Why is it important for people to work across a range of disciplines?

When many young people decide on a career in construction, they are not always aware of the full range of roles available to them. Offering an apprenticeship that

allows students to sample all the different disciplines will not only give them hands-on experience to help them decide the best career path, but also give them a perspective of the overall process. By understanding the bigger picture, they will appreciate how their work affects the next person in the chain. This can only be a good thing for us all, as it should help bring projects in under budget and on time.

### Will this be a way of attracting young people into building services?

I certainly hope so. The construction industry is a growing sector and, hopefully – by providing all possible opportunities for young people to get ahead – it will give them the chance to build the future how they see it.

### How many apprentices will be taking part in the scheme?

The initial pilot will have six students from the North West region embarking on a 24-month apprenticeship. Each student will get to spend two months with each discipline of the built environment profession, including structural engineers, quantity surveyors, M&E engineers, architects and main contractors. At the end of the programme, they will choose which discipline they prefer and specialise in it, embarking on a full degree apprenticeship in their chosen profession.

### What are the benefits for participating for companies?

Partners should benefit as much as the students because they will be able to help mould this new framework of learning and create work-ready recruits for their businesses.

### Does poaching of employees deter companies from training young people in construction?

Definitely, and this is something I have experienced. We invest heavily in our staff to give them the tools to do the best possible job for our clients. In recent years, however, we have had several staff members poached by firms that are not contributing to training younger staff. This just puts a strain on everyone, leaving employees and businesses frustrated.

■ **STEVE HUNT** is managing director at Steven Hunt & Associates

## NATIONAL EVENTS AND CONFERENCES

### CIBSE AGM

**7 May, Royal Society, London**  
CIBSE AGM, followed by incoming president Lynne Jack's address.

### SLL LightBytes

**9 May, London**  
The 2018-19 LightBytes series, in collaboration with the CIBSE Facilities Management Group, continues.  
[www.cibse.org/sll](http://www.cibse.org/sll)

### Facilities Show

**18 June, London**  
This year, the annual event will feature the Smart Buildings Expo and Workplace Wellbeing Show. Visit CIBSE on stand FM6244.  
[www.facilitiesshow.com](http://www.facilitiesshow.com)

### CIBSE TRAINING

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

### Air conditioning inspection for buildings

**8 May, London**

### Practical approach to LV fault analysis

**10 May, London**

### The New London Plan: half-day

**14 May, London**

### Design of ductwork systems

**14 May, London**

### Low carbon consultant design

**15-16 May, Birmingham**

### Understanding smoke control

**16 May, London**

### Energy surveys

**16 May, London**

### Overview of IET wiring regulations

**16 May, Birmingham**

### Building services explained

**20-22 May, London**

### Low and zero carbon energy technologies

**21 May, London**

### Fundamentals of digital engineering (including BIM)

**23 May, London**

### Electrical distribution design

**24 May, London**

### Fire sprinkler systems: design to BS EN 12845

**30 May, London**

### Variable flow water system design

**3 June, London**

### Energy Savings Opportunity Scheme

**5 June, London**

### Mechanical services explained

**5-7 June, London**

### Fire risk management systems: PAS 7 2013

**7 June, London**

### Understanding and application of psychrometric charts

**10 June, London**

### Building services explained

**11-13 June, Manchester**

### Below-ground building drainage

**12 June, London**

### Air conditioning and cooling systems

**14 June, London**

### Practical controls for HVAC systems

**14 June, London**

### Electrical services explained

**18-20 June, Manchester**

### Building services one-day overview

**18 June, London**

### Low carbon consultant design training

**19-20 June, London**

### Standby diesel generator

**21 June, London**

### Air conditioning inspection for buildings

**24 June, London**

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

**26 June, London**

### Energy efficiency building regulations: Part L

**1 July, London**

### Electrical services explained

**2-4 July, London**

### Fire safety in the design, management and use of buildings BS 9999

**3 July, London**

### Mechanical services explained

**3-5 July, Birmingham**

### Gas safety regulations (designing for compliance)

**5 July, London**

## CIBSE GROUPS, SOCIETIES AND REGIONS

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

### SoPHE - Northern celebration dinner

**10 May, Manchester**  
The Society of Public Health Engineers' annual northern dinner celebration, with guest speaker Graham Poll, former Premier League referee.

### CIBSE application workshop

**13 May, London**  
Workshop to help get Associate and Member applications started, with experienced CIBSE interviewers.

### South West: Smart buildings and AGM

**14 May, Bristol**  
With presentation by Schneider Electric.

### SLL AGM, awards and presidential address

**23 May, London**  
With presentation by Henrik Clausen, director and head of research at the Fagerhult Lighting Academy, followed by SLL awards and presidential address from incoming SLL president Jim Shove.

### SLL and North West: Red shift: the growth of red saturated light since 2000

**23 May, Manchester**  
This lecture will explore the use of saturated red lighting in relation to art, culture, history and neurobiology, with speakers Colin Ball and Lora Kaleva from BDP.

### West Midlands Young Engineers: The neuroscience of leadership

**29 May, Birmingham**  
Seminar with Tom Flatau of Teamworking International.

### ILEVE AGM

**11 June, Birmingham**  
AGM of the Institute of Local Exhaust Ventilation Engineers.

### SFE city walk

**18 June, London**  
Society of Façade Engineering walking tour around an area of London to discuss façades.

### South West: Summer ball

**22 June, Cardiff**  
Taking place at the Park Plaza Hotel, the evening will commence with a drinks reception, followed by a three-course meal, then a live band and DJ.

## HIGHLIGHT



BDP senior lighting engineer **Lora Kaleva** is speaking about the growth of red saturated light on 23 May in Manchester

## Facilities Show

18 June, London

The Facilities Show brings together more than 12,000 facilities management professionals from around the world to source cost-effective solutions across all sectors. This year, the event will host two new features - the Smart Buildings Expo and the Workplace Wellbeing Show, showcasing the latest technology and education related to these two critical sectors.

Visit CIBSE on stand FM6244.  
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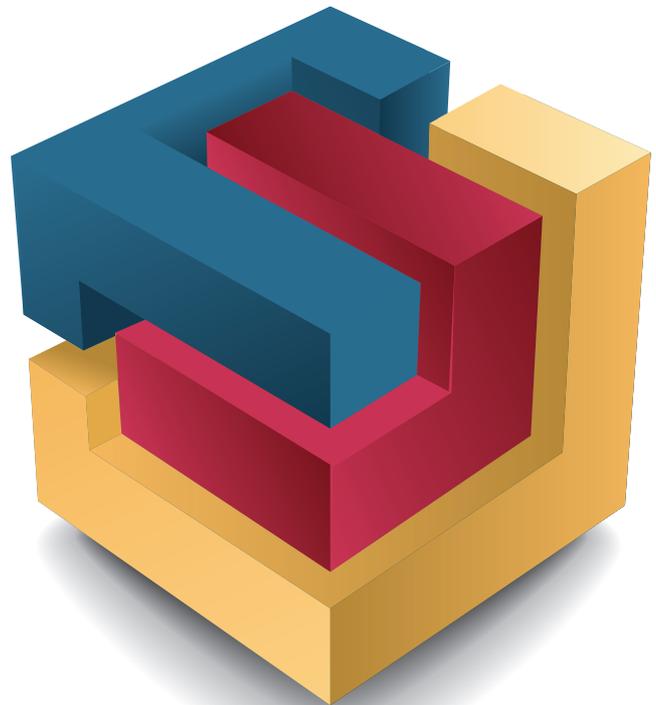
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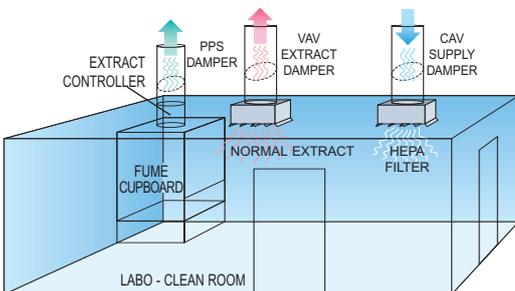


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