

HOW DID THIS HAPPEN?

What must be done to avoid another Grenfell Tower disaster



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Sombre reflection



The findings of the public inquiry into the awful fire at Grenfell Tower will have a long-lasting effect on the construction industry. In the immediate aftermath of the fire, attention was focused on the aluminium composite panels that appeared to burn as easily as tissue paper on the surface of the 67-metre tower. The panels were found to have a core that was combustible rather than fire-retardant.

But, it's not just the panels that will be under scrutiny. The inquiry will look at how well Building Regulations governing fire (Part B) were drafted, and how they were enforced by building control officers. There is a question mark over whether Part B has

kept up with the rapid changes in methods of construction over recent years; it has not been reviewed for 10 years. The Fire Protection Association (FPA) released a damning statement after the Grenfell fire saying it had grave concerns about the regulation, and that it was not fit for the 'prescription of new building and refurbishment methods and materials.'

The FPA said it was greatly concerned with the increasing combustible content of buildings and doubted that on-site building quality and checking processes were good enough to ensure the level of encapsulation required to provide fire compartmentation was not undermined.

The statement was borne out by fire consultant Martin Kealy MCIBSE, who has seen many examples of poor firestopping in buildings where he has worked across the Middle East, India and Asia.

In an industry that struggles to construct airtight buildings and close the energy performance gap, you can see why current building practice may end up compromising fire safety in UK housing.

The blaze will result in more coordination and care in the design, construction and operation of our buildings.

It will lead to more oversight of contracts as clients pay close attention to the impact of value engineering on original specifications. Building Regulations will be simplified and reviewed on a regular basis. There is currently too much confusion as to what combination of materials and designs are allowable in specifications.

For years, the review of Building Regulations have been at the bottom of the government in-tray – the mantra has been to cut red tape, not review and improve. Now the industry and government must put fire safety at the heart of every build and make sure that no-one in the UK is living in a firetrap.

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Our deputy editor visits Skanska to see how it is encouraging female engineers to return to work



Tim Dwyer

The Journal's technical editor looks at the issue of thermal comfort in nat-vent buildings



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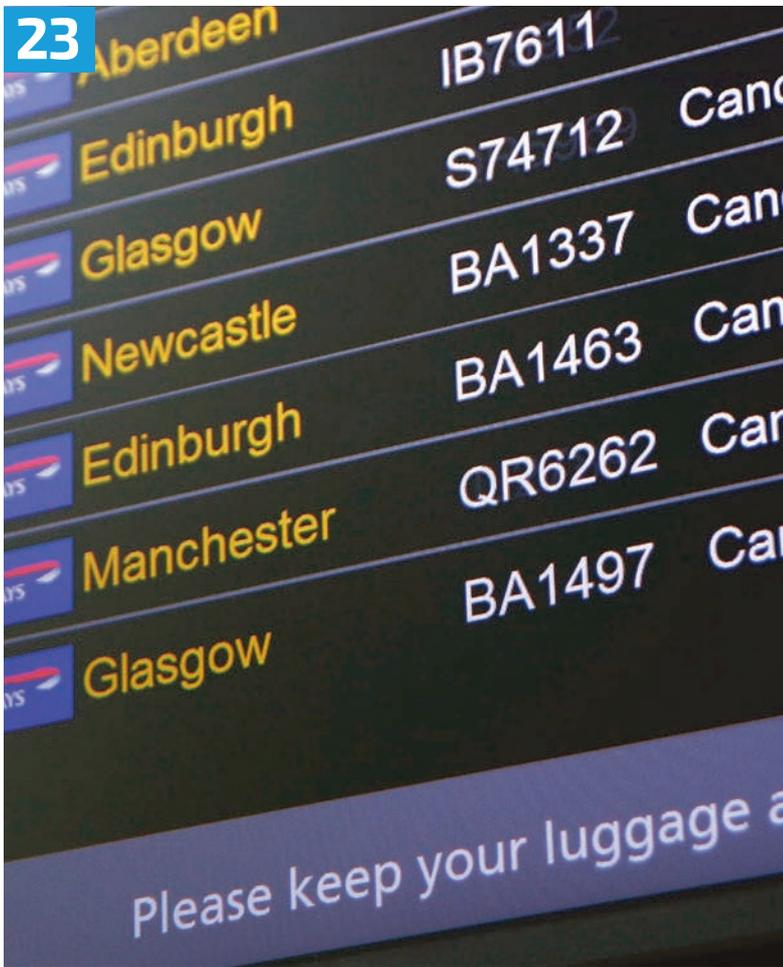
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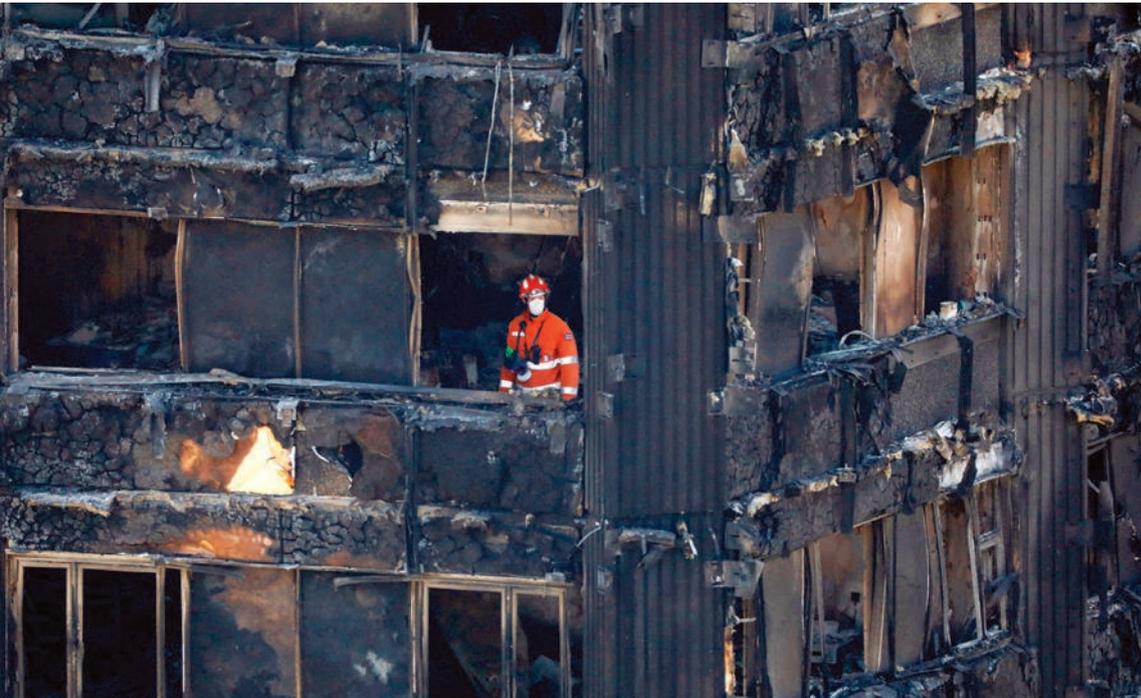
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Flammable cladding found on other residential towers

Combustible cladding similar to that used at Grenfell Tower has been identified on 11 towers in eight local authorities.

Safety tests have confirmed that buildings were clad in aluminium-composite panels made with a flammable polyethylene (PE) core.

Local authorities and housing associations are doing urgent checks on the cladding of tower blocks and sending samples for fire testing.

The London Borough of Camden announced it was preparing to remove external PE cladding from five tower blocks on the Chalcots estate.

Downing Street said that 600 towers had cladding similar to Grenfell Tower and that they were being tested to see whether it was combustible. More councils were expected to reveal tests as *CIBSE Journal* went to press.

Civil disaster reaction taskforce promised

The government has pledged to create a civil disaster reaction taskforce following the chaotic response of the authorities in the immediate aftermath of the Grenfell Tower fire.

In the Queen's Speech, it said it would also 'assess the position on building regulations' in light of the Grenfell Tower inquiry's interim findings.

The speech contained eight Brexit-related bills, plus measures on electric cars and extending smart metering. It also reaffirmed the UK's commitment to the Paris Agreement, as well as to technical education with T-Levels.

Two days after the Queen's Speech Theresa May started Brexit negotiations in earnest by offering 3 million EU citizens the right to stay in the UK.



Grenfell Tower cladding was illegal, says Hammond

Public inquiry will examine cause of fire that killed dozens in West London

The type of rainscreen cladding used in the refurbishment of Grenfell Tower – and widely blamed for spreading the fire that, at the latest count, is believed to have cost 79 people their lives – should not be used in buildings higher than 18m, said Chancellor Philip Hammond.

There will now be a criminal investigation and public inquiry to establish whether the refurbishment project breached Part B of the Building Regulations, and whether the regulations were properly drafted and correctly enforced at Grenfell Tower.

A number of fire experts initially speculated that the fire spread so quickly because the rainscreen cladding had a polyethylene (PE) core, which – when heated – produces a gas that quickly ignites. The police later said the cladding and insulation behind it had failed safety tests.

The planning application for the refurbishment of Grenfell Tower approved the use of aluminium composite Reynobond cladding, and – according to news sources – the PE version of the panel was specified.

Experts speculated that the mineral-fibre block firestops failed because, in the event of a fire, they are designed to expand outwards to fill the cladding ventilation void. But if the cladding was the PE version – and, so, combustible – it would have failed, and the horizontal stops would have had nothing to expand against.

Ribs in the concrete columns could also have contributed to the fire spread.

The Fire Protection Association has called for a review of the Building Regulations. It said it 'was greatly concerned' about the increasing combustible content of buildings, and that onsite building quality and checking processes were not good enough to ensure combustible materials remain separate from a fire event.

In other developments, the All-Party Parliamentary Group on Fire Safety and Rescue accused successive housing ministers of 'sitting on evidence' since 2013 that could have helped avert the disaster. The group's secretary, Ronnie King, said a review into the 2009 Lakanal House fire – which killed six people – produced recommendations that were ignored. 'I wouldn't have expected fire to spread like that [at Grenfell Tower] if there had been automatic fire sprinklers installed,' said King.

In October last year, then housing minister Gavin Barwell told MPs that the government had 'publicly committed' to reviewing fire regulations after the Lakanal House fire.

More than 70 health and safety organisations have written an open letter to Theresa May calling on government to complete its review of Part B of the Building Regulations.

The letter called on the government to immediately scrap its approach to health and safety deregulation. At the moment government policy is to only allow a new regulation if three are scrapped first.

Foster device links sound and wellbeing

Foster+Partners is working with Wandsworth City Learning Centre, London Southbank University and the Noise Abatement Society to help children understand the link between noise and wellbeing, and inform future planning decisions.

The company has developed portable noise-monitoring devices, which are being placed in local schools as part of the partners' Listening to London project. It will 'create a soundscape that can inform planning and design at neighbourhood level'.

It is also part of Foster's work on planning smart cities, giving 'valuable real-world data' to support modelling and simulation.

UK could save £2bn a year with CCS

Carbon capture and storage (CCS) could help the UK to reduce its energy costs by £2bn a year during the 2020s, according to a report from the Energy Technologies Institute (ETI). It calculated that delaying the implementation of CCS at scale would add between £1bn and £2bn a year to the cost of reducing carbon emissions in line with the Climate Change Act.

The ETI analysed the appraisals of the Peterhead and White Rose projects, which were competing for the government's £1bn CCS fund before it was cancelled in 2015. It found 'no technical barriers' to the storage of CO₂ in offshore stores and that the UK should be able to develop CCS 'at scale'.

The Committee on Climate Change has said capturing CO₂ from industrial processes by 2035 is essential to the UK meeting its commitment to reduce greenhouse gas emissions by 80% by 2050.

Britons prepared to pay the price to clean up air pollution

Clean Air Day survey shows 80% of people concerned about effect on health

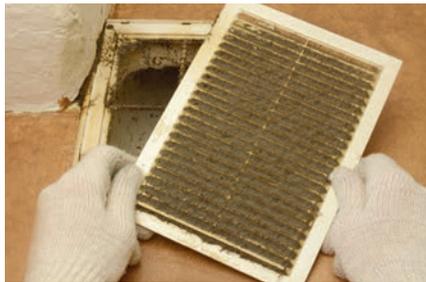
The British public would be prepared to spend more than £1bn a year to clean up air pollution, including tackling indoor air quality (IAQ).

Research by organisers of the first National Clean Air Day, on 15 June, canvassed the views of 2,000 adults, two-thirds of whom said they would be prepared to spend an average of

£2.59 each month. The survey, by campaigners Global Action Plan (GAP), revealed that eight in 10 people were concerned about how air pollution was affecting their health.

Heart conditions cause the majority of premature deaths from outdoor pollution, but GAP's research showed that 75% of adults do not realise to what extent air pollution affects the heart.

More than 200 events were held across the UK to mark Clean Air Day, including one organised by the Building Engineering Services Association (Besa), which focused on IAQ. Here, Clean Air in London founder Simon Birkett reiterated his call for IAQ to become part of national planning policy. He urged occupants to challenge their building managers to ensure mechanical ventilation systems are installed and maintained properly. 'The cost of filtration is tiny compared to the health and productivity of people,' said Birkett.



New owners revive Green Deal loans

The Green Deal loan scheme, which was closed by the government two years ago, has been revived by a privatised version of the Green Deal Finance Company (GDFC).

Assets of the original GDFC, which folded in June 2015 because of low take-up of the home-improvement and energy-efficiency loans, was bought by Aurium Capital Markets and Greenstone Finance in January. GDFC's chief executive, Kilian Pender, said they had received 'a very significant amount of support from government, energy efficiency-focused organisations, manufacturers and installer organisations', who wanted to see the scheme 'continue where it left off'.

The original Green Deal was launched in 2013, but failed to hit its targets - although there were 5,600 finance plans in place by the time it was cancelled, and more than 10,000 properties had had measures installed via the scheme.

Householders who borrow money from the GDFC to pay for energy-efficient works repay it through their energy bills. The GDFC has raised more than £2m through the peer-to-peer finance platform Abundance Investment, which is also behind the Innovative Finance ISA.

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For more information contact Karl Bateman,
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IN BRIEF

VR and 3D vital for government targets

The construction industry must embrace virtual reality (VR) and 3D printing if it is to meet targets for improving efficiency outlined in the government's 2025 Strategy, according to a new report.

Virtual Reality and 3D Printing - Reducing waste in office construction through new technology – produced by Arup for the British Council of Offices (BCO) – identifies problems with delays and reworking of designs that could be avoided if VR was more widely adopted, thereby reducing costs and material waste. 3D printing, it adds, could turn current methodology on its head and transform procurement.

VR can help stakeholders make early decisions about aesthetics and other aspects of a project before anything is built, which would shorten the delivery process and reduce the cost of time, labour and materials. 3D printing, meanwhile, can deliver zero material wastage and speed up build times, as well as allow the use of 'cheaper bespoke parts' and reduce transport cost and time.

OBE for NEF boss

Dr Kerry Mashford, National Energy Foundation chief executive, has been made an OBE in the Queen's Birthday Honours, for services to the energy industry.

Mashford has been head of the Milton Keynes-based organisation – which advises industry on energy efficiency in homes and workplaces – since 2012. She has increasingly focused her work on bringing together engineering, technical and business innovation, to address the challenges of developing a sustainable future.

In a statement, the NEF said Mashford believes the UK must change the way 'we generate, distribute and use energy, and that addressing the demand side of the energy equation is as important as generation in making the transition to a low-carbon, low-energy future'.

Clarification

The article 'Here comes the sum' (*CIBSE Journal*, June 2017, page 38) has been updated with contemporary terms, and can now be downloaded from the *Journal* website.



Lack of fire barriers could turn Parliament into inferno

Historic ventilation shafts and voids could create a 'furnace', expert said

Historic corridors and ventilation shafts at the Palace of Westminster would make it easier for fire to spread, experts have warned.

The shafts and voids, which house most of the mechanical and electrical (M&E) services, were originally intended to move large volumes of air around the building. Now, without effective fire compartmentation between sections of the building, these Victorian chambers – some 200 metres long – provide an ideal route for a fire to spread quickly.

Compartmentation slows the spread of fire through a building, allowing time for occupants to be evacuated safely, and for firefighters with specialist equipment to get on site.

Dr Henrik Schoenefeldt, principal investigator of the Palace of Westminster's historic ventilation system, said a complex network of ventilation shafts and floor voids permeate the building – from basement to roof level. 'If not controlled with barriers, the stack effect – on which the historic ventilation system was based – could pull hot air up, permeating the whole

building, which, in the event of a fire, would become like a furnace,' he said.

Although the fire security design team within Strategic Estates has been inserting fire-resistant partitions into horizontal voids, and sealing redundant vertical shafts and valves within the vaulting, these measures have not been comprehensive because of insufficient understanding of the ventilation infrastructure.

Schoenefeldt is currently carrying out a systematic investigation of the historic infrastructure, which is being used to help identify gaps and improve compartmentation.

But he said there is little to prevent fires from spreading vertically through the Palace's 98 risers, used for modern services, and the 2,000 shafts embedded within the walls, originally used for air supply and extraction.

According to the Palace of Westminster restoration and renewal (R&R) programme pre-feasibility study, some inaccessible voids still house vulcanised India rubber cables, dating to the 1950s – now considered a fire risk.

The decision to give the £3.6bn R&R project the go-ahead was postponed when Theresa May called the General Election.

Congested M&E services in a ventilation shaft

Retailers face refrigerant shock

Major European retailers are not moving fast enough to deal with looming shortages of vital refrigerant gases, according to the Environmental Investigation Agency (EIA).

Supplies of HFC gases will be slashed by about 48% in real terms next year, as the European Union's phase down of high global warming potential (GWP) gases gathers pace. The EIA claimed this will leave many of Europe's largest retail chains exposed to shortages and dramatic price rises, as they struggle to keep refrigeration and air conditioning systems operating.

'European retailers stand out as global leaders in the adoption of HFC-free commercial refrigeration, but – despite well-established and efficient HFC-free alternatives – the uptake is far short of the pace needed to meet the EU's fast-acting HFC phase-down,' said the EIA's Clare Perry.

She urged retailers to increase the pace of their adoption of 'natural' refrigerant alternatives to avoid 'soaring refrigerant bills' and the threat of an 'illegal trade in HFCs'.

Refrigerant supplier Chemours is to double the price of high-GWP refrigerants R404A and R507 this month, and Honeywell will stop sales of these gases in Europe next year. Market analysts suggest the cost of these two widely used gases has risen by more than 200% in three months. Other gases with medium GWP, such as R134a and R410A, have effectively doubled in price this year.

'HOME OF CRICKET' OPENS WARNER STAND



Engineers Arup – together with architects Populous and BAM, and client Marylebone Cricket Club – have redeveloped the Warner Stand at Lord's Cricket Ground in London. The geometry of each seating tier has been optimised to create the best possible viewing experience, while an open-loop, heat pump system – linked to two boreholes that drop deep into the aquifer – sit at the heart of the building. Solar thermal panels on the roof deliver 25% of the domestic hot water, while a rainwater-harvesting system is used to flush the toilets.

Up to £15m of funding available for 'game changing' innovators

Innovate UK says projects should demonstrate potential to generate commercial impact at home and overseas, and improve productivity

Government-backed Innovate UK has announced funding of up to £15m for 'game-changing, cutting-edge or disruptive innovation projects' that lead to new products, processes or services. It invites proposals from any technology, science, engineering or industrial sector, but has priority areas in emerging and enabling technologies, health and life sciences, infrastructure systems, and manufacturing and materials.

Funding is available for a wide range of projects, from feasibility studies to experimental development that is closer to market. However, priority will be given to proposals that are likely to lead to sustainable growth in productivity, or develop products and services that will access new markets overseas.

There is up to £5m for projects that last between three and 12 months and up to £10m for projects that last up to three years, with costs of £100,000-£5m inclusive.

ILEVE pioneer dies

James Wheeler, part-time coordinator for the Institute of Local Exhaust Ventilation Engineers (ILEVE), has died.

Originally a biochemist, Wheeler moved into occupational health and safety, initially in Sheffield, and latterly at the Health and Safety Executive (HSE) in Bootle. As a specialist inspector with the HSE, Wheeler was instrumental in the creation of ILEVE, and was the HSE representative on its steering committee until he retired in September 2016. He then became coordinator for ILEVE.

The condolences of ILEVE, the steering committee and the wider CIBSE community go to his family. A fuller appreciation of Wheeler's work will appear in the August *Journal*. Funeral arrangements will be posted on the ILEVE website.

Electrical industry mourns Bill Wright

Bill Wright, latterly head of energy solutions at the Electrical Contractors' Association, has died after a long battle with cancer.

Wright graduated from Cambridge in 1975, before joining the civil service and working for now privatised Qinetiq, as head of test services. He spent 25 years with the John Lewis Partnership, rising to chief electrical engineer and corporate energy manager.

A chartered electrical engineer and Fellow of the Institution of Engineering and Technology, Wright helped create several versions of the Wiring Regulations. He held non-executive roles at Electrical Safety First, Gas Safety Trust, SummitSkills and NICEIC, and from 2013-14, was Master of the City of London Lightmongers Livery Company.

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IN BRIEF

Benevolent Fund report to CIBSE AGM

In its 84th year, David Wood provides a short report on the status of the Benevolent Fund.

The main source of income is usually member donations, via subscription renewals. However, the 2017 renewals have been spread over a much longer period because of issues with the new customer relationship management (CRM) system. This meant we received a much smaller income from this source, but expect this to be made up this year.

Last April, we received an unexpected donation of £5,392 from the Federation of Property Services, so our income from 'other' donations increased substantially – but, overall, our total income fell by £7,399.

Grants awarded last year also fell dramatically, from £55,130 to £37,550, so the fund had a surplus of £8,820. The fall in grants is concerning, because this is reflected in a slight reduction in the number of active cases – but it should be noted that the grants in 2015 were at a record level.

We are looking at ways to raise the profile of the fund. The treasurer, Graham Manly, has introduced the annual review, which is issued to all members with their annual subscription letter. The fund celebrates its 85th anniversary next year, and we will use this to help raise awareness.

We have almoners in every CIBSE Region, except the East Midlands and Hong Kong. We are very grateful for the help we receive from the regions, and those who have helped us are listed in the Annual Review. I would like to thank Stuart Brown and Janet Wigglesworth, at CIBSE HQ, who work hard to administer the fund.



Ken Dale Bursary winner will fulfil ambition to travel

St John Townshend



Winner will blog and film his experiences as he travels around Asia

St John Townshend, graduate building services engineer at Hydrock Consultants, has won the Ken Dale Travel Bursary 2017, which will allow him to travel across Asia for four weeks, collating air pollution data.

Townshend's research topic – air pollution in the built environment – will have a particular focus on how building services are being used to affect indoor air quality in each country, and how instances of small particulate pollution can be reduced indoors.

In August, Townshend plans to visit multiple cities across India, China, South Korea and

Singapore, progressing from the most- to least-polluted cities. When he returns, he will have to present his 5,000-10,000-word report to the CIBSE board.

Townshend will blog his experiences as he travels and, afterwards, is hoping to create a short film. His next steps are to contact relevant organisations within his chosen cities, and to arrange to do some charitable work while there.

'I am thrilled to have the opportunity to research a topic of my choice while immersing myself in a different part of the world,' he said. 'Winning the Ken Dale Travel Bursary will enable me to fulfil my huge ambition to travel, and will further strengthen my career.'

The annual bursary offers £1,500-£4,000 to CIBSE members in the developmental stage of their career, to spend three to four weeks abroad researching aspects of a topic connected to their field of work.

The application process involved an initial written submission, followed by a presentation to a CIBSE panel. Applicants had to propose a research topic of their choice, a planned itinerary for their travels, and a financial breakdown of the cost of the trip.

In particular, Townshend had to demonstrate the benefits of his proposal to CIBSE, his employer – Hydrock – and to clients.

Slough waste-recycling project wins green infrastructure cup

A design to transform a busy waste-recycling centre in Slough into a green oasis has won the second Green Infrastructure Challenge, held by CIBSE and the ARCC Network.

Teams were invited to demonstrate creative use of indoor and outdoor green infrastructure to enhance the office environment. The winning team – led by Louise Handley, of environmental services company Amey – submitted an ambitious plan to re-model Chalvey Recycling Centre, to accommodate new staff and departments, improve energy efficiency and wellbeing, and reduce flood risk.

The 1980s building, situated on a floodplain, suffers from overheating in the summer and – because of its industrial surroundings – poor air quality. Amey's solution proposes a radical redesign of the premises that makes extensive use of 'living walls' and other plant material,

such as vertical farming and green roofs. This will naturally shade the building from the sun and cool it internally, and retain heat in winter. The green elements are also designed to have positive effects on wellbeing.

Amey also plans to add several rain gardens to catch and arrest rainfall, to prevent a nearby stream from being overloaded.

Runners-up were Deependra Pourel, Bernadette Widjaja and Karan Patel, from the University of Westminster. They applied the scientific principles of green infrastructure to the Clarence Building at London South Bank University, to model the effects of changes with green roofs, living walls and green ceilings.

The Challenge culminated in an event exploring green infrastructure as a building service during Open City's Green Sky Thinking Week, at Build Studios in London.

CIBSE Awards is event of the year

The 2017 CIBSE Building Performance Awards have been crowned Membership Event of the Year at the MemCom awards in London.

Held annually, the awards are widely recognised as the most prestigious accolades in the built environment industry, and are the only ones that ask for a whole year's evidence of measured performance data.

The MemCom judges praised the overall organisation and quality of the awards, but singled out the expert judging panel and the diverse range of entries that they attracted.

Entries are now open for the Building Performance Awards 2018, with the ceremony taking place on 6 February 2018, at the Grosvenor House Hotel, London. For more details on how to enter visit www.cibse.org/bpa

Calling all young engineers

The deadline to enter the CIBSE ASHRAE Young Engineers Awards is fast approaching.

Comprising the Employer of the Year and Graduate of the Year, the awards celebrate the industry's best examples of young engineering talent and employers' strategies for recruiting, nurturing and empowering young people.

Entries need to be received by 1 August, with the awards taking place on 12 October.

Visit www.cibse.org/yea



SLL president aims to inspire new generation

Industry's roots lie in illuminating spaces well for people's benefit, said Caple

The development and support of the next generation of lighting professionals is a priority, according to new Society of Light and Lighting (SLL) president Richard Caple.

Speaking at the SLL AGM, at London's Royal Society on 25 May, Caple recalled his start in the industry – when little information about lighting careers existed – and called on the society and the lighting industry to do more to advertise the opportunities available for those entering the sector. He suggested targeting people interested in design and mathematics to demonstrate the full potential of lighting as an interesting and rewarding career.

Caple, who noted that SLL produces a range of guidance, challenged the society to publish even more technical research, but to remember the industry's roots. New technology, he

said, makes lighting more advanced – with innovations such as Li-Fi and environmental sensors – but lighting is still primarily about illuminating spaces well, for people's benefit.

Wellbeing is one of the major issues for the society, added Caple, noting its potential to change the way places are designed. But he urged caution around human-centric design, stating that more research is needed into its effects and implications.

'I aim to inspire more people to pursue lighting as a career,' said Caple. 'One of the great things about our industry is its varied make-up. There are many different levels at which you can join, and you can work your way to the top – the sky really is the limit.'

Congratulating outgoing president Jeff Shaw, Caple praised the society's work last year, including SLL's wide range of events, guidance and research. President-elect Iain Carlisle was also inducted, serving his term from May 2018.



Kevin Kelly with John Mardaljevic (above) and Arnold Wilkins (below) receiving prizes for technical papers



Lighting's bright stars rewarded

Various awards were presented at the Society of Light and Lighting (SLL) AGM, held at London's Royal Society in May.

Sponsors in Partnership certificates were presented to Chris Wilkes (Holophane) Lou Bedocs (Thorn), Jamie Yates (Trilux) and Roger Sexton (Xicato), while LET Student Prizes went to Simon Blyth, Nicola Parker and Ben Poulton.

Prizes for technical papers published in *Lighting Research and Technology (LR&T)* – available for free to CIBSE members – were awarded to Professor John Mardaljevic and N Roy, who received the Leon Gaster Award for *The sunlight beam index*. Professor Arnold Wilkins was presented with the Walsh Weston Award for *A physiological basis for visual discomfort: application in lighting design*.

Dan Lister, SLL representative for the Yorkshire region, received the Regional Award in recognition of his continued and significant contribution to the SLL, as well as his extensive work on the Night of Heritage Light and Pockets of Light in October 2016.

The SLL Lighting Award went to Iain Macrae for his ongoing commitment to lighting and to the SLL. Joe Lynes was given an Honorary Fellowship, while the President's Medal was awarded to Lou Bedocs for his outstanding contribution to the lighting industry.

ANNUAL GENERAL MEETING

The annual general meeting of the CIBSE was held at the Royal Academy of Engineering, Carlton House Terrace, London, on 9 May 2017. Outgoing President John Field chaired, and chief executive Stephen Matthews read the notice convening the meeting.

The minutes of the 39th CIBSE AGM, held on Thursday 5 May 2016 and published in the July 2016 issue of *CIBSE Journal*, were accepted as a correct record and signed by the chair, subject to noting that:

- a) Chris Jones had proposed at the meeting that a number of motions be considered, but that these were not put to the meeting because the business had not been notified to the membership in the Calling Notice and – in the case of a proposal to vary the subscription rate for part-time student members – was not a valid motion under the bylaws;
- b) The sentence ‘it was explained that this had been considered by the Board, but it was felt that the rate charged was reasonable in view of the fact that part-time students were generally in employment’ was an answer given by the honorary treasurer, and did not indicate that the Board had consulted on the issue during the meeting.

ANNUAL REPORT AND FINANCIAL STATEMENTS

John Field introduced the Annual Report for 2016, drawing attention to developments in building performance, technical knowledge, membership promotion and the development of CIBSE services. He highlighted, in particular, progress on digital engineering and on building information modelling.

He referred also to the challenges posed by the introduction of the Institution’s new customer relationship management (CRM) system, which had been long awaited, but was now beginning to offer very valuable benefits that would be developed for the future. He had visited 14 of the 20 CIBSE Regions during his year in office, and one consistent issue raised was the difficulty experienced with email communications. However, much progress was now being made to improve this through the use of the new system, and he acknowledged the work of the staff in what had not been an easy process. He believed that the Institution would benefit greatly from the investments that had been made in IT.

He also referred to the reconstitution of the Institution’s diversity panel as the new

inclusivity panel, and thanked Lynne Jack for her work in taking this forward. He believed the Institution was now well placed to deliver a strong offering in this area, and stressed the importance of CIBSE being welcoming to all and inclusive of all.

John Field concluded by referring to the strategic partnership agreement that had been signed with ASHRAE in October; this was a very positive development, and he welcomed the fact that CIBSE – having recently had an Australian president – was now about to welcome its first president from Hong Kong.

Richard Willis, audit partner at Moore Stephens, read the audit report, which confirmed that the financial statements gave a true and fair view of the Institution’s affairs, and had been prepared in accordance with all relevant requirements. There were no matters to be reported as exceptions under the relevant legislation.

Stuart MacPherson introduced the financial statements for the year, drawing attention to the breakdown of group income, subsidiaries, investment income, subscription income and fees for charitable services.

In respect of CIBSE Services, he pointed out that income from the *Journal* had been affected by market uncertainties, probably as a result of the Brexit referendum.

CIBSE Group expenditure incurred substantial costs in relation to the IT project, and in pursuit of the 2020 Strategy Objectives. Total expenditure – including a considerable investment in CIBSE Services – was substantially above the previous year. It was noted that the Hong Kong Region operated as a separate subsidiary company because of local requirements, with its accounts consolidated into the CIBSE Group.

He further outlined the breakdown of expenditure between Societies, Regions, Groups and Networks, but pointed out that Societies, in particular, generated income, as well as requiring expenditure.

The overall effect of group income and expenditure for the year produced a substantial net decrease in funds of £437,000, and this had been reflected in reserve levels; much of this related to investments made

Board and Council for 2017/2018

Stephen Matthews reported that, in the current year, there had been no more candidates than vacancies and that all candidates had therefore been elected unopposed. He declared the following individuals elected to serve as Officers, Board members and Council members, following the AGM 2017:

Officers:

President:	Peter Wong (takes office automatically)
President-elect:	Stephen Lisk
Immediate past president:	Nick Mead (takes office automatically)
Vice-presidents:	Paddy Conaghan Lynne Jack Kevin Kelly
Hon treasurer:	Stuart MacPherson

Board members:

Elected members:	Ashley Bateson, Adrian Catchpole, Susan Hone-Brookes, Chris Jones, Kevin Mitchell
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Council members:

Elected members:	Eleanora Brembilla, Carol Clark, Cathie Simpson
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in the IT and 2020 strategies. The balance sheet reflected the decrease in investments, which had provided the funds to finance the deficit recorded for the year.

It was pointed out that there had also been a negative impact on cash flow, arising from delays to the issue of Subscription Renewal Notices, following the introduction of the new CRM system. Debtors and creditors were substantially higher than in previous years, but this was because of the way the new CRM system treated membership subscriptions: subscription fees were now treated as debts from the point of issue whereas, before, subscription income was not recognised until received.

It was asked what steps were being taken to address the fact that the commercial activities under CIBSE Services had made a loss for the year. Stuart MacPherson explained that investment had been made to drive a number of new initiatives, which would hopefully generate a positive return. This, however, involved upfront costs and there was inevitably a delay before income could be brought online. Historically, CIBSE Services had been profitable and it was believed that the initiatives taken would be positive in the longer term. The aim was to drive income heavily from CIBSE Services in future, which required investment, but it was acknowledged that the questions raised were valid, and that the position needed to be monitored closely.

Regarding the creation of debtors when renewals were raised, it was agreed that this resulted in an issue when members chose not to renew. However, the fundamental problem was the same with either approach, being a loss of income to the Institution.

Further detail was requested on the investments being pursued within CIBSE Services. Rowan Crowley, CIBSE Services MD, outlined a number of developments being pursued, including digital engineering services, new systems for CIBSE Certification and new learning management systems for the online learning offering. These were separate from the main IT investment, but were needed to drive the business for the future.

AUDITORS

This item was considered when the honorary treasurer was not present at the meeting and, in his absence, Stephen Lisk proposed that Moore Stephens be appointed as the Institution's auditors for 2017, and that the Board be empowered to agree their remuneration. This was seconded by Thomas Chan and approved nem con.

SPECIAL RESOLUTION

Stuart MacPherson proposed adoption of the Special Resolution for

"Field stressed the importance of CIBSE being welcoming and inclusive of all"

membership subscriptions for 2018 as set out in the Calling Notice. He stressed the importance of maintaining subscription income levels, while acknowledging that there were substantial future targets for membership growth. The increases proposed were broadly in line with inflation, being between 2.5% and 3%, and it was felt this was a reasonable level of increase in the current economic climate.

It was pointed out that increases in subscriptions might work against membership growth, and Stuart MacPherson confirmed that, for this reason, increases should be kept in line with inflation. He also said that, given current uncertainties, inflation by 2018 might be at a higher level. It was not felt wise to allow subscription levels to fall behind because this eventually gave rise to larger increases that were much more off-putting to existing members and potential new members.

The resolution was seconded by Bryan Franklin and approved nem con.

ANY OTHER BUSINESS

Newly elected Board member Chris Jones referred to the confidentiality of the meeting and stated, as a matter of his own integrity, that he wished to inform members that he had brought a data protection concern regarding the Institution to the attention of the Information Commissioner's Office. In view of this, he sought to propose a motion to remove himself, Chris Jones, from the Board, to allow the meeting either to endorse, or otherwise, his position in serving on the Board.

Chair John Field ruled that the proposed motion could not be put before the meeting because the membership at large had not received notice that this business would be considered. Stephen Matthews referred to the Board away-day, which was to be held the next day, and suggested that the matter be discussed there to find a way forward.



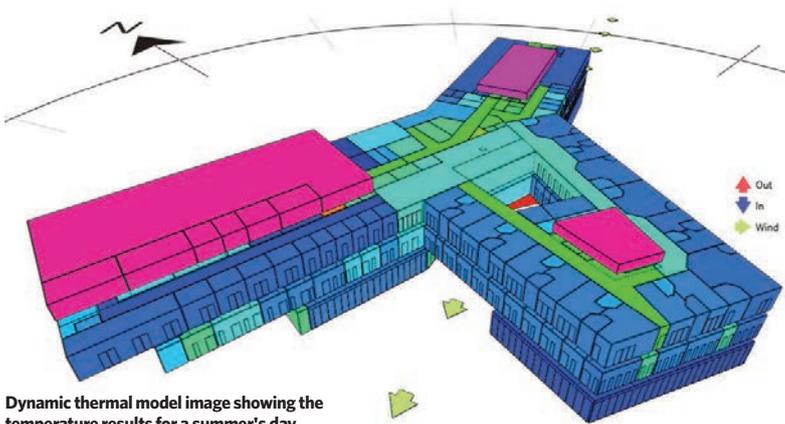
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Dynamic thermal model image showing the temperature results for a summer's day

Readers react to recent press criticism of energy modellers, and subsequent coverage in *CIBSE Journal*

Blame game

Bath University's recent research into energy modelling had all the ingredients of a great story, but only one thing was missing – a proper understanding of the issue.

The report lays the blame for the energy performance gap squarely at the door of energy modellers, singles out engineers and insinuates they are woefully incompetent.

The basis for their research is the belief that calculations undertaken at the design stage are underestimating actual energy consumption. Any competent engineer knows that design calculations are primarily related to compliance with Building Regulations, and not an attempt to predict future energy consumption.

They also used a complex dynamic simulation tool, IES, to model a very simple domestic building in detail. Industry professionals would only use this for overheating calculations, and the Building Regulation compliance tool SAP for energy efficiency compliance calculations.

The research appeared to make no differentiation between architects, sustainability experts and engineers – with only the latter likely to have the skills to perform meaningful analysis into energy performance modelling.

Misdirected research is bad enough, but when it's combined with lazy journalism, it does nothing to solve the problems that engineers are working hard to resolve. Fortunately, we can rely on *CIBSE Journal* to report the controversy without giving credence to the original study. *Alan Fogarty, partner at Cundall*

Learning from the past

Reading last month's 'Model answer' column (*CIBSE Journal*, June 2017), I had a strong sense of déjà vu. The ability of software and software users to make consistent and accurate predictions has been the subject of research for more than 40 years (see 'The decade with a flair for innovation', *CIBSE Journal*, November 2016). That research identified the need for serious quality management of the process. *CIBSE Guide A* (2015) proposes a methodology for recording input data – PAMDOC. This was developed from collaborative

research carried out under the International Energy Agency Buildings and Community Systems programme and requires the user to justify the choice of variables. A simple example might be the selection of the exposure of a surface in a U-value calculation. Adopting this approach will not guarantee error-free analysis, but it will make the task of checking much simpler.

The current and previous versions of chapter A5 have also stressed the need to understand the difference between standards and reality. To reiterate something made clear in last month's *Journal*, standards are intended to provide a level playing field; they are – or should be – clear in methodology, so that users have complete knowledge of intention and limitations. Thus, neither SBEM nor SAP can be expected to predict actual energy use; they can be expected to give a realistic measure of differences between design options.

There remains the question of 'accurate prediction of energy consumption' and whether it's possible. I suspect not. Many reasons for this have been given. I ask the simple questions: does the modeller ever have sufficient information fully to describe the building, system, controls and occupancy? Does the modeller understand the theoretical models of thermodynamic process incorporated within the software package? The latter is of particular importance where options are available. A model is a representation of reality – it is not reality – and, as such, it is not possible to construct 'an accurate model' without full knowledge of how the input data will be interpreted. This is in the hands of the software provider.

When I first became involved in the industry, design calculations were usually made using standard calculation sheets developed by design practices. These were transparent and the practice accepted responsibility for the chosen methodology. It is still reasonable to expect the design practice or energy consultant to take responsibility for the analysis – but, to do that, it is necessary to have access to the theoretical models employed within the software package and the reason a particular model was selected.

I am no longer conversant with the documentation from vendors – hopefully it meets this requirement. I am aware that, in some cases, the source code is available, but I suspect that would not be helpful to many. To return to A5: 'It is incumbent upon the user to ensure that the software is suitable for the purpose'.

It is essential that the user has a sound knowledge of thermodynamics, fluid mechanics and system design – without this, it is unlikely that the result of the analysis will be fully understood. It is also important that users understand the role of sensitivity analysis in the identification of the effect of uncertainties. We should move away from single-point predictions towards scenarios, and produce performance envelopes.

Mike Holmes, Hon FCIBSE

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Risky business

Under the 2008 Climate Change Act, the government must publish an environmental risk assessment every five years. Hywel Davies reports

The *UK Climate Change Risk Assessment 2017* (CCRA), published in January,¹ recognises the trend towards warmer winters, hotter summers and changing rainfall patterns. It considers how this affects communities across the UK, and sets out ongoing investment and work to tackle these risks.

Based primarily on the independent evidence report, published in July 2016 by the Committee on Climate Change's Adaptation Subcommittee (ASC), the report outlines the government's 'ongoing commitment to ensure the country can adapt to a changing climate'.

The ASC's 168-page chapter on people and the built environment² covers four primary policy areas: communities, buildings, the health and social care system, and population health and health protection. It notes the complex interaction between risks and the responsibilities of government departments – health protection falling to the Department for Environment, Food and Rural Affairs and the Department of Health; while buildings, communities and settlements are the remit of Communities and Local Government.

The CCRA also observes that many climate hazards have implications across several policy areas. Four major extreme-weather risks are identified: heatwaves, floods, drought and cold. Each has the potential to have an impact on communities, buildings, health and social care, and on population health. For buildings, extreme weather is likely to result in overheating, flood damage, damp and mould, subsidence and cold homes, as well as stressing and disrupting health services and – in the case of drought – water supplies.

CIBSE has produced new guidance on assessing overheating risk in homes,³ which has been a growing concern in the residential sector for at least a decade.

The CCRA is clear that concerns will continue to grow, with the supporting evidence review identifying overheating and the urban heat island as two of five key risks in the built environment. The heat island effect in urban centres will exacerbate increases in temperature.

Overheating also affects schools, hospitals, care homes, prisons, and other building types, with adverse impacts on health and thermal comfort. The proportion of dwellings that will overheat is very likely to increase with climate change, so consideration must be given to reducing the burden of overheating in existing buildings. Evidence of cost-effective adaptation of individual houses exists, but



"Specialist buildings will need to be adapted to remain fit for purpose"

scaling-up to change the wider housing stock is complex, and guidance is needed on refurbishment approaches.

Mitigation and adaptation measures should be combined when considering refurbishment projects and the wider implications of proposed improvements on the overall performance of the building.

The review suggests that, compared to older buildings, newly built hospitals are more at risk of overheating during hot spells because they do not have the same thermal mass, and because they are built as one large block, rather than several units.

Information from care homes suggests they may also be at risk from high temperatures because of building design and management issues. As the risk of overheating is likely to increase, these specialist buildings will need to be adapted to remain fit for purpose.

The evidence review says 'the risk of overheating of buildings requires urgent action', with energy demand for cooling buildings projected to increase – possibly exceeding £1bn – by 2050.

In homes, that cost falls on the occupiers, but for hospitals, care homes and schools, the costs of mitigation measures and of the consequences of overheating are borne by various government departments – and negative outcomes affect patients, pupils and residents.

The review also projects an increase in flood risk, with damages rising from £1.3bn in 2016 to £2.1-£12bn by the 2080s. Again, mitigating this risk needs to be considered alongside other building adaptations and improvements, to deliver the best and most appropriate outcomes.

The CCRA will now be followed by the second National Adaptation Programme, to be published in 2018, which will set out how the government intends to address these risks.

As the 2017 report demonstrates, the risks associated with extreme events requires a broader view – embracing several policy areas – if they are to be tackled effectively. An appropriate response to extreme events requires a coordinated and systematic multidisciplinary and multiple-agency approach.

If we are to shape our built environment in response to emerging evidence of risks and evolving needs, engineers have a very significant contribution to make.

References:

- 1 *UK Climate Change Risk Assessment 2017*, bit.ly/CJJul17HywelD
- 2 *People and the built environment*, bit.ly/CJJul17Hywel2
- 3 CIBSE TMS9 *Design methodology for the assessment of overheating risk in homes*, April 2017.

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director at CIBSE
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Performance boost

A new toolkit aims to reduce the performance gap by sharing forensic analysis of a live housebuilding site, says Bioregional's Douglas Drewniak

The energy performance gap is a problem, but not yet a scandal. Unlike the revelations that car manufacturers were cheating on diesel emissions, there has been no concerted effort to mislead the public that their new homes are more energy- and carbon-efficient than they really are. But that's not to say our industry is blameless.

The energy performance gap has been known about for years, but a chronic lack of urgency meant we only began to address the problem recently. With the UK poised to embark on the biggest housebuilding programme in a generation, any further inaction would be a scandal, affecting hundreds of thousands of dwellings and their occupants for years to come.

That is why we have helped to develop the Building Energy Performance Improvement Toolkit (Bepit for short). It is the result of a four-year, government-funded research project to understand the reasons for the energy performance gap through analysis of the design, procurement and construction processes of new homes.

Led by Bioregional, the Bepit taskforce did forensic testing and research on a live housebuilding site, involving more than 400 site days, 1,000-plus hours of observation, 150 tests and 130 logged observations. The study found that the energy performance gap results from many minor, frequently occurring problems, ranging from buildability issues, poor sequencing and planning to incomplete design or missing design information.

Given that there is no single or major cause of the energy performance gap, it is perhaps no surprise that little has been done to address the problem.

An enormous amount of hard work has gone into Bepit, and we know that it works. We've been trialling the toolkit on a large, new-build housing development in Oxfordshire, where airtightness tests have shown a 40% improvement between phases. Other energy performance tests can only be conducted when it gets colder, but we anticipate similarly impressive results over the coming winter.

As Julian Sutherland, partner at Cundall, explained at Bepit's launch, the programme is all about pre-empting problems before they are 'built in' to a new construction. It will also offer a framework that enables designers, architects and builders to collaborate effectively to solve the myriad small problems that add up to a big energy performance gap.



"Any further inaction would be a scandal, affecting occupants for years to come"

Using process mapping, monitoring and testing, we have gained an in-depth, all-round understanding of how new homes are built in the real world, which parts of the process impact most on their performance, and what can go wrong.

By identifying critical processes, key players and optimal times to intervene, Bepit creates a proactive focus that encourages communication within the team. It is facilitated and administered through a series of targeted meetings and workshops, similar to an onsite toolbox talk.

The beauty of the process is that existing knowledge within the delivery team is harnessed, so they are not just reacting to problems as they occur. The knowledge required to avoid energy performance problems is almost always held by someone in the team, but it is only if emerging problems are recognised early – and brought to their attention – that they can be solved.

We found that one of the main reasons for the energy performance gap is a lack of focus and awareness at all levels across the delivery team, and insufficient collaboration to address problems. Bepit solves this by scientifically examining the causes of energy inefficiency and codifying these in a single set of resources. If followed, these will have a real and measurable effect on the next generation of homes.

Bepit has a range of recommendations and toolsets, which describe where problems are likely to occur, and how to avoid or mitigate them at the design, procurement and construction stages. Its greatest impact, however, will be in offering a framework for communication, and for sharing experience and best practice.

We see Bepit as the start of a new era of collaboration within our industry, based on simple, easy-to-understand targets for energy performance, and a common language to reach this goal. Through collaborative contracting, reciprocal links between parties, and control maintained during the delivery process to achieve predictable outcomes, we can go beyond the requirements of compliance and aim for the ceiling, not the floor.

For owners and occupiers, it means lower heating bills, fewer carbon emissions, better ventilation and air quality, fewer draughts and less mould. For the industry, it means better construction, and significantly less time and money spent on remedial work – as well as being a significant safeguard to our reputation for quality and commitment to sustainability.

DOUGLAS DREWNIAK is a Bepit research engineer at Bioregional

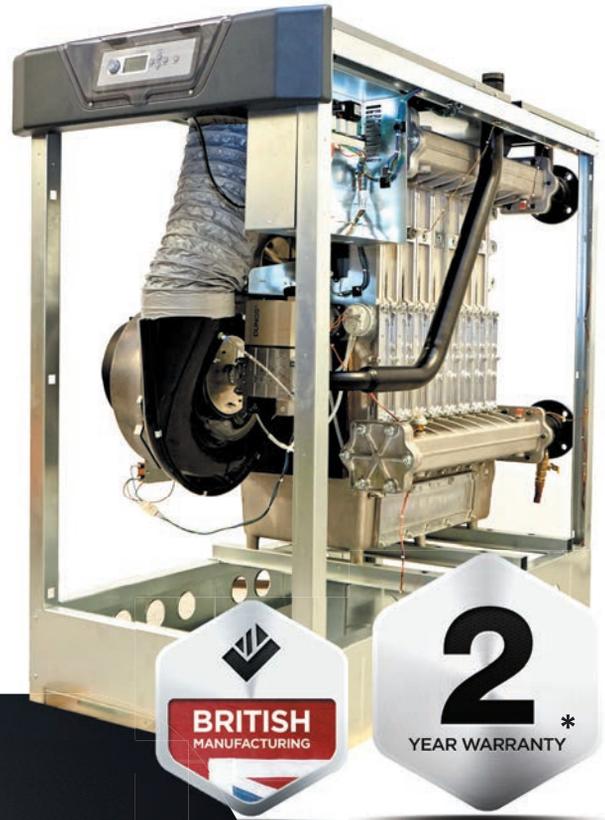


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WHEN THE SMOKE CLEARS

The Grenfell Tower fire should never have happened. **Alex Smith** looks at what must be learned to ensure residents are never put at risk again

The UK construction industry will never be the same again after the devastating fire at Grenfell Tower in the early hours of Wednesday 14 June. At least 79 people are dead, or missing presumed dead, after the worst housing disaster in Britain since World War II.

A criminal investigation is under way, and a public inquiry has been launched to establish how such a tragedy could have happened in one of the world's richest – and most technically advanced – countries.

When Martin Kealy MCIBSE first saw footage of the blaze ripping through the 24-storey residential tower in west London, he understood immediately what he was seeing. 'It is clear that the cladding played a significant role in the rapid spread of fire – you could see panels falling to the ground on fire,' says the managing director of MKA Fire.

The speed with which the flames raced up the building's façade was similar to many fires Kealy had seen while working in the Middle East. 'There have been many of these type of fires in residential towers in the United Arab Emirates (UAE),' he says. 'The main difference between these fires and Grenfell is that those buildings are sprinklered, so nobody has died, and the majority of these fires receive little attention in the UK media'. As a result of these incidents, the UAE authorities have changed their building codes and do not allow the use of combustible cores in cladding.

The Grenfell Tower public inquiry won't only ask fundamental questions about the cladding – it will also look at everything that contributed to the loss of life. There will be a focus on whether sprinklers would have saved lives, and whether there was adequate emergency lighting and smoke ventilation to allow people to escape.

Investigators will want to know why the fire spread from the fourth to the top floor in only 15 minutes, and will look at the fire compartmentation and whether the build quality on site compromised the resilience of the design. They will also examine: the suitability of the Building Regulations; who

was responsible for approving the final designs and completed works; and whether contractual arrangements undermined fire safety.

The concrete-framed Grenfell Tower was designed in 1967 and completed in 1974. It was refurbished in 2016 by lead contractor Rydon Maintenance in an £8.6m scheme for the Kensington and Chelsea Tenant Management Organisation, which maintains the local council's housing stock. The refurbishment was designed by architect Studio E. According to drawings, the retrofit replaced the original façade of precast spandrel panels and single-glazed aluminium windows with new powder-coated aluminium windows and a cladding system. It was calculated that the cladding would save households around £200 a year on their energy bills, and – to further increase the energy efficiency of the building – a new heating and hot-water system was installed.

WHY FIRE REGULATIONS MUST BE REVIEWED

The Fire Protection Association says that Part B is no longer fit for purpose. Here are its concerns:

- The government must introduce regular reviews of Part B. Not having a scheduled review acts as a disincentive for the industry to respond.
- If measures are not mandated, they will not be done routinely. While performance-based codes support many applications, absolute adherence encourages value engineering to support a race to the bottom.
- The FPA is greatly concerned about the ease with which fire may now break into some forms of construction via combustible structure, cladding and insulation from external sources.
- Building Regulations were developed when products that used to form fire compartments were non-combustible. The FPA does not believe regulations have adapted sufficiently to deal with this change.
- There is concern that other Building Regulations – particularly relating to sustainability – unwisely bias building methods and material choices towards those that might perform less well in fire scenarios.

New Guide E



CIBSE's Guide E Fire Safety Engineering 2017 will be available this autumn at www.cibse.org/knowledge Turn to page 35 for a summary





‘There are really good reasons to clad these buildings,’ says Sweco’s Geoffrey Palmer. ‘Concrete panels have gaskets that perish over time. They are starting to leak, they’re damp, and the heating is very expensive. Unfortunately, this cladding seems to have been catastrophic. It appears to have introduced a fire risk that wasn’t understood.’

The drawings show a cladding cassette system comprising Celotex FR5000 polyisocyanurate (PIR) insulation board attached to a timber backing. Architectural consultant Probyn Miers says PIR is difficult to ignite and ‘exhibits pronounced charring, which enables it to withstand a fire for longer.’ This insulation was protected from the weather by an aluminium composite panel (ACP), which is made of an insulated core sandwiched between two, 0.5mm aluminium sheets. There was a 50mm gap between the insulation and the rainscreen cladding.

ACPs are popular in both new-build and refurbishment projects, because they are lightweight, offer good thermal properties, and instantly transform the appearance of ageing buildings. The drawings show an ACP manufactured by Reynobond; according to *The Guardian*¹ the cladding installed on the tower had a polyethylene (PE) core. Probyn Miers describes polyethylene as ‘a thermoplastic material,

which... melts and drips as it burns, spreading the fire downwards as well as upwards.’² This type of panel is not permitted in the UAE, the USA or Australia, where its use is under the microscope after a fire in Melbourne in 2014 [See panel, page 22].

Reynobond PE was selected over a fire-resistant version that was £2 per square metre more expensive, according to *The Guardian*, which spoke to John Cowley, managing director of CEP Architectural Facades, which fabricated the ACPs and windows. ‘We supplied components for a system created by the design and build team on that project,’ Cowley confirmed to the newspaper. The panels were installed by subcontractor Harley Facades.

Cowley rejected the accusation made by Chancellor Philip Hammond on BBC1’s *The Andrew Marr Show* that the cladding is illegal in the UK. In a statement, he said: ‘Reynobond PE is not banned in the UK. Current Building Regulations allow its use in both low-rise and high-rise structures.’ But, the Department for Communities and Local Government, which oversees Building Regulations says: ‘Cladding using a composite aluminium panel with a polyethylene core would be non-compliant with current Building Regulations guidance. This material should not be used as cladding on buildings over 18m in height.’

Kealy says ‘fire consultants would not specify combustible cladding panels for a high-rise’ – so why were they specified for Grenfell Tower? If the contract was design and build, the architect is unlikely to have been aware of the final specification, and *The Guardian* claims Studio E proposed a fire-retardant cladding in 2012.³

Hammond says the criminal investigation will look at whether Building Regulations were breached, and whether they are rigorous enough. Many have called for an urgent review of Part B of the Building Regulations governing fire safety, long before the Grenfell Tower fire, as it has not had a major update since 2006.

The Fire Protection Association (FPA), which works with many UK insurers, says the current Building Regulations are not fit for today’s building/refurbishment methods and materials. In a strongly worded statement, it says it is ‘greatly concerned’ by the increasing combustible content of buildings within structure, insulation and cladding elements, and that the regulations have not developed sufficiently to deal with the change. The FPA draws attention to the reliance on firestopping in preventing the spread of fire, and says onsite building quality and checking processes are not good enough to ensure protection from fire when using combustible materials. ‘The firestopping requirements of some forms of construction are simply not achievable,’ adds the FPA. (See panel on page 20).

This rings true with Kealy, who has found examples of compromised firestopping in the Middle East, India and Asia. He says penetrations are often not sealed properly because they occur after the firestopping contractors have finished on the scheme. ‘The firestopping may be immaculate, but then a contractor might come in with, say, a security system addition and the new penetrations are left open,’ says Kealy. This raises another issue, because CCTV >>



The 24-storey, 67-metre Grenfell Tower had 127 flats and the bottom three levels were mixed use

» cameras and security buzzers are not controlled work, so do not involve building control. No regulatory check would be required, even though fire compartments could be compromised.

‘I’ve inspected several new buildings with numerous breaches in the compartmentation. That’s one way fire can travel up the inside of a building,’ says Kealy. Where compartmentation is likely to be of questionable standard, Kealy says, retrofitting sprinklers will help reduce the risk of fire spread in existing buildings.

Each individual firestopping should be logged on a BIM drawing and clearly labelled on site, so building operators know they are integral to fire safety, adds Kealy.

When it comes to cladding, Kealy is concerned that combustible components can be shown to comply with small-scale fire tests if they are assessed as part of a ‘desktop study’ report from a suitably qualified fire specialist. This method of compliance – one of four options outlined in Building Control Alliance (BCA) Technical Note 18⁴ – is being used to get cladding systems approved without having to conduct a full multi-storey fire test on the cladding system. The Note says the report should be supported by test data from a UKAS-accredited testing body, but a BCA presentation claims that reports from some



Charred insulation on Grenfell Tower

fire engineers are instead based on opinion, rather than fact.

To approve a design, fire engineers have to understand the interaction of the various materials in the construction. This includes the nature of the firestopping around every penetration of the façade, including windows, vents and ducts. The fixing methods also have to be addressed in the desktop study, and should be robust enough to keep protective materials in place in the event of a fire.

Kealy says it is difficult to know how complex designs will perform unless tested on a multi-storey fire rig. In Dubai, the authorities are now insisting on a full-scale test for the cladding of tall buildings.

Councils are rushing to review all buildings with cladding similar to Grenfell.⁵ (See news, page 7). Some – including Croydon – are making a commitment to install sprinklers into their residential high-rises. This was a recommendation from Judge Frances Kirkham, the coroner at the inquest into the deaths of six people at Lakanal House, in Camberwell, in 2009. Currently, only buildings erected after 2007 and more than 30-storeys high require sprinklers.

The fallout from the tragedy is likely to have a profound effect on the construction industry. For decades, it has lamented how buildings don’t perform as the design intended but, while people can live with an energy performance gap, a building that fails to protect people in a fire can never be tolerated. **CJ**

MARTIN KEALY MCIBSE FIFireE, MSFPE is the chair of the committee for CIBSE Guide E Fire Safety Engineering 2017

MELBOURNE CLADDING FIRE

The spread of fire in the Lacrosse Apartments in Melbourne, Australia, was blamed on the use of non-compliant ACP. There was no loss of life, but the Victorian Building Authority (VBA) carried out an external wall-cladding audit of 170 high-rise residential and public buildings, to assess the risk to residents. It found that 51% of the buildings were non-compliant, but it deemed that only one building required immediate action. The VBA is considering further action, including the investigation of building practitioners involved in multiple instances of non-compliance.

References:

- 1 Cladding for Grenfell Tower was cheaper, more flammable option, *The Guardian* 16 June 2017 bit.ly/CJJul17Gren1
- 2 Fire Risks From External Cladding Panels – A Perspective From The UK, *Perspective*, Probyn Miers, Winter 2016 bit.ly/CJJul17Gren2
- 3 Councils rush to reassure tower residents after Grenfell fire, *The Guardian* 20 June 2017 bit.ly/CJJul17Gren3
- 4 BCA, Use of combustible cladding materials on buildings exceeding 18m in height, Building Control Alliance Note 18, June 2015.
- 5 Grenfell Tower: 16 council inspections failed to stop use of flammable cladding, *The Guardian* 21 June 2017 bit.ly/CJJul17Gren4



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TIERS FOR FEARS

The meltdown of British Airway's IT systems, after a power-supply failure, demonstrates how critical data centres are to business operations. **Andy Pearson** looks at levels of resilience and explains why cloud computing is making firms more susceptible to power cuts

In May, BA suffered a catastrophic IT failure when the power supply to a key data centre was lost and the backup system was rendered ineffective. The failure shut down the airline's IT systems, causing passenger chaos worldwide. BA has yet to explain the precise cause and sequence of events that resulted in the failure of two of its data centres.

The incident caused consternation in the data-centre sector, with many experts surprised that BA's systems were not more resilient, and that the procedures which should have been in place to prevent this type of meltdown failed. It was not only the scale and duration of the IT power cut, but that the failure brought down a key data centre and the backup data centre, too. 'What was the most surprising aspect of this, for me, was that BA couldn't restart their data processors somewhere else,' says Alan Beresford, managing director at EcoCooling.

So how are data centres designed to be resilient – and what is it about the way they are engineered that should prevent downtime and failures from occurring?

To understand resilience, you first need to appreciate how a typical data centre is arranged. The most critical area contains the data halls – rooms in which the data processing units, or servers, are housed in rows of cabinets or racks. These servers need a continuous supply of power and cooling, which is why data centres are

designed with a robust set of systems to deal with power failures and to ensure cooling is always available. The measurement of how vulnerable your system is to failure determines its resilience.

The Uptime Institute, an organisation focused on business-critical systems, defines four tiers of data centre resilience: N, N+1, 2N and 2N+1, where N is the base and 2N+1 is the most resilient. This terminology is best explained using the example of standby generators serving a 1MW data centre (see panel, 'Tiers of data resilience').

It is important to note that this tiering makes no reference to the type of systems employed; it does not state which type of uninterruptible power supply should be used, or how a data centre is to be cooled. Tiering is about how the systems are arranged.

The other thing to note is that the tiering designation is about the maintainability of systems. 'Most people would argue that a Tier III data centre is concurrently maintainable, because you can take out a piece of kit to maintain it and you don't lose anything,' says

»

"The measurement of how vulnerable your system is to failure determines its resilience"

» Robert Thorogood, executive director at consultant Hurley Palmer Flatt. ‘Some banks specify Tier IV, which means the systems are not only concurrently maintainable, but you can have a fault anywhere on the system and you still won’t lose anything, because there is more redundancy.’

Not all businesses will require the same level of resilience as a bank. Thorogood says they have to ask: ‘What will happen to my business if the data centre goes down?’

Some organisations can deal with an organised period of downtime once a year. However, increased reliance on the internet means access to it is becoming critical for more and more businesses. Many retailers, for example, now have a 24/7 web presence and can no longer accept downtime overnight.

‘It used to be that research organisations did not require a high level of data-centre resilience; if the data centre went down, it went down. These days, because everybody relies on email and the internet, even universities want access to a Tier III data centre,’ explains Thorogood.

However, it is important to remember that not all areas in a Tier III data centre will be serviced to the same level of resilience.

‘A typical data centre will have the hall housing the computer racks, accompanied by support areas – such as storage, loading bays,



security and plant, and the uninterruptible power supply (UPS); the infrastructure serving these areas will not have to be nearly as reliable as that serving the data hall,’ says Don Beaty, CEO at DLB Associates Consulting Engineers in the US, and the person responsible for starting the ASHRAE technical committee on mission critical facilities, TC9.9.

Beaty warns that – just because you have multiple systems inside a data centre – the building can still be vulnerable to single points of failure externally, particularly with data network. ‘Data centres are nothing without connectivity to the outside world; you want diverse fibre routes from different carriers coming into the building from diagonally opposite corners,’ he says. ‘However, if those fibres converge upstream, then that will become a single point of failure’.

The same issue is true for power, where it can be difficult to avoid a common supply. Very few data centres have two discrete power supplies, but it is common to have two incoming power supplies from different substations – although these can come from the same power source further upstream – with supplies entering the building on different sides.

On a Tier 3 data centre, for example, each supply – once inside the building – will be kept separate, passing through a dedicated set of

DATA CENTRE PERFORMANCE

A new category has been added to the CIBSE Building Performance Awards 2018: Project of the Year – Data Centre. Entries, for projects completed between 1 June 2014 and 31 August 2016, should demonstrate how a new-build or a refurbishment of a data centre meets high levels of user satisfaction and comfort. This includes applied research initiatives from academia. The project should also deliver outstanding measured building performance, energy efficiency and reduced carbon emissions. For details, visit bit.ly/CJJul17BPA

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transformers through a UPS, and then down dedicated cables until they reach the server. So each computer server is fed from two independent power supplies. ‘The UPS will be supported by standby generation, so – if the mains go down – the UPS batteries will take over until the standby generators fire up, synchronise and supply power,’ says Beresford.

Beresford adds that not all systems require the same level of resilience. ‘Power and fibre optics systems might be 2N, but cooling might be N+1, because it’s a lot simpler,’ he says. ‘You play tunes on the level of redundancy according to the type of technology.’

When considering resilience, it is important to ensure that, should a system fail, the operator understands how to deal with the situation. ‘When you get big data centres with multiple levels of redundancy, their operation can become very complicated,’ warns Beresford. ‘There is an alternative view that very simple systems can actually prove to be more resilient and more reliable than complicated ones.’

The ‘keep the engineering simple’ mantra has been embraced by data-centre developer and operator DigiPlex, which engages with the operational team when it puts together a design. ‘If you put a design in front of the operations guys and they don’t get it, then scrap it, because it must be easily understandable for them to operate in an emergency,’ says Geoff Fox, DigiPlex’s chief innovation and engineering officer. ‘If technicians don’t understand the system, your resilience is super weak.’

DigiPlex’s philosophy means it designs to minimise the opportunity for human error by following a 2N – rather than an N+1 – solution for data centre electrical infrastructure. ‘We found that trying to save on the cost of a generator builds in complexity to the design, results in additional costs for the switchboards and cross-connects, which makes it harder to maintain,’ says Fox. Resilience is further enhanced by using factory manufactured, prefabricated switchrooms and plantrooms, to enable quality to be controlled and to fully test the units before they arrive on site.

Sophia Flucker, director at consultant Operational Intelligence, believes commissioning the data centre before it is operational is fundamental to its resilience. She lists what she terms the ‘five levels of commissioning’ necessary to achieve resilience: factory acceptance; dead testing on site; start up on site; systems testing; and integrated systems testing.

Flucker says a comprehensive approach to commissioning is to ‘test all the components, then test the systems and their failure modes’. Sound advice, which perhaps BA will follow in the future – particularly testing in failure mode.

Read more in CIBSE’s *Data Centres: an introduction to concepts and design* at www.cibse.org/knowledge 

TIERS OF DATA RESILIENCE

Definitions are based on an example of standby generators serving a 1MW data centre

- Tier I (N) Normal, the data centre has 2 x 500kW generators
- Tier II (N+1) The data centre has a spare generator – so, 3 x 500kW
- Tier III (2N) The data centre has two power supply systems, A and B, and each stream has two 500kW generators – 4 x 500kW in total
- Tier IV (2N+1) Each A and B stream has 2 x 500kW generators, plus a spare 500kW generator – so, 6 x 500kW generators in total



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The first Return-to-Work cohort in 2016



THE BIG BREAK

Diversity – especially at the mid- and senior levels – is scarce in the construction industry, which is still predominantly ‘white and male’. But Skanska’s Return-to-Work programme – launched last year – aims to inject variety into its business, and help people who have taken a career break of two or more years get back into work.

The firm trains successful applicants, who – after completing a 12-week internship in a discipline in which they are qualified or experienced – are offered a permanent role within the company.

During the internship, applicants have external coaching from organisations such as Women Returners – which pioneered the ‘return to work’ concept for women in the UK – and by mentors within Skanska.

Israil Bryan, diversity and social programme manager at Skanska, says people are often stigmatised for having significant breaks in their CV, whether for childcare, parent responsibilities or sickness reasons.

As part of its new business plan, Skanska launched a diversity and inclusion vision to tackle the mid-level skills shortage, and attract more senior and experienced people. ‘It also helps diversify the nature of the talent we are bringing in from a range of industries,’ Bryan adds.

Getting back into employment after a career break can be an uphill struggle. Liza Young finds out how Skanska’s Return-to-Work scheme is encouraging diversity by recruiting from outside the construction industry

The focus of the programme is to target scarce skills, including core technical disciplines – such as engineering and quantity surveying – as well as commercial, and project- and construction-management roles.

Women returners

The lack of diversity at mid- to senior levels within the industry is partly caused by the difficulties women face when seeking flexibility after starting a family, says Bryan. Kate Young, senior engineer at Skanska, fits into this category; she applied for the firm’s Return-to-Work scheme last year, after a seven-year break following the birth of her two children.

After graduating, Young worked as a rail vehicle engineer for six years, but – after the birth of her first child – she found her firm unreceptive to flexible working, so she resigned. However, when her youngest child started school last September, Young decided it was time to get back into the workplace.

‘I looked at various roles, including teaching, but it seemed such a waste – having got my degree and got chartered – to bin those skills and do something completely different,’ she says. ‘I went into engineering because I enjoyed it; I loved my job before I had my kids, that’s why I was keen to get back into it’

With help from Women Returners, Young enrolled onto Skanska’s programme, before taking a permanent role in February, working three days a week. In the next few years, as her children get older, she

hopes to increase her hours and move up through Skanska's management levels.

'Before I got on this programme,' she says, 'I began to wonder if I'd ever find something in engineering that fitted in with my family.'

Although women are disproportionately affected by childcare, Bryan says the concept of flexibility affects everyone. 'We've used the programme to bring in flexible working patterns and enhanced holiday across the company, to ensure it's a fundamental aspect in our offering – which will not only attract people, but retain our existing workforce.'

Skanska employees, at all levels, can now take advantage of additional leave, variable shift patterns and flexible working, which employees can request in almost every role at the firm.

Diversity

Skanska's Return-to-Work scheme is not just for women; men who have had a prolonged career break are also eligible.

Of the 124 applicants to the programme this year, 40% were male. 'We've had stay-at-home dads, people who have had career breaks as a result of illness, and two Syrian-qualified engineers, who have been attaining refugee status,' says Bryan.

The programme is also not limited to the construction sector – the firm is trying to widen its talent pool by recruiting from a variety of industries.

'Instead of scrapping around alongside our competitors for the same people from the same companies, we are broadening the base of where we look,' says Bryan, 'and ensuring Skanska is an appealing proposition for people with the skills that can complement our sector.'

Commercial managers, for example, traditionally start off as quantity surveyors

“Having the same people with the same backgrounds and the same mindsets doesn't bring scrutiny or challenge – it just perpetuates group thinking, with everyone becoming 'yes' men”

and work their way up. But the fundamentals of such a role include numerical acumen, dealing with contracts and scrutinising project financials, says Bryan, who adds that these are capabilities that can be found in the financial services.

In the past, Skanska has also recruited former military personnel as project managers and planners and, this year, the firm retrained a qualified accountant as a senior project manager. 'These are people who don't have conventional construction skills, but who have skills that can be easily adapted to our industry,' says Bryan. Recruitment decisions are made according to the needs of the business at that time.

Historically, the industry has struggled to find people to fill planning roles, which – today – use technologies such as 4D planning, building information modelling (BIM) and augmented reality.

'These are the same technologies that the gaming industry has cultivated and been using for many years,' says Bryan. 'We've started stripping down those roles and identifying the core skills we need – which don't necessarily have to be found in the construction sector – and employed people that previously worked in gaming companies.'

Another success story this year is a female chartered civil engineer with 15 years' experience. After a three-year career break, she spent a year volunteering in a charity shop because she was unable to get back into construction – until Skanska took her on.

'With the amount of infrastructure projects happening across the UK at the moment, the industry is crying out for people with the experience she's got,' says Bryan. 'Without taking on the people that we have, our projects would have been worse off.'

To produce excellent results, people need to bring different ideas, scrutinise designs and be empowered to challenge one another – all of which comes with diversity, says Bryan. 'It is important for us to branch out into new sectors so we can support our clients, who are becoming more and more diverse. To give them innovative products and solutions, we need to have a fund of different ideas, which only comes from employing a variety of people.'

'Having the same people with the same backgrounds and the same mindsets doesn't bring scrutiny or challenge – it just perpetuates group thinking, with everyone becoming "yes" men.'

As well as gaining the wealth of experience on which Skanska would otherwise have missed out, the programme has broadened the firm's recruitment pool. 'We no longer only look for people who have worked at main contractors; we recognise the benefits of going to different industries and seeing how they can complement our projects,' says Bryan, who adds that – as the industry evolves – it is starting to branch out into new sectors and technologies.

The aim is to identify not only people with the skills that the industry needs now, but also those with the skills that will be needed in the next five to 15 years. 'We will always need engineers, and we will always need quantity surveyors and commercial people – but we'll also need additional skills to complement them.' CJ



Kate Young with her children



POWER SHARE

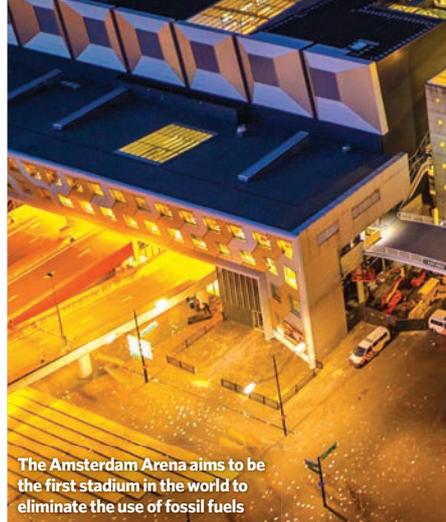
Battery storage capacity is set to soar as prices tumble and renewable fuel plays an increasingly important part of the energy mix. **Andrew Brister** examines developments in the technology and looks at innovative applications

Battery storage is a disruptive technology set to revolutionise the way we power communities. From large-scale grid-stabilisation systems through to commercial buildings and the home, energy storage in batteries is set to soar. The growth can be attributed to several factors: the increasing contribution of renewable energy in the UK generation mix; advances in battery technology, spurred on by a number of big competitors entering the market; and a dramatic fall in prices. It's a perfect storm that is unlikely to abate any time soon.

Figures from Bloomberg New Energy Finance (BNEF) predict that battery storage capacity is set for rapid growth. Installed capacity will rise from just 6GWh in 2015



Thornton Science Park energy centre is a major research and innovation hub



The Amsterdam Arena aims to be the first stadium in the world to eliminate the use of fossil fuels

to more than 81GWh by 2024 – a cumulative average growth rate of 44%. At present, its main applications are in balancing services for grid transmission and distribution systems. However, BNEF argues that the use of batteries paired with renewable energy sources – such as solar PV systems – will become the dominant market after 2020.

The cost of batteries has been falling dramatically, driven by enormous increases in manufacturing capacity and expertise by the likes of electric car manufacturers Tesla and Nissan. Prices of lithium-ion batteries have fallen by around 80% over the past five years, according to BNEF figures.

Energy analyst Thomas Christiansen, associate director at EY, describes a hierarchy of applications that will become progressively more attractive as battery costs fall further. These are: islanding, where batteries are used with renewables in isolated grids; grid balancing; peak shaving; and the behind-the-meter market, which allows consumers to store and use the power they generate. (See panel, 'Uses for battery storage'.)

xStorage enters the Arena

Nissan has teamed up with power-management specialist Eaton to develop the xStorage range across buildings, home and grid-scale applications. The xStorage Buildings unit combines 'second life' Nissan Leaf lithium-ion batteries and an uninterruptible power supply (UPS), and can take multiple energy inputs from the grid and renewable sources – such as solar – to deliver power.

The integrated system selects the right energy sources according to the load, the grid constraints, and the availability of renewable energy. 'For commercial and industrial customers, implementation of peak shaving and load-shifting flexibility will enable avoidance of



peak-demand charges and, ultimately, increased revenues through participating in demand-response schemes,' says Frank Campbell, Eaton's president, corporate and electrical sector, for Europe, the Middle East and Africa.

One of the first applications for xStorage is the Amsterdam Arena, home of Ajax FC and a concert venue. The aim is for the arena to become the first stadium in the world to eliminate the use of fossil fuels, and the deployment of the xStorage solution is seen as crucial in its progress towards that sustainability goal.

'The drive towards fossil-free status is only one reason why the arena has chosen to implement energy storage,' says John Robb, commercial buildings segment leader at Eaton. 'Major variances in the power requirements of different events – coupled with the need to ensure a seamless experience for fans and further Uefa 2020 [European football championship] requirements – meant the arena was seeking better power-management that would increase responsiveness, to ensure an uninterrupted supply without adding costs.'

Using 280 Nissan Leaf batteries, consisting of 1,160 battery packs, the solution designed for the Amsterdam Arena will be the largest energy-storage system – powered by repurposed batteries – used by a commercial business in Europe. It will have 4MW of power and 4MWh of storage capacity. Carbon dioxide (CO₂) emissions will be reduced because the system – including 4,200 solar panels on its roof and an associated windfarm – enables the arena to maximise its use of renewable energy resources. The battery packs will be housed in 119 racks and integrated with nine bidirectional inverters from Eaton.

The xStorage system stores energy during low-demand periods and supplies power when there is an outage. This will offer a crucial backup to ensure the arena is resilient to any grid instability, reducing the need to deploy diesel generators as a temporary power source. To maximise efficiency, the arena will also be able to avoid peak tariffs during times of high demand (peak shaving).

'An additional advantage and revenue stream of the system is that – in between events – the stored energy can be directed into services that help to stabilise the grid,' says Robb. 'The benefits of energy storage will be felt not only by the arena, but by neighbouring buildings that are supporting and participating in the development of a smart city hub.'

"The cost of batteries has been falling, driven by enormous increases in manufacturing capacity and expertise"

USES FOR BATTERY STORAGE

- **Islanding** – batteries are used alongside renewables in isolated grids, displacing expensive small-scale fossil-fuel generation using diesel or fuel oil.
- **Grid balancing** – provides short-term supply (or demand) to keep electricity grids in equilibrium, and helps to reduce the need for investment in transmission and distribution networks.
- **Peak shaving** – reducing demand for expensive power from the grid at peak times. As batteries get cheaper, it becomes economical to use them for energy-load shifting, charging the batteries when grid power is cheap and discharging them when it is expensive. These techniques become economic for commercial users first – with high peak charges but moderate overall use – followed by large industrial users with high energy demand.
- **Behind-the-meter market** – batteries are paired with renewable systems to allow consumers to use more of the power they generate by, for example, using stored solar power into the evening.

The rise of the microgrid

Battery storage has an important part to play in private wire systems, localised electricity grids or microgrids, which – although connected to local distribution networks – have privately owned central plant that produces electricity. Microgrids operate a standalone supply in the event of the grid failing to provide localised energy security, and can reduce energy costs.

A recent Navigant Research report identified more than 400 microgrid projects currently under development globally. EY has estimated that, in the 20 countries analysed >>



The storage capacity of the 280 Nissan Leaf batteries, consisting of 1,160 battery packs, that make up the Amsterdam Arena's energy-storage system

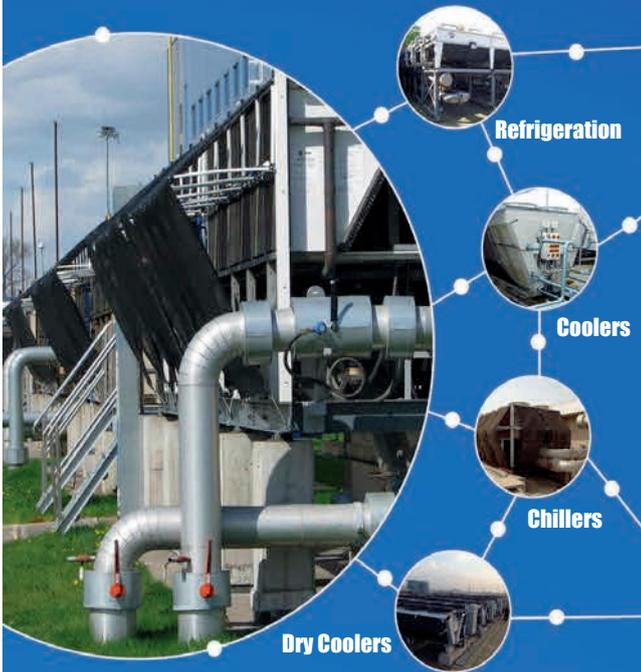
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"The use of batteries paired with renewable energy sources will become the dominant market after 2020"

» by the company, microgrids could result in anywhere between US\$64bn and US\$171bn in electricity cost savings for commercial companies by 2020. In the UK, the savings would be equivalent to between 21% and 30% of overall electricity costs.

'Savings arise from the ability to take advantage of the changing cost dynamics of newer technology, including energy-storage systems, the falling costs of solar and wind energy systems, and reduced exposure to increasingly volatile fossil fuel prices,' says Peter Jones, technology strategy manager at ABB's power grids division.

Microgrids typically integrate multiple sources – such as solar, wind power, biomass, small hydro, geothermal, waste-to-energy and

44%

Predicted cumulative growth rate in installed battery storage capacity by 2024, up to 81GWh compared with just 6GWh in 2015

LEADING BY EXAMPLE

Energy provider Norvento has launched its Advanced Energy Engineering Services to the UK market. Through this new turnkey service, the company will provide renewable energy projects to help public and private sector organisations break their dependency on fossil fuels.

Norvento's headquarters, in Lugo, Spain, illustrate the company's approach – the 4,000m² site has been awarded the Breeam Outstanding rating. Renewable electricity, heating and cooling – plus high-tech energy-storage methods – meet 100% of the building's peak energy demand, while a fleet of electric vehicles charge in the car park. All technologies feed into a purpose-built microgrid, which is managed by Norvento's advanced control system to balance onsite energy generation and storage with real-time consumption and future forecasts.



CREDIT: ABB



Part of an ABB grid energy storage system in Victoria, Australia

combined heat and power (CHP) systems – and are increasingly being equipped with energy-storage systems, especially as lithium-ion batteries become more cost-competitive.

ABB's PowerStore Battery is a containerised plug-and-play microgrid solution, available in various ratings from 60kW (delivering 365kWh) up to 580kW (delivering 2,055kWh), with a standardised specification for a wide range of applications. ABB favours new batteries and – while it is

not tied to any particular supplier – it has an agreement with Samsung.

ABB has been selected by the University of Chester to deploy a microgrid control system for the new energy centre at its Thornton Science Park in Cheshire, a major research and innovation hub. The microgrid, which will be the first of its kind at a UK university campus, will play a key role in the energy centre's mission to be a demonstration environment, where innovative energy technologies can be developed and tested.

The site consists of 90,000m² of industrial laboratories, workshops and office space for companies, and is an emerging centre of excellence for the energy, engineering and advanced manufacturing industries. >>

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ENCRRAFT SUPPORTS INDEPENDENT CORNWALL

Energy consultant Encraft has been engaged by Cornwall County Council to produce an analysis of the county's renewable resource potential. Cornwall is leading the way in taking responsibility for its own distributed energy systems, including energy-storage facilities.

'Advances in energy-storage technology have moved renewables from the periphery to the centre of many governments' energy plans,' says Nick Painter, regional director and acting head of distributed energy at Encraft. Already with one of the best wind resources in western Europe and the highest levels of solar irradiation in the UK, Cornwall also has a huge potential for using geothermal energy and offshore renewables.

Encraft began by mapping existing and future energy supply and demand, which allows it to project the energy demand of future buildings based on proposed regulatory changes. 'We also examined the various network constraints and their impact on economic growth; conducted analysis into energy-storage options; demonstrated how to increase renewable energy generation; and explored potential investment opportunities, including the use of storage to offer services to the local and national electricity networks,' says Painter.

Demand - mapped against generation and grid constraints - identified six priority sites that would most benefit from energy-storage solutions. 'The six case studies focused on a range of energy-storage technologies, including: power-to-gas and hydrogen storage; domestic battery storage aggregated to a large-scale virtual battery; liquid air energy storage; thermal storage; and lithium-ion battery storage,' says Painter. 'Our analysis determined the most appropriate technology for each location, and the costs and benefits.'

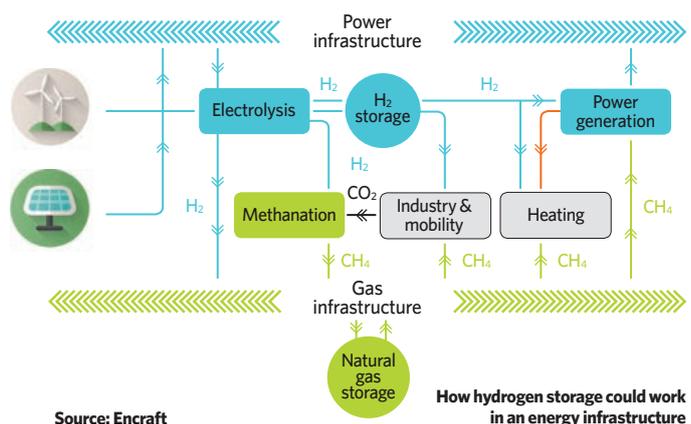
The economic benefits of storage can be realised most effectively when it is co-located with renewable generation - such as a wind farm or a solar park - and a power purchase agreement is established with a local consumer. This enables generators to avoid curtailment of their output while receiving maximum return for their generated electricity.

» Individual elements within the microgrid include a CHP unit, diesel generation, solar PV plant, an energy-storage facility and a load bank. ABB will provide some of the technology for the energy centre, including the overall control system that will act as the 'brain' of the microgrid. This will enable the integration and optimum deployment of multiple energy sources and storage units connected to the same local power network.

ABB's microgrid solution aims to demonstrate how distributed energy resource technologies can work together to minimise fuel costs and emissions within a grid. It will also maximise the penetration of renewable energy in a grid. The microgrid controller will manage the energy centre's connection to the campus network - and then connection to the local grid. This will show the microgrid's ability to connect to, or disconnect seamlessly from, the main grid and operate in an islanded mode, ensuring supply continuity in case of an outage.

'Even in advanced economies such as the UK, microgrids can be used to increase the reliability and quality of power supply in both grid-connected and isolated operation,' says Jones. 'They can also reduce energy costs and enhance their predictability, and help to reduce the carbon footprint and overall environmental impact. We are seeing a substantial level of interest. The technology is not new - it's just there are new applications for it. Now is the time for the UK to embrace microgrids.' 

"Distributed energy resource technologies can minimise fuel costs and emissions"



Source: Encraft

How hydrogen storage could work in an energy infrastructure

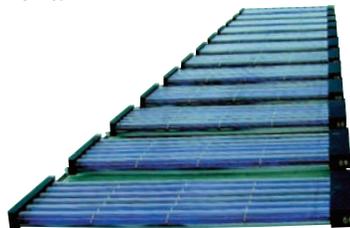
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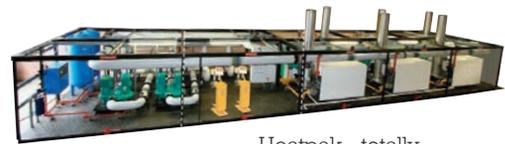


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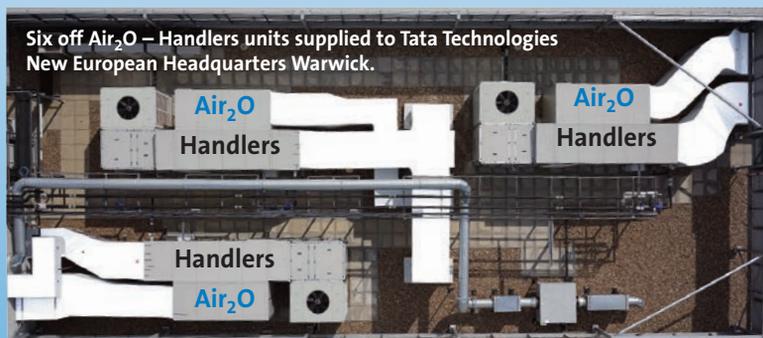
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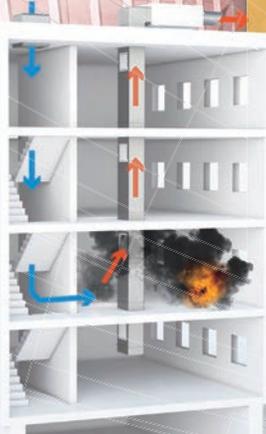
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This month: CIBSE Guide E *Fire Safety Engineering*; car park ventilation; vaping and smoke alarms; and latest products

FIRE DRILL

The latest version of CIBSE Guide E *Fire Safety Engineering* highlights key areas of responsibility for services engineers. MKA Fire MD and Guide E chair **Martin Kealy** reports

The tragic fire at Grenfell Tower, in West London, last month has turned the spotlight on the importance of fire engineering in buildings. The new guide addresses the design of essential life-safety systems to protect building occupants, firefighters, businesses and property, including heritage buildings.

Fire engineering is carried out on premises, including those that – because of the uniqueness of their design – cannot conform to regular building codes. The benefits that fire-engineering alternatives can bring to a design include: increased flexibility; reduction in construction and/or running costs; and measures more suited to the building use.

CIBSE Guide E *Fire Safety Engineering* is intended to be the ‘go to’ document, giving building services engineers and fire life-safety consultants quality guidance on a broad range of fire-engineering issues. It has been significantly updated for 2017 and substantially improved by streamlining the chapters, and will be published this autumn.

The fourth version of the guide has been updated by experienced fire engineers, all of whom practise fire-safety engineering in the UK and

overseas. Many are members of the main fire professional bodies, including the Institution of Fire Engineers and the Society of Fire Protection Engineers.

The guide now includes additional content on international best practice, including from the USA, Canada, New Zealand and Australia. It is widely referenced by government organisations in codes, standards and guidance, including in the UK, the USA, Hong Kong and Australia.

Historically, fire engineering has been associated with building services engineering, and is often part of the building services consultants’ scope of service for a project. The terms ‘fire engineering’, ‘fire protection engineering’, ‘fire and life safety’, and ‘fire safety engineering’ are frequently interchanged and misused, so the guide explains the differences.

The guide has three main uses:

- Design of fire systems, including suppression systems, smoke-control systems, and detection
- Design of fire strategies, such as means of escape, fire compartmentation, and firefighting
- To provide regulatory bodies with a well-referenced and trusted set of internationally accepted design criteria and methodologies to approve fire-engineering designs.

The design of fire systems usually sits with the MEP engineers, and the fire strategies with the specialist fire life-safety consultants.

There is much crossover between building services and fire engineering, and the new framework of the guide has been modified to make this clearer. For example, the sections on fire dynamics and smoke control have been substantially updated, streamlined and simplified. The designer can now access the section on smoke-control system design directly, without having to be sidetracked by issues that are not relevant to their task.

The guide has crossovers with other disciplines, such as architecture and structural engineering. For example, the chapter on fire resistance now includes more practical advice on fire and smoke dampers that aligns with the latest British Standard BS9999. The fire-resistance chapter also contains a new, >>





» but separate, section that addresses structural fire protection. It does not contain structural fire calculations, but sets the framework and points the reader to other detailed references.

What's in the guide

Chapter 1: Introduction

Chapter 2: Legislation

This updated chapter gives a high-level overview on consultation and procedures with the local fire authorities, both in the UK and major overseas geographies, from design to post-completion.

Chapter 3: Building designation

This addresses how buildings are classified, and the implications for design, including a useful checklist.

Chapter 4: Performance-based design principles

This chapter offers information on the basic design principles, including objectives and scenarios. The fire-safety design process is described, and reference made to UK and international documents.

Chapter 5: Application of risk assessment to fire-engineering designs

This chapter has been substantially modified to address business resilience and insurance. Societal concerns and risks to firefighters are also considered.

Chapter 6: Fire dynamics

A basic understanding of the processes that

govern fire and smoke development are offered in this chapter, which also gives techniques for calculating design fires, smoke-production rates, flame heights and fire resistance. It has been simplified and contains new diagrams and equations, which have been updated to reflect the latest research on smoke-control design.

Chapter 7: Means of escape and human factors

This chapter covers the basic principles of designing for escape using traditional code and alternative fire-safety engineering approaches, including evacuation simulation models.

Chapter 8: Fire detection and alarm

This updated chapter covers in detail the design of fire-alarm systems and automatic fire-detection systems.

Chapter 9: Emergency lighting

This chapter provides detailed practical guidance on the design of emergency escape lighting provisions.

Chapter 10: Smoke ventilation

Significantly updated and simplified to bring it up to date and make it more relevant, this chapter describes the objectives of smoke-ventilation systems, such as tenability criteria, and the design of systems and components.

Chapter 11: Fire suppression

This substantially updated chapter contains design guidance on fire-suppression systems within buildings, including automatic sprinkler systems, and foam, gaseous and water-mist systems.

Chapter 12: Fire resistance

Fire compartmentation, fire resistance and maintenance of fire-resisting barriers are covered in this chapter, with additional guidance on fire and smoke dampers. A new section on structural safety fire engineering describes the framework for this alternative approach and references other publications for detailed calculations.

Chapter 13: Firefighting

This chapter has been revised in consultation with the London Fire Brigade and includes references to international practices and codes. It describes principles of firefighting, equipment, fire-department response, vehicle access and water supplies, and addresses firefighting timelines and an alternative fire-engineered approach.

Chapter 14: Fire-safety management

This chapter reflects the importance of the proper management of a building with respect to fire safety. It addresses legal obligations, design, maintenance, fire prevention and planning.

Chapter 15: Fire safety on construction sites

This updated chapter reflects new industry guidance and the responsibilities of designers. It also addresses the use of timber products and timber-framed structures of buildings.

Thanks to the authors of the chapters. Without their dedication, and the time and expertise they have given freely, this new and improved edition of Guide E would not have been produced. **CJ**

■ CIBSE Guides are available on the Knowledge Portal at www.cibse.org/knowledge

■ **MARTIN KEALY** MCIBSE is chairman of CIBSE Guide E Steering Committee and managing director and principal fire consultant at MKA Fire. He has been involved with the guide since its first edition, in 1997, and has written fire sections for the more recent *Buildings for Extreme Environments: Arid and Tropical* guides.

Specifying the right life safety system

The issue of poor and unplanned maintenance for vital life safety fire and smoke control systems is a key concern, which also has potentially fatal consequences. In particular, a number of recent reports have highlighted poorly maintained smoke control systems in some housing association (HA) properties, which have placed tenants at risk.

Recognising the need to raise the standards when it comes to maintenance, SE Controls has launched SECloudlink™, an innovative 'remote services' solution, which provides detailed, around-the-clock system status interrogation. This comprehensive system enables SE Controls' maintenance team to provide planned and corrective maintenance when needed, driven by regulatory demands or by notifications direct from the smoke control system.

Using integrated 4G communications technology, it enables the system to be constantly monitored, as well as allowing any adjustments and tuning to ensure it matches the needs of the building and occupants, whether it is for smoke control only, environmental ventilation or a hybrid of both systems.

This approach not only provides an effective solution for buildings where ongoing maintenance might be an issue, but is also applicable to any building with a smoke control system that requires regular maintenance to the standards demanded by BS9991, BS9999 and BS7346 Part 8, together with Building Regulations ADB; BS EN 12101 and others.

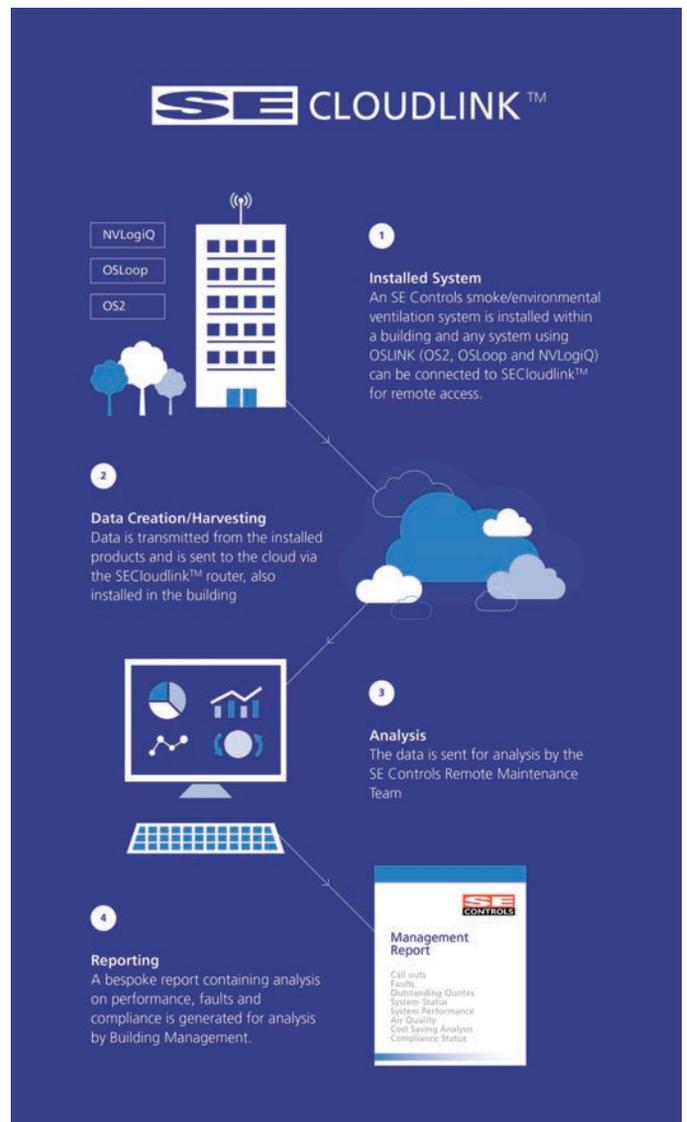
The key benefits of SECloudlink™ remote services include:

- **Proactive management of life safety systems to ensure building compliance**
- **Improved efficiency and budget control, minimising disruption and reducing costs associated with expensive site visits**
- **System performance, including historical data, for individual sites or a portfolio of buildings**
- **Highlight faults and service requirements with fast problem resolution**
- **On-going support with advice and assistance when needed**
- **Management reporting**

Simon North, Service and Maintenance Division Manager with SE Controls, explained: "Once a legally compliant smoke and fire safety solution is installed, the responsibility for planned maintenance and servicing can be overlooked. However, the potential costs associated with reactive maintenance and sending an engineer to site when there is an issue or servicing requirement, begs the question - why wouldn't you want to engage an SECloudlink™ solution?"

The system can also provide significant benefits to contractors, particularly where they are responsible for maintenance on multiple sites, as SECloudlink™ software can monitor every installation remotely where an SE Controls solution has been installed.

Individual rooms can be monitored on a floor-by-floor basis and the system's graphical interface can be configured to notify SE Controls, or the appointed maintenance contractor, when an issue appears. Any alerts or notifications can be immediately interrogated on screen with data logs to show details of the reported event to speed up corrective actions. SECloudlink™ is already in place on several sites where life safety systems are installed and the resulting benefits to landlords have also been significant, although the over-riding benefit



is for the building's residents. If a fire should occur, the system will operate flawlessly and escape routes will be kept clear of smoke, as the alternative doesn't bear thinking about.

Further information on SE Controls' products, solutions and projects can be obtained online from www.secontrols.com, by emailing sales@secontrols.com or calling +44 (0) 1543 443060.

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VAPE OF THINGS TO COME

Smoke detector false alarms cost the UK £1bn a year. Nittan Europe's **Lee James** explains how dual-optical detectors can prevent alerts caused by vaping

Smoking cigarettes in UK public buildings has been banned since 1 July 2007, since when many smokers have developed a new habit – vaping.

E-cigarettes and vapes – which are cheaper and are thought to have fewer health risks than those associated with cigarette smoking – have become very popular. In 2016, sales of e-cigarettes rose by 24% on the previous year, with 2.6 million adults in the UK using them.

While many countries are expected to introduce legislation on the use of e-cigarettes, there are currently no guidelines on where they can, and cannot, be used. However, many organisations – such as public transport providers, hotels and pubs – have banned vaping in their vehicles and premises because of problems such as fires caused by charging equipment and smoke detectors being activated by the vapour given off from vapes or e-cigarettes.

The Frog & Frigate, a pub and music venue in Southampton, has experienced these issues. Although vaping is allowed at the property, owner Derek Gardener says this has not been without its problems, citing incidences when vaping has activated the pub's smoke detectors, leading to disruption of the running of the venue.

Vapes have a cartridge containing nicotine in a solution of either propylene glycol or glycerin and water. When the device is sucked – as a cigarette – a sensor detects the airflow and starts a process that heats the liquid inside. This then evaporates to form a vapour.

Unlike e-cigarettes – which most often resemble traditional cigarettes – vapes come



in all shapes and sizes, and thousands of flavour combinations, from blueberry and marshmallow to single-malt scotch. In an enclosed venue, where several people are vaping simultaneously, they can have the same effect on a smoke detector as steam, leading to false alarms.

Smoke without fire

In the case of The Frog & Frigate, smoke-detector false alarms caused by vaping were becoming a considerable problem. A false alarm happens when the infra-red light technology in the fire-detector system is unable to distinguish between smoke and larger particles, such as steam and dust. However, Gardener was reluctant to ban vaping in his pub, so 'dual optical' detectors were recommended to him by installers Fire and Safety Testing.

Unlike industry standard, single optical-sensor smoke detectors, the dual detectors use 'traditional' infra-red light to 'view' the particles entering the alarm chamber, plus blue LED light technology. By calculating the ratio of these light sources – which operate at different wavelengths – the detector can determine the size of the particles and so distinguish between smoke and non-combustion products. Steam and dust have much larger particles than smoke, so the detector won't false alarm, but will remain sensitive to combustion (fire) products to generate an alarm.

Gardener reports that there has not been a single false alarm at The Frog & Frigate since Nittan's Evolution EV-DP smoke detectors – which use the dual technology – were installed six months ago.

False alarms are one of the biggest issues facing the fire industry, and, according to the Fire Industry Association, cost the UK more than £1bn a year. For businesses and organisations, false alarms not only cause an obvious loss of earnings, but can also impact on the customer experience – so minimising them is a priority for all concerned.

Fire-detector and alarm systems are essential, but no-one should have to put up with false alarms. False alarms, especially from steam, don't have to be a headache. **CJ**

■ For more information, visit www.nittan.co.uk

■ **LEE JAMES** is general manager, sales and marketing, at Nittan Europe



24%

Increase in sales of e-cigarettes in 2016 compared with the previous year; 2.6m UK adults use them

CLEARING THE AIR

Specifiers should not be over-reliant on air-change-rate methods when designing jet fans for car parks. Fläkt Woods' James Allen lists the key factors for a successful design

Those tasked with designing smoke-control systems for enclosed car parks have to consider a variety of factors. Escape routes must be protected, firefighting operations supported, and smoke spread limited as much as possible in the event of a fire.

Jet fans are a tried and tested way of achieving this. For decades, jet-fan systems have enjoyed great success and, as a result, are widely used for car park ventilation and fire protection. But there is a heavy reliance on air-change-rate methods when designing ventilation systems; 10-12 air changes per hour for smoke venting is common practice. This helps meet minimum ventilation requirements, but is insufficient for every scenario when it comes to smoke control.

It is vital to ensure a proposed jet-fan system will not cause smoke to spread, and that firefighters are able to see a fire so they can put it out. However, air-change-rate methods alone cannot comprehensively answer these needs.

There is currently no UK legal requirement for smoke-control measures, but British Standard BS7346 Part 7 – published in 2006 by the UK Smoke Control Association – sets out three design purposes: to assist firefighters to clear smoke from a car park; to give smoke-free access to firefighters to a point close to the fire; and to protect means of escape. While the first purpose pertains to air changes, the latter two relate specifically to smoke control.

Section 10.1.2 of BS7346 Part 7 notes that smoke control should be designed so the extract rate is calculated for the removal of the mass of mixed air and smoke impelled towards exhaust intakes. Yet there is no definitive guide available to demonstrate how to calculate air and smoke flow rates when jet fans are operating.

So when considering a ventilation and smoke-control system for an enclosed



The positioning of jet-thrust fans will be determined in part by the geometry of the car park

car park, the following factors must be considered to arrive at an effective solution.

Identify air-supply and smoke-exhaust locations

It's important to ensure air-supply and extractor points are not placed immediately next to each other. This could cause short-circuiting, whereby air supplied is immediately extracted.

Provision of sufficient escape routes should also be a consideration. In many cases, smoke shafts are placed near stair cores for cost efficiency but – if this is an extract point – it could compromise visibility for evacuees and fire-service personnel. Sufficient stair cores without neighbouring extract points must be made available.

Prepare worst-case scenarios

Understanding the worst-case fire scenarios enables the designer to better plan which fans should be specified and where. The geometry of the space will have considerable influence over the possible smoke mass flow and temperatures produced.

Corner-located fires tend to produce large quantities of smoke and heightened heat intensity, because the corner walls absorb and radiate heat. Furthermore, smoke can only travel away from the corner, so firefighters are likely to have to approach against the smoke flow. A fire at the furthest distance from an extraction point leads to increased smoke production because there is more air with which to mix. If a fire originates on a zone boundary, smoke has the potential to spread to multiple areas.

Another worst-case scenario is a fire backed by a wall – this can lead to increased energy in the smoke, compared with less confined

“Air entrainment into the smoke plume can cause the plume to lean and attach itself to the wall”

areas. Air entrainment into the smoke plume can cause the plume to lean and attach itself to the wall. In this circumstance, the energy in the smoke layer often occupies a hemispherical shape, which can lead to higher smoke velocities.

Create an initial fan layout and zone strategy

A zone strategy should be created in accordance with guidelines in BS7346 Part 7 and those of the fan manufacturer.

The maximum smoke-control zone size is 2,000m² according to BS7346 Part 7, but – in practice – zoning must be dictated by the car park’s geometry and size. Smoke-control

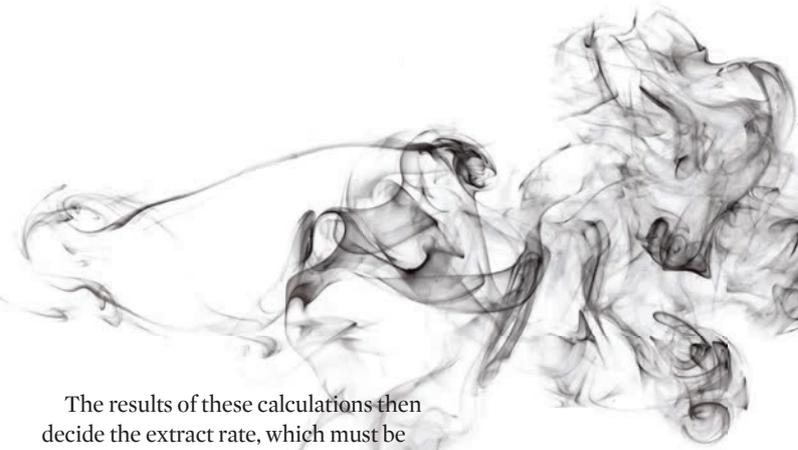
zones should be governed by the location of air supply, and the critical air velocity required to control smoke. Where possible, best practice is to consider extract shafts every 30-40m – which generally constitutes a smoke-control zone. This distance loosely corresponds to recommended travel distances as specified in Approved Document B, so – for most car parks – this should be a practical proposition.

Once the smoke-control zones have been delineated, the initial fan layout can be worked out based on lateral and longitudinal fan-positioning advice from the manufacturer.

The fan type and model can also be determined at this stage, taking into account the worst-case scenarios that have been identified. For example, potential risk areas – such as corners, walls and partial enclosures – may need fans with higher thrust.

Removing flow of smoke and air at extraction points

To ensure that the flow of smoke and air is removed effectively, the number of jet fans and the mass flow they generate – plus the total maximum smoke mass flow – must be balanced with the mass flow of air and smoke extracted. To determine this, a set of mass-flow balancing calculations must be completed, in addition to an estimation of the critical smoke velocity. For details, Fläkt Woods can issue a copy of its technical paper #0410.



The results of these calculations then decide the extract rate, which must be greater than the highest of either the induced smoke and air mass flow or the critical velocity.

Use modelling methods

Commercial and open-source technological advances – plus the availability of computational fluid dynamics (CFD) modelling on the cloud – mean the practice is more affordable than ever. The time investment may seem daunting, but the long-term benefits of using CFD modelling more than compensate for the initial set-up.

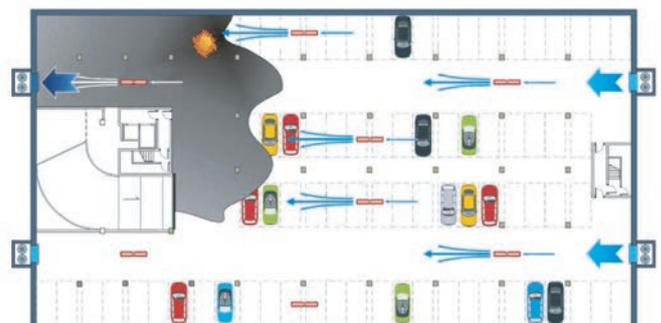
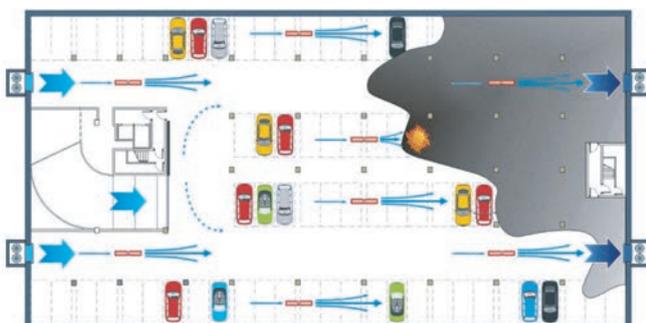
Unfortunately, many projects wait until a point at which the results of the model mean difficult adjustments to an already meticulously detailed plan – which could vastly outweigh the cost of earlier modelling.

Smoke-control systems should always be CFD modelled to verify calculations; if done at an early stage, this can save time and money further down the line.

It is crucial that fire-engineering consultants and specifiers bear smoke control in mind from the earliest stage possible when designing a larger car park. By considering the necessary factors at this point, required ventilation rates can be reduced, supplying safer systems and ensuring increased protection for firefighters and building contents. **CJ**

■ Visit www.flaktwoods.co.uk for more information

■ **JAMES ALLEN** is senior fire-design and CFD engineer at Fläkt Woods



Artistic impressions of how jet thrust fans contain smoke within zone boundaries and provide visibility for the fire brigade of at least 10 metres upstream of the fire

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F-Gas regulations prompt R32-compliant systems

■ R32 has a global warming potential that is three times lower than R410A

The F-Gas Regulations will have a major impact on those who use, commission, design, install or maintain air conditioning. Options for the next generation of refrigerant gas must meet the demands of this legislation in reducing the environmental impact of hydrofluorocarbons (HFCs), and many manufacturers are stepping up to the task with new R32-compliant products.

The recently revised F-Gas Directive encourages the use of refrigerants with a global warming potential (GWP) of less than 750 in single-split systems with a charge less than 3kg. As well as having a lower GWP, R32 can deliver a capacity equal to R410a with a 30% smaller refrigerant charge. As a result, total carbon dioxide (CO₂) emissions can be reduced by around 77%.

Mitsubishi Electric has released the next-generation Mr Slim power inverter with R32-compliant features. The compact system meets European Union F-Gas Regulation legislation, helping to lower CO₂ emissions.

Clients can choose from a range of sizes – from 3.5kW to 14kW – with 35 system combinations, including 10 new outdoor units and 25 new indoor units, available as ceiling cassette, ducted, wall-mounted and ceiling-suspended types. Longer pipe runs of up to 100m ensure flexibility, too.

Toshiba's new generation of air conditioners also operate on the reduced GWP refrigerant R32. It is used in the firm's Mirai range of residential, wall-mounted air conditioning split units, launched last May, available in capacities from 1.5kW to 4.5kW.

David Dunn, Toshiba director and general manager, said: 'R32 is classified as slightly flammable under certain, specific conditions. However, after thorough testing and evaluation, it is now widely accepted within the industry that – as long as good practice is followed – any risks are exceptionally small and can be managed.'

Toshiba said it has been producing R32 units for the Japanese market since 2014 and more than 225,000 units



have been installed without incident. Across all manufacturers, there are more than five million R32 units installed in Japan alone.

The new range features dustless operation – thanks to a special coating on the cooling coil – a larger heating capacity, and quiet operation because of a 13% increase in fan size.

Eliminating fire risk

Toshiba units are designed to eliminate potential sources of ignition, and are equipped with brushless motors and a power relay instead of contactor. To reduce flame propagation, both indoor and outdoor units have fireproof steel enclosures surrounding the electrical systems.

For installers and service engineers working with R32, the refrigerant is classified as flammable and needs to be handled accordingly. Correct procedures are explained in the Hydrocarbon Safe Handling Course, which is a top-up on the standard F-Gas qualification.

Toshiba also advises technicians to inform their insurance company and check that tools – such as vacuum pumps and recovery systems – are suitable for use with R32.

With the launch of its new R32-based Sky Air A-series range, Daikin UK has also expanded its air conditioning portfolio.

Easy onsite installation is ensured, said Daikin, with lighter units, longer pipe runs, and the inclusion of pre-charged pipe runs – which it said also ensures that additional gas is not required for runs shorter than 40m.

Daikin claimed its products are ideal for light commercial applications, including restaurants, retail stores and small offices, the range offers a leak-check function and quiet operation, with the Alpha unit operating at just 46dB(A).

Why use alternatives

In March 2014, the European Parliament passed the EU F-Gas Regulation legislation. The objective was to reduce F-Gas emissions by 79% between 2015 and 2030, by cutting the availability of hydrofluorocarbons (HFCs) with a high global warming potential (GWP).

Already making up 50% of the existing R410A refrigerant found in many current air conditioning systems, R32 has a GWP of 675 – one third that of R410A – and is energy efficient and easy to recycle. In addition, the volumetric capacity of R32 is around 20% higher than that of R410A, which means system refrigerant volumes are lower.

Panasonic VRF selected for Soapworks project



Leaving air temperature of 16°C ensures efficiency, said supplier

Panasonic's variable refrigerant flow (VRF) system has been chosen for the sustainable and low-carbon regeneration of the Soapworks in Manchester.

Originally home to Colgate-Palmolive in the 1800s, the Salford Quays site – owned by global asset management company The Carlyle Group and joint venture partners Nikal and Abstract Securities – is being developed into a modern office spanning 400,000ft². Confirmed occupiers include TalkTalk, MWH Global and the Home Office.

Because of the structure and historic features within the building – including a vaulted ceiling – conventional building services hidden above a false ceiling were rejected. Instead, a system was chosen that could be installed under the floor, while supporting Soapworks' sustainability goals, including a B-rated Environmental Performance Certificate.

Distributors the Intelligent Comfort Group (ICG) said it specified Panasonic's 3-Pipe ECOi MF2 Series because of its adaptable design, energy-saving attributes and simultaneous heating and cooling capabilities. With adequate underfloor space available, MF2 variable static pressure units – usually fitted into the ceiling – were installed under the floor. Bespoke grills, evenly distributed throughout the space, allow the warm air to be dispersed around the room.

The system could also guarantee consistent leaving-air control of 16°C – the ideal temperature for warm air to rise and distribute effectively, for a comfortable environment, without using additional energy. Energy recovery ventilation (ERV) units also offer variable heating and cooling at the same time, ensuring warm air can be extracted and distributed to other areas of the building. This supports the project's sustainability objectives and modern office standards for energy efficiency.

Rise of near-zero GWP refrigerant

Trane, supplier of indoor comfort solutions, has announced that its entire European portfolio of water-cooled XStream and air-cooled Sintesis chillers now includes a next-generation refrigerant with near-zero global warming potential (GWP).

Trane, an Ingersoll Rand brand, offers a combined portfolio of screw compressor chillers and high- and low-speed centrifugal chillers with Honeywell Solstice ze (R-1234ze) – a near-zero GWP refrigerant.

The new solutions – part of the EcoWise portfolio of products – are designed to lower their environmental impact. The portfolio featuring R-1234ze refrigerant consists of chillers designed for medium-capacity applications between 240kW and 14,000kW.

As well as helping building owners and operators to earn Breeam points, the new chillers could enhance the heating capabilities of HVAC systems because the full heating capacity can be delivered at 85°C. This allows operators to increase the sustainability of their operations by expanding the application field for the use of renewable energy.



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Assessing the risks of refrigerant ignition

New research analyses leaking, ignition and flame-spread of A2L refrigerants

New research has found that although A2L refrigerants have a relative low burning velocity, there is rapid flame spread under many observed conditions.

The paper *Benchmarking risk by whole-room scale leaks and ignitions testing of A2L refrigerants* found that in certain confined refrigeration equipment – such as walk-in coolers – medium or large leaks can cause refrigerant accumulation of the heavier-than-air refrigerant, and flammable concentrations can be reached fairly easily. A cursory evaluation of hazard-mitigation systems suggests refrigerant-detection systems will need a faster response time than 30 seconds.

The authors Pravinray Gandhi, George Hunter, Randall Haseman and Brian Rodgers conducted refrigerant-leak and ignition testing under whole-room scale conditions to develop data and insight into the risks associated with the use of Class A2L refrigerants – such as R-32

and R-425B (with GWPs of about 675) – versus the Class 1 refrigerants currently in use, such as R410A (GWP of 2,088).

A2L refrigerants meet all the requirements of a '2' safety classification in ASHRAE Standard 34, but have a burning velocity of less than 10cm/second.

Several scenarios were considered, involving

tests that would be outside of proposed standards – for example more refrigerant was leaked into the space without mitigation, such as ventilation, proposed by the standard. Two are particularly relevant to building services applications: packaged terminal air conditioner (PTAC) unit in a motel room and split HVAC unit with evaporator section in a utility closet.

The PTAC test emulated the release of refrigerant from the evaporator into a motel room, with ignition devices representing sources that could be expected to occur. One test, using R-452B, resulted in a low-energy ignition near the PTAC power-cord plug lasting no more three seconds. Another test placed electric arcs directly in front of the PTAC in the refrigerant discharge zone. This resulted in ignition of the refrigerant.

In internal leak tests for the split HVAC unit in a utility closet both R-32 and R-452B refrigerants ignited in the hallway in less than 12 seconds in proximity to the return grill, where pilot flame and electric arc sources were located. There was some spread of flame along the hallway.

Read report at bit.ly/CJJul17report

Selected findings

- The low burning velocity of 2L refrigerants fails to prevent rapid flame spread under many conditions observed. Moreover, ignitions can occur even when local air velocity is much higher than the laminar burning velocity, though this could be related to ignition source energies used.
- Cursory evaluation of hazard-mitigation systems suggests refrigerant-detection systems will need a response time faster than the 30 seconds originally envisioned.

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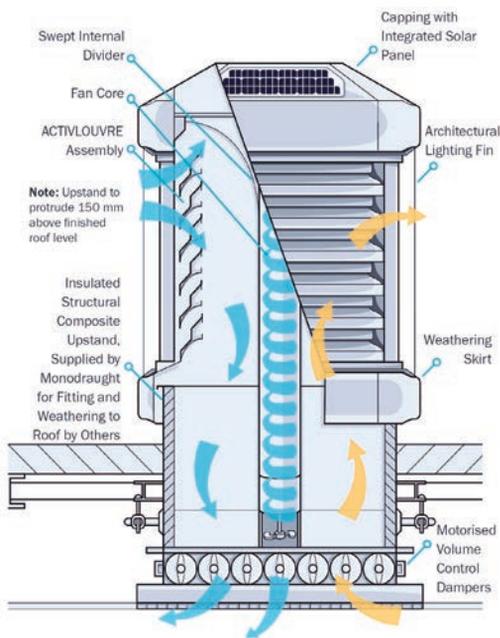


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Monodraught were specified as a natural ventilation solution as part of the recent refurbishment of **Eton College Boathouse** function room.

4 N° SOLA-BOOST X-Air Systems were installed in the conference area and ensure that the area is kept cool even when the room is fully occupied.

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Determining thermal comfort in naturally conditioned buildings

This module considers newer methods of assessing the comfort of occupants in naturally conditioned buildings, and explores how this relates to the current standards for evaluating thermal comfort

How comfortable people feel in a building plays an important role in how that space is appreciated – and it is increasingly likely that smart investors will seek ‘future-proofed’ buildings that are ready for warmer climates, are well-liked by their occupants, and that offer affordable running costs. The traditional methods for assessing thermal comfort were developed to meet the needs of designers of mechanically conditioned buildings. Increasingly, the opportunities offered by mixed-mode, hybrid or naturally conditioned buildings are provoking a rethink of the applicability of the traditional, deterministic methods.

Designing for comfort

Different people can be thermally comfortable at very different temperatures because of their individual thermal histories and expectations. Comfort is influenced by personal and cultural assumptions – plus a cocktail of other variables – so it is impossible to predict precisely at what temperatures individuals will be comfortable.

In recent years, the quest for sustainability has become more prominent, with different and potentially conflicting factors introduced. Fabric improvements – including more insulation and improved building airtightness – have been adopted, alongside technological developments that have resulted in the growing use of combined heat and power (CHP), heat pumps and heat-recovery systems. Together with the greater focus on ‘environmental ratings’, this technological evolution could be thought of as potentially deflecting attention from the consideration of a building’s ability to perform adequately in meeting the temporal variations in external temperatures and solar gains. As a consequence, the problems of overheating in inappropriately conceived buildings have led to the growing use of fans and mechanical cooling systems – with a consequent impact on energy consumption.

The quest for a robust and usable standard for comfort has been documented at least since David Boswell Reid experimented in the early 1800s¹ and, latterly, with Thomas Bedford’s seminal work in the mid-1900s. The vocabulary for ‘comfort temperature’ morphs with each scrutiny, and ‘operative temperature’ is currently the accepted term, for which there are various abbreviated symbols (including T_{comf} , t_c , t_o , θ_o and θ_c). CIBSE uses θ_c .

There are two principal approaches used by designers to establish what constitutes a suitable environment in buildings and how to establish appropriate comfort temperatures – the ‘heat-balance model’ and the ‘adaptive thermal-comfort model’.

Heat-balance model

Developed in the last century, this model has traditionally been used by systems designers and modellers for buildings that rely on comfort being delivered through predominantly mechanical systems. Heat-balance models rely on a knowledge of the heat flows between the body and the environment.



» The key is that, thermally, to maintain an acceptable heat balance for a particular person requires heat transfer by convection, conduction and radiation, and so will be determined by the air dry-bulb temperature, surrounding surface temperatures and air movement. It is not possible to predict these variables accurately, as they are contextually dependent not only on the occupants, their activities and acclimatisation, but also on the physical context of the modelled system – such as reflected solar gain, velocity of air, exposure of the site and variability of external climate as the weather changes. Particularly challenging in such calculations is the impact of potentially open windows.

The best known of heat-balance models is the predicted mean vote (PMV), developed by Ole Fanger.² The PMV model is particularly important because it provides the basis for many commonly used national and international comfort standards. Its application can be inappropriate in naturally ventilated and mixed-mode buildings, and inflexible when used in conditioned buildings with multiple zones that are ‘thermally landscaped’ to save energy without affecting occupant comfort – for example, where significantly different controlled temperatures are used for corridors and toilets compared with non-transient areas.

Adaptive thermal-comfort model

People are actively engaged – and constantly working to keep themselves comfortable – in all buildings, whether they are naturally ventilated or air conditioned. People adapt to stay comfortable in a variety of ways.³

Physiologically: The body is constantly making subconscious adaptations to maintain its core body temperature of 37°C.

Behaviourally: This can be conscious, semi-conscious or subconscious. Examples include changing clothing, opening/closing windows, blinds or curtains, and using local heaters or fans.

Psychologically: This includes issues of expectations around the cost of energy, personality, status, ethical standards and control.

Adaptive comfort is measured in field surveys by asking people in buildings how comfortable they are on scales such as the BS EN ISO 7730 or Bedford – as illustrated in Table 1. The results of such surveys are then analysed statistically, to estimate the temperature at which the average survey participant will be comfortable. A useful elaboration on the application of comfort scales as survey tools can be found in BS EN ISO 10551 *Ergonomics*

BS EN ISO 7730 comfort scale (also used by ASHRAE)		Bedford comfort scale	
+3	Hot	7	Much too hot
+2	Warm	6	Too warm
+1	Slightly warm	5	Comfortably warm
0	Neutral	4	Comfortable
-1	Slightly cool	3	Comfortably cool
-2	Cool	2	Too cold
-3	Cold	1	Much too cold

Table 1: BE EN ISO 7730 and Bedford comfort descriptors. The idea of ‘comfort’ is absent from the 7730 scale: people voting between -1 and +1 on this scale are generally assumed to be comfortable, and those voting +2 or +3 to be uncomfortably hot (Source: developed from CIBSE TM52, Table 1)

of the thermal environment. Assessment of the influence of the thermal environment using subjective judgement scales.

Recognition of the contribution and importance of this dynamic relationship between occupant and building underpins the adaptive comfort approach. The adaptive thermal-comfort model was initially developed to offer a more appropriate interpretation of the needs of low-energy and naturally ventilated buildings, and is recognised by CIBSE as being the appropriate method for undertaking such analysis.

Standards of comfort

These are the principal standards that are currently applied when considering comfort in buildings:

BS EN ISO 7730:2005 Moderate thermal environments – Determination of the PMV and PPD indices and specification of the conditions for thermal comfort

ISO 7730 sets out the heat balance comfort calculation and use of the predicted mean vote/predicted percentage of dissatisfied (PMV/PPD) index, as well as including some criteria for local comfort. The standard refers to ‘classes’ or categories of buildings according to the range of PMV that occurs within them. Category A buildings – with a notional PPD<6% – maintain their indoor environment within a very tight band of acceptable temperatures; practically, this could be regardless of whether a building is truly comfortable as determined by its particular occupants.

ASHRAE Standard 55:2013 Thermal Environmental Conditions for Human Occupancy

When ASHRAE 55 is applied to buildings with mechanical heating or cooling, it is similar to ISO 7730 in that it is based on PMV. The standard also defines acceptable thermal conditions for occupant-controlled, naturally conditioned spaces, where 80% to 90% of the building occupants might expect to find the conditions acceptable based on a comfort equation using a band of conditions centred on... $\theta_c = 0.31 \cdot \theta_{pma} + 17.8^\circ\text{C}$

θ_c is the nominal operative temperature (for comfort) and θ_{pma} is the prevailing mean outdoor air temperature (this is described more fully in section 5.4 of Standard 55, but is normally a ‘running mean’ temperature). For 80% of the occupants being satisfied, the limits are $\theta_c \pm 3.5\text{K}$, and to satisfy 90%, $\theta_c \pm 2.5\text{K}$.

BS EN 15251:2007 Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics

BS EN 15251 uses categories for buildings (I, II and III) that are defined by the nature of the building rather than referring directly to the quality of its indoor environment. The adaptive standard defines acceptable values of the indoor operative temperature according to deviation from an operative temperature, θ_c , defined by the equation...

$$\theta_c = 0.33 \cdot \theta_{rm} + 18.8^\circ\text{C}$$

where θ_{rm} is the exponentially weighted running mean of the outdoor temperature, which would normally be representative of at least the previous 10 days.

CIBSE recommends that ‘free-running’ buildings – those without mechanical heating or cooling – should conform to Category II (as shown in Figure 1), which sets a maximum acceptable temperature of 3K above the nominal comfort temperature. In summer, for most ordinary, free-running buildings, people can be considered to be comfortable indoors within a fairly wide temperature band over a day – varying by up to 8K – with the opportunity to open windows to facilitate year-round natural cooling. The very action of increasing the air speed from 0.1 to 0.6m·s⁻¹ would increase the operative temperature for comfort⁵ by 2K.



Figure 2: Shading reduces solar gain in this thermally slow response building and windtowers provide an unobtrusive method to enhance natural ventilation ©Michael Franke



Figure 3: The Eton College boathouse incorporates four windtowers with integrated solar-powered fans. The natural ventilation brings a steady supply of outdoor air into the conference area, so maintaining good levels of IAQ (Source: Monodraught)

Naturally conditioned buildings to meet the demands of occupant comfort

When using natural systems, indoor temperatures may fluctuate considerably over a day and across the seasons, but numerous studies have shown that occupants who are given local control are satisfied with a far wider range of comfort temperatures if they can negotiate, implement and accept conditions themselves.

The three main drivers for the climatic design of an individual building on a particular site are the wind, sun and rain. It is important that the whole design team considers the influence of the building shape and orientation by early review of sun paths and wind patterns, to maximise useful energy across the seasons, while avoiding overheating and excessive energy use. Buildings that are characterised as having a ‘slow’ thermal response are more able to maintain an internal environment where the temperature will not change too rapidly over the course of a day. (See CIBSE Guide A Section 5.6.4 for an explanation of thermal response.)

Materials that store heat accessibly in the building fabric can time-shift the energy flow so that it can be used internally when needed, rather than removing it from the building. Typically, buildings – such as that shown in Figure 2 – will benefit from being oriented towards the midday sun with appropriate structural shading and without excess glazing, and be constructed so as to allow for dumping excess heat via single-sided, cross or stack ventilation.

By understanding and using microclimate data in and around the construction, the building can be ‘landscaped’ into different temperature zones. In buildings

such as the Eton Boathouse (Figure 3), thermal landscaping should take account of where ‘pools’ of heat or coolth existing around a building can be harvested, when necessary, to enhance the comfort of people indoors. For example, in conference centres, natural ventilation can be used to circulate fresh air around seated occupants to improve the concentration and focus of delegates, with optimum CO₂ levels maintained. However, the sourcing of that airflow is also thermally critical.

Buffer spaces should be designed to protect against extreme thermal exposure, so giving an opportunity to decouple outside and inside temperatures.

Even if the building is already in operation, in a warming climate it is inevitable that more work will have to be done to maintain acceptable indoor conditions. Occupants should be encouraged – and educated – to take simple actions themselves and with their buildings to achieve more comfort. This can be as straightforward as adjusting clothing, opening windows, operating shutters, controlling shades and enabling people to move around spaces. In many cases, local mechanical systems can be applied ad hoc, to reduce peaks in heat/cold-stress.

The field of comfort is now recognised as a foundation stone in the design of low-carbon buildings, and fundamental for the enhancement of wellbeing, productivity and tolerance of occupants. An understanding of the principles of adaptive comfort is essential in designing and realising such buildings.

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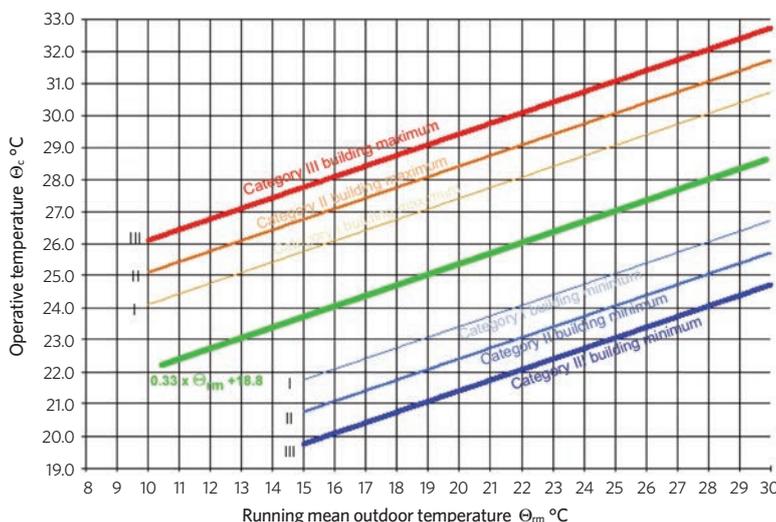


Figure 1: Acceptable operative temperature ranges for free-running, naturally conditioned spaces (Source: developed from BS EN 15251⁶)

This article was developed from a paper by Professor Sue Roaf, director at Low Carbon Cities Initiative.

Turn to page 52 for further reading and references. >>

» Module 113

July 2017

1. What symbol is currently adopted by CIBSE for operative temperature?

- A t_c
- B T_{comf}
- C t_o
- D θ_c
- E θ_o

2. What is the approximate core temperature that the human body attempts to maintain?

- A 31°C
- B 33°C
- C 35°C
- D 37°C
- E 39°C

3. On the Bedford comfort scale, what would be considered as comfortably cool?

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

4. For a category II free-running building, what is suggested as the acceptable upper limit of operative temperature when the running mean outdoor temperature is 25°C?

- A 26°C
- B 27°C
- C 28°C
- D 29°C
- E 30°C

5. Which of these is not advocated as a means of delivering thermal comfort in naturally conditioned buildings?

- A Designing buildings to be thermally lightweight
- B Educating occupants to adjust themselves
- C Employing thermal buffer spaces
- D Harvesting external heat and coolth
- E Operating windows and shading devices

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Further reading:

Sections 1.3 and 1.4 of CIBSE Guide A 2015.

CIBSE's TM52, *The limits of thermal comfort: avoiding overheating in European buildings.*

CIBSE Knowledge Series: KS16 *How to manage overheating in buildings - A practical guide to improving summertime comfort in buildings.*

Short, A, *The Recovery of Natural Environments in Architecture: Air, Comfort and Climate*, Routledge 2017.

www.usablebuildings.co.uk

References:

- 1 Schoenefeldt, H, Question time: Boswell Reid's pioneering work on occupant evaluation in the Houses of Parliament, *CIBSE Journal*, September 2016.
- 2 Fanger, P O, *Thermal Comfort*, Danish Technical Press, 1970.
- 3 Humphreys, M et al, *Adaptive Thermal Comfort: Foundations and Analysis*, Routledge 2016.
- 4 BS EN 15251:2007, *Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics*, appendix A2.
- 5 CIBSE Guide A, 2015, Section 1.3.1.1.

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✓ Cooltherm equips Cardiff University with high-efficiency Mitsubishi chiller



Cooltherm was selected to design bespoke full turnkey chiller plant to ensure the most efficient and low-carbon system was installed at Cardiff University.

Cooltherm's project team back-engineered the existing system and regrouped all the data, to ensure the design was as efficient as possible and the performance of the system was maximised. The chiller was feeding 13 indoor fan coil units located within the third-floor laboratories, as well as an air handling unit cooling coil.

The Mitsubishi E-Series chiller has highly efficient, scroll-compressor technology - using only 5% of a conventional chiller's starting current - equipped with a soft-start device. The starting current of 8 amps is the key feature of the low-carbon emission machine, and is anticipated to save the university £4,000 a year on energy costs. A conventional chiller would have an average starting current of 180 amps.

■ Call 0117 961 006,
email enquiries@cooltherm.co.uk or
visit www.cooltherm.co.uk



✓ Alpha heats care centre

When it was time to upgrade the boilers at Meadowlark Care Centre, in Forres, Morayshire, Martin Annal, of CHES, recommended Alpha Heating Innovation to maintain thermal comfort with an efficient heating solution. Annal specified two Alpha ProTec Plus 50 boilers with header kits, mixing pots and weather compensating controls for the two plantrooms. Featuring a cascade manager, the system can adapt to changing demands easily and efficiently.

■ Visit www.alpha-innovation.co.uk



✓ Condair's new dehumidifier range offers custom units

The new Condair dehumidifier range covers desiccant and condensing technologies, with extensive standard capacities from 0.5kg/h to 182kg/h (at 20°C/60%RH). Custom units, capable of even greater dehumidification, or of operating under specific or extreme environmental conditions are also available.

Condair desiccant dehumidifiers use a silica-coated sorption rotor to absorb moisture. This technology is ideal for low-temperature conditions, or applications that require dry air, below 50%RH.

■ Visit www.condair.co.uk

✓ Luceco's Ice

Recent additions to the LED commercial luminaire range from Luceco include Ice Linear and the decorative Ice Circular.

Contemporary and stylish, Ice Linear is a transparent optic pendant luminaire that ensures both upward and downward light distribution. Supplied with adjustable wire suspensions, Ice Linear delivers an enhanced lit effect, while the sleek transparent design complements modern interiors even when turned off.

Ice Circular is an alternative aesthetic luminaire for ambient lighting, with 50,000 hours of efficient operational life.

■ Call 07890 320 152 or
email Zoe.nh@luceco.com



✓ Swep delivers to Oxford Westgate shopping centre

Swep, a supplier of compact brazed-plate heat exchangers (BPHEs), has provided 79 of its gasket-free BPHEs for the 800,000ft² Westgate Shopping Centre in Oxford.

The BPHEs cover a range of 25kW to 750kW load at 1K log mean temperature difference (LMTD), and the AHRI-certificated models have each passed a performance test completed by a third-party test facility.

The shopping centre is being developed by Land Securities and The Crown Estate.

■ Call +46 (0)768 908115, email Christer.frennfelt@swep.net or visit www.swep.net



✓ New generation of sliding-door mechanisms ideal for interior use

Geze UK has enhanced its range of manual sliding-door mechanisms, with the addition of the Rollan 40 NT, the Rollan 80 NT and the Rollan 80 NT SoftStop - a new generation of fittings, ideal for interior use.

They boast a smooth and simple operating action, are easy to fit and quiet to use. The systems can be used on doors weighing up to 40kg (Rollan 40 NT) or 80kg (Rollan 80 NT), and with any door material - wood, plastic, metal, and glass with clamped fittings.

■ Call 01543 443 000, email info.uk@geze.com or visit www.geze.co.uk

✓ **Safety first – it's no accident**

Family-owned and run air movement specialist Gilberts (Blackpool) has just completed its second accident-free year. The achievement comes despite enhanced and more proactive reporting and managing procedures across the 93,500ft² factory and warehouse, which spans two sites on opposite sides of a road. Gilberts is a heavy user of aluminium, steel and dyes for processing metal, and operates metal presses, transport buggies and forklift trucks.

■ Call 01253 766911 or email info@gilbertsblackpool.com



✓ **Mikrofill at Aureus school**

Aureus School is a science, technology, engineering and maths (STEM) specialist mixed school that creates choice for the wider community in Oxfordshire.

Established services contractor J & B Hopkins was appointed as the mechanical and electrical contractor for the school's new build works. Domestic hot water requirements were covered by the installation of two Mikrofill Extreme 500-litre loading cylinders.

The Extreme is a hot-water generator that combines the advantages of an instantaneous hot-water heater and a storage system, creating harmony between a condensing boiler and a hot-water cylinder.

Each stainless steel, unvented loading cylinder can produce more than 2,500 litres per hour and 845 litres in a 10-minute peak period at 60°C. A Mikrofill 1,000/2 pressurisation package was installed to unvent the indirect low pressure hot water (LPHW) circuits.

■ Call 03452 606020 or visit www.mikrofill.com



Lochinvar upgrades EcoKnight water heaters

Boiler and water heater manufacturer Lochinvar has revamped its popular EcoKnight range of gas-fired, condensing water heaters, adding a number of enhanced control functions.

EcoKnight water heaters are available in eight models with hot water outputs of between 709 to 3,819 litres per hour based on a temperature rise of 50°C. As circulating-type water heaters, they give higher hot-water recovery rates than traditional storage equivalents. This makes them suitable for a variety of medium to large commercial projects, as well as some industrial applications.

Fast recovery hot water is generated in the high-efficiency grade, 316-litre, stainless steel heat exchanger, which also offers superior corrosion resistance. The hot water is then 'circulated' to a storage vessel or a series of storage vessels.

It is possible to install a wide range of multiple water heater and storage vessel combinations, providing maximum design and installation flexibility.

■ Visit www.lochinvar.ltd.uk



◀ **Holophane wins Queen's Award for Enterprise: Innovation 2017**

Milton Keynes-based lighting manufacturer Holophane has been awarded a Queen's Award for Enterprise in Innovation, in recognition of its lighting product development. This prestigious accolade is given to British businesses that excel at innovation, sustainable development or international trade, and is the highest official UK honour for British companies. Managing director Alasdair McRury said: 'This is a major endorsement of our outstanding team of research engineers, who enable us to compete globally with industry-leading technology.'

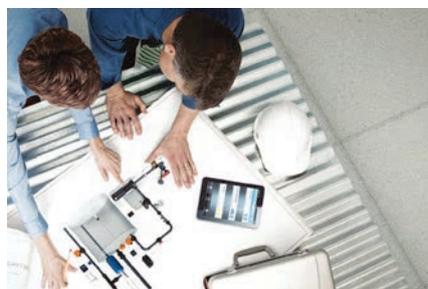
■ Call 01908 649 292, email info@holophane.co.uk or visit www.holophane.co.uk



✓ **BIM boost for George Fischer's EcoFIT range**

GF Piping Systems has taken a step towards facilitating the use of building information modelling (BIM), by adding the EcoFIT range to the products available to specifiers in the 3D format. The move will enhance GF's attraction for architects and engineers across the construction industry, especially those involved with public sector and high-specification commercial developments, such as the landmark tall buildings currently planned for major cities round the country.

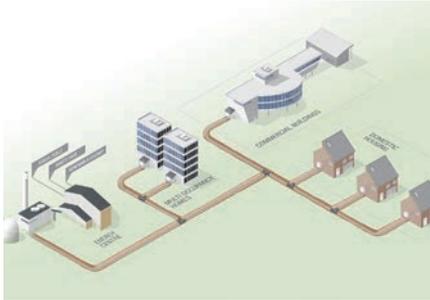
■ Call 024 7653 5535, email uk.ps@georgefischer.com or visit www.gfps.com/uk



▲ **Old meets new – historic St Paul's Cathedral gets Hamworthy makeover**

St Paul's Cathedral has been standing on Ludgate Hill, London, for more than 300 years ago. As a Grade I-listed building, its structure is subject to strict regulations, prohibiting alterations without special permissions. When the cathedral was faced with failing boilers, the challenge to replace them was met by British commercial heating and hot-water specialist Hamworthy, which supplied a modular boiler system and two high-performance calorifiers.

■ Call 01202 662 516 or email pr@hamworthy-heating.com



Hot tapping innovation for district heating pipes

Rehau has launched Nexus, the world's first system for hot tapping PE-Xa district heating networks. Rehau Nexus makes it possible retrospectively to extend an existing heat network - or add ventilation or measuring point to a district heating system - using Rehau orange PE-Xa pipes. In the past, hot tapping was only possible with polymer pipes in cold water and gas mains, and with steel district heating pipes.

Call 01676 526568 or email rehau@cgent.co.uk



Big Foot Systems offers Safe Access to German university

Zemos Research Building, at the Ruhr University Bochum, in Germany, has been supplied with a Safe Access solution by Big Foot Systems. The system allows a secure route for service engineers to gain access to plant, and to manage the flow of other personnel. '3D models of each design scenario were created. Our technical team was then able to design a custom solution for each location, which was followed by a final site survey,' said project engineer Jake Quintel.

Call 01323 844355 or email enquiry@bigfootsupport.com



Vent-Axia helps UK Green Building Council beat records

Vent-Axia has installed its Lo-Carbon T-Series fan in windows and a partition wall as part of an office refurbishment for the UK Green Building Council (UK-GBC). The aim was to challenge industry thinking about what is achievable in a small-scale fit-out, and the project has achieved the lowest recorded embodied carbon footprint for an office refurbishment in the UK - 22% below a comparable 'standard' fit-out.

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



Swegon's Zeta Rev heat pump goes extreme

Swegon's new Blue Box Zeta Rev HP XT - with capacities ranging from 40kW to 200kW - was designed to operate at the sort of extreme ambient temperature limits with which conventional heat pump units simply wouldn't be able to cope - right down to -20°C ambient.

To help it withstand such punishing conditions, the Zeta Rev HP XT comes with the latest injection technology, enabling it to deliver temperatures up to 65°C, capable of producing domestic hot water. It also results in a higher efficiency heat pump with a seasonal coefficient of performance (SCOP) of A+ that meets the 2017-19 EcoDesign targets.

The Zeta Rev HP XT uses the latest generation of Blue Think controls, which have an integrated web server that allows easy remote monitoring, building management systems integration and sequencing for multiple units. With optional Smartlink, it can communicate seamlessly with Swegon's Gold air handling units, for further energy savings.

Visit www.swegon.co.uk



HygroMatik launches website to meet growing industry demand

HygroMatik has created a new website - designed with the customer in mind - which will help to deliver a smooth and enhanced platform that is user-friendly, with advanced navigation and functionality. As a manufacturer and supplier of commercial air humidifier systems, HygroMatik's new site had to match the company's clean image, while giving users extensive information relating to new products, services and parts, and help with the specification process.

Call 02380 443 127, email info@hygromatik.co.uk or visit www.hygromatik.com



Wimbledon continues to serve up excellence

When eyes turn to the Wimbledon tennis championships each summer, the focus is on the players - and the excitement of the matches - as we follow their progress through the various stages of the tournament. But behind the scenes is an army of hidden supporters that are equally as important to this grand slam event - including a wide range of Grundfos pumps.

A recent new arrival is a six-pump Grundfos Hydro MPC-E booster set, which will help to support the latest part of the Wimbledon Master Plan. This includes the development of a roof over Court One, extra seating and a new public plaza. Delivering the required amount of water to where it is needed - and when - is crucial, but even more so at an iconic event where the spectators, between them, drink 330,000 cups of tea and coffee each year, and consume 140,000 servings of strawberries and cream.

Call 01525 850 000, email grundfosuk@grundfos.com or visit www.grundfos.co.uk

✓ **Viessmann's new Vitocrossal 100: the exceptionally compact floor-standing commercial boiler**

Viessmann is introducing a new compact commercial boiler, the Vitocrossal 100, for buildings where plantroom space is limited, such as offices and schools. The Vitocrossal 100 has an exceptionally small footprint, thanks to its innovative stainless steel heat exchanger; the smallest available version measures just 450mm. It is also the first floor-standing, gas-fired condensing boiler on the market to feature Lambda Pro technology, for optimum performance and efficiency.

■ Visit www.viessmann.co.uk



EOGB launches Heating Health Check service ✓

Commercial heating specialist EOGB Energy Products is offering companies and organisations a new service that aims to help save them money on heating bills.

The Heating Health Check involves a specialist EOGB engineer visiting a site and carrying out a full boiler and plant inspection, to check current efficiency performance. An analysis of the boiler combustion process is performed and the customer receives a full report, with recommendations and estimated savings based on their current fuel tariff. The report outlines what savings can be made with either basic plant adjustments or upgrades to the burner or controls. It also addresses the payback period by offering a full illustration of the timescales involved.

EOGB is an expert on gas, oil and dual-fuel heating systems for all types of commercial buildings and industrial process applications.

■ Call 01480 477066, email technical@eogb.co.uk or visit www.eogb.co.uk



Fan coil unit that requires no onsite commissioning >

The next generation of pressure-independent control systems has been announced by Advanced Air. The firm has entered into a special agreement with Belimo and Advanced Air's control specialist to design and develop an amazingly simple EPIV/Delta control package.

The EPIV/Delta means the fan coil unit can be pre-commissioned in the factory, with the set points for water and airflow established and pre-set, so there's no need for onsite commissioning.

The unit is fully addressable from a handheld device, where it can be easily checked to ascertain that the pre-set values are being achieved, even without the building management system working.

The LED screen on the handheld device shows the engineer exactly what is happening with the fan coil unit. If changes to the fan coil performance are required because of design changes, then the set points can be adjusted via the device.

■ Visit www.advancedair.co.uk



✓ **AET supplies HIU system to Hexgreave Hall**

AET has announced an exclusive distribution deal with Italian-based DAE Energia for heat-metering solutions for residential and commercial applications. It has since secured its first order, supplying Hexgreave Hall in Nottinghamshire.

The units supplied by AET are floor-standing, 300-litre storage ones, designed to provide communal developments with independent, fast-recovery hot water and high-efficiency heating, giving the end user the same autonomy as if they had their own boiler and tank.

■ Call 01342 310 400, email aet@flexiblespace.com or visit www.flexiblespace/hiu



✓ **Ecoflam celebrates 25th anniversary with British Touring Car ticket giveaway**

To commemorate its 25 years of cutting-edge product design, development and manufacturing expertise in the UK and Ireland, Ecoflam is offering customers the chance to get their hands on two VIP tickets to the final race of British Touring Car Championship at Brands Hatch in September. To be in with a chance of winning, customers must register the serial number of any Ecoflam burner bought between 1 May and 31 August 2017.

■ Call 01905 788 010 or visit www.ecoflam.co.uk

✓ **ELCO Heating Solutions creates CPD module for CHP**

A new continuing professional development (CPD) module has been designed to help building services engineers maximise combined heat and power (CHP) when it is incorporated within commercial heating systems. It considers all aspects of commercial CHP installations, including: sizing of a CHP unit and the different design approaches for optimum running times and efficiencies; thermally led CHP installation, including sizing a buffer vessel/thermal store; and combining a CHP with gas condensing boilers.

■ Visit www.elco.co.uk/cpd



Tridonic appoints solutions architect for the Internet of Light >

Lighting components and systems specialist Tridonic UK has named Robert McIntyre as its new solutions architect. McIntyre's role will be key for customers making the transition from the Internet of Light concept - which Tridonic has spearheaded over the past 18 months - to the delivery of systems and solutions that bring real benefit to building operators and users, using the innovative net4more toolbox. Before joining Tridonic, McIntyre worked with Schneider, in a global solutions architect role.

■ Visit www.tridonic.com



> Titon appoints new UK sales director for ventilation systems

As the need for good indoor air quality grows in importance, domestic ventilation manufacturer Titon has appointed Lee Caulfield as UK sales director of its ventilation systems division. Caulfield will be responsible for leading the sales team, while spending time with new-build residential clients. He brings with him a wealth of experience from his previous roles, in which he gained considerable knowledge about the ventilation sector, as well as strong leadership and people management skills.

■ Visit www.titon.co.uk



< Airedale goes home with the help of quick construction

After a devastating fire in 2013, Airedale International Air Conditioning's HQ had to be rebuilt on a tight schedule. Kingspan Kooltherm FM pipe insulation was installed in the rebuild in Rawdon, Leeds, because of its wide operating-temperature envelope. Temperatures in the HQ's research and development test chamber can vary between -20°C and 50°C and, with more than 2km of pipework in the building, it was imperative that the insulation could support extreme temperature ranges.

■ Call +44 (0) 1544 388 601, email: info@kingspaninsulation.co.uk or visit www.kingspaninsulation.co.uk

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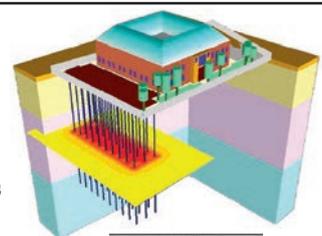


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Director of Building Services Engineering - London

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Renowned multi-disciplinary consultancy is looking for their next strategic building services hire. Due to successful project wins, a top candidate is required to create a new building services team. Possessing a minimum of 25 years' experience in London you will have the ability to lead and manage a team whilst delivering multi-million pound projects. BD skills required.

**For further information please contact
Martin Bell on 01728 726120**

Senior Mechanical Design Engineer - Manchester

£50k plus generous benefits

An award winning multidisciplinary consultancy is looking for a Senior Mechanical Engineer to join its team of astute engineers. Working on a range of gripping projects enabling them to demonstrate their professional expertise and knowledge of the Building Services Industry in order to flourish in a well-established firm.

**For further information please contact
Charlie Ridd on 01728 726120**

Building Services Manager - Hemel Hempstead

Up to £60k plus excellent package

High-end developer is looking for an experienced Building Services Manager. You will have experience working for consultancy and contractor/ developer, having managed projects from tender through to sign off. This is a hands-on design and management role with some business development thrown in.

**For further information please contact
Jessica Davey on 01728 726120**

Fire Divisional Director - London

£60k to £70k plus benefits

An award winning forward thinking multi-disciplinary consultancy is now looking for a well-rounded fire engineer to join the business as a divisional director. Working with up to 10 M&E teams, you will be an expert in fire engineering, creating and managing a brand new fire strategy group. Strong leader capable of providing forward thinking fire engineering concepts to a wide range of projects and clients.

**For further information please contact
Martin Bell on 01728 726120**

Principal Mechanical Design Engineer (Luxury Hotels) - London

£60k to £65k plus benefits

Chartered mechanical design engineers required with a proven track record in hotel projects in the UK and abroad. Large award winning multi-disciplinary firm requires an experienced and client focused candidate able to lead a team to exceed client expectations. Proven experience of delivering technically excellent and profitable projects. An unrivalled benefits package is on offer.

**For further information please contact
Martin Bell on 01728 726120**

Senior Mechanical Design Engineer - Nottingham

£50k+ plus generous benefits

This multi-disciplinary consultancy is renowned for its variety of exciting projects and high end delivery within a competitive industry. They are seeking an experienced, dynamic individual to join their expanding team.

**For further information please contact
Charlie Ridd on 01728 726120**

Senior Electrical Design Engineer - Birmingham

£50k plus generous benefits

Market leading multi-disciplinary consultancy is looking for a knowledgeable Senior Electrical Design Engineer. You will join a team of engineers renowned for their high quality of work and eye for detail. This company recognises good work and is keen on career progression, enabling candidates to push their capabilities.

**For further information please contact
Charlie Ridd on 01728 726120**

Associate Electrical Design Engineer - Oxford

Up to £65k plus generous package

A key innovator in building services solutions is looking for an electrically biased Associate to join their flagship office. Rare opportunity for a technically astute engineer to lead an established team working across a broad selection of markets. The firm is an accredited Investor in People.

**For further information please contact
Jessica Davey on 01728 726120**

Associate Mechanical Design Engineer - Hampshire

Up to £60k plus generous package

High quality multi-disciplinary consultancy is seeking an experienced Associate Mechanical Design Engineer. Capable of working across commercial, residential and mixed-use schemes, you will have a steady career history. Excellent opportunity with an ever-developing organisation.

**For further information please contact
Jessica Davey on 01728 726120**

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Senior Electrical Engineer
Central London, £38 - £40p/h

An award winning consultancy that is at the forefront of high performance buildings with a focus on sustainable design; an opportunity has arisen for a Senior Electrical Engineer to join the well-established team in London. You will have the opportunity to work on some of the most iconic buildings in London that will push the boundaries of design within the built environment. Ref: 4163

Mechanical Engineer
Croydon, £38p/h

A mechanical engineer is required to assist a national design consultancy based in Surrey. You will manage multiple projects in a clear concise, coordinated manner meeting project deadlines and financial restraints. You must work with your own initiative with minimal supervision in both office and on site (commercial/retail). An 18-month contract for the successful engineer. Ref: 4399

Senior Building Services Manager
London, To £75,000 + Bens

A leading international construction company that operate in the UK, Middle East and Canada that employ 50,000 staff worldwide and record revenues of over £5bn per year are hiring. You will oversee design, installations and commissioning on projects, act as lead contract manager overseeing sub-contractors and end delivery. Projects include high end, high rise residential projects with values exceeding £150m. Car allowance, 10-15% bonus, 7% pension, flexible working conditions, and progression to Head of Building Services. Ref: 4397

Principal Mechanical Engineer
To £65k + Bens

Outstanding opportunity for a Principal Mechanical Engineer to lead a mechanical team and run projects across multiple sectors. You will be responsible for growing the London office and supporting the Director in this hands on/client facing role. You must be technically sound and able to demonstrate your knowledge of UK building regulations. Excellent remuneration and progression for the right person. Ref: 4400

Senior Electrical Engineer
Bristol, £30k - £40k + Bens

A highly successful Building Services Engineering Consultancy that employ some of the most talented engineers in the UK are looking to strengthen their electrical commercial, residential and retail team. With a clear progression structure and high profile projects you will establish yourself an engineer with one of the UK's finest design companies. Excellent benefits and training await an ambitious and hard working person. Ref: 4315

Principal Security Engineer
London / Oxford / Cambridge, £40k - £50K + Car + Bens

With a reputation for delivering some of the UK's most prestigious projects for high profile clients, this engineering company are working on industry revolutionising designs. They seek an experienced engineer with detailed knowledge of BMS, Access Control, Intruder Detection, CCTV and security system design. This is a fantastic opportunity to join a specialist group within a leading MEP consultancy. Ref: 4389

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Star performance

Australian consultancy Floth achieved the first six-star Nabers Indoor Environment rating for its head office. Principal Anthony Marklund explains why it was done

Building services and engineering consultancy practice Floth became the first company to achieve the highest six-star National Australian Built Environment Rating System Indoor Environment (Nabers IE) rating for its Brisbane head office. The tool measures factors such as air quality, thermal comfort, lighting, office layout and occupant satisfaction. Office building owners, managers and occupants can benchmark operational indoor environmental quality (IEQ) using a third-party occupant satisfaction survey, combined with spot measurements. Floth is now working towards Well Building Standard certification for its head office.

Q How does Nabers IE differ from the Well Building Standard?

A Nabers IE is a relatively straightforward, yet reliable, benchmarking tool for operational IEQ and user satisfaction. While Well covers the whole gamut of occupant health and wellbeing optimisation – including water quality, nourishment, fitness and mind – Nabers IE consists of a third-party occupant satisfaction survey, combined with spot measurements of air quality, acoustic comfort and lighting. Significant Nabers IE improvements can be achieved by upgrading office layout and furniture, air conditioning, and lighting. Thermal comfort measurements can be spot measurements or annual zone-temperature trend logs. The cost of a Nabers IE rating is a fraction of that of Well certification; however, Well is undeniably more attractive than Nabers IE, and this is reflected in our project pipeline.

Q Do you think Nabers IE will become commonplace as property owners seek to differentiate themselves as 'healthy' workplaces?

A Currently, Australia has 47 Nabers IE-certified properties, while there are 28 Well-certified projects around the world. This indicates successful incursion into a market that has historically been oblivious to the benefits of a healthy, happy workforce. A small, but significant, number of corporate trusts see the benefit, having rated most – if not all – of their office portfolios. A rating is quick, with between 0 and 6 stars achieved in 'as is' condition, setting a benchmark from which to improve. These certifications will become commonplace because wellbeing is, essentially, an extension of health and safety – arguably a basic human right rather than a privilege. Millennials will certainly see it that way. Leading developers are now building healthier buildings, and the tenants are coming.

Q Is IEQ linked to productivity?

A I have been consulting on the growing body of evidence linking building IEQ with health and productivity outcomes since the 2000s. During this time, Australian

office developers were improving indoor environments as a Green Star initiative to attract tenants, more from a qualitative – rather than quantitative – perspective. But the penny is dropping that even a small improvement in productivity can pay back the cost of indoor environment upgrades many times over during the life of a tenure.

Q What measures did you take to be awarded six stars?

A Indoor air quality initiatives include: ideal outside air intake locations; clean and maintainable air distribution ductwork; outdoor air systems sized to improve outdoor air rates by 50%; responsive CO₂ sensors to maintain no more than 800ppm CO₂ in each zone served; and low-emission finishes, furnishings and printers. Visual comfort initiatives include high colour rendering, glare-reducing LED lighting with direct and indirect elements, and photo-sensor controls, giving a measured average illuminance of 550 lux at desk heights. Acoustic comfort measures have also been integrated in the ceiling tiles, carpet, partitions and furniture.

Q How do you measure occupant satisfaction?

A For our pre- and post-occupancy surveys, we used Building Occupants Survey System Australia (Boss). The results for the new office showed we improved from our three-star previous offices, scoring 93.9% for air quality, 97.4% for acoustic comfort, 100% for lighting, and 97% for office layout.

Q What air quality benchmarks did you adhere to?

A Spot testing of environmental parameters was completed in three locations in the office, and outdoor air measurements were taken on the roof to compare outdoor CO₂ to interior levels. On the day measured, the average external CO₂ was 352.3ppm, and our highest recorded CO₂ spot-check inside was 620ppm, proving effectiveness of the ventilation strategy. Formaldehyde was not detected in any cases and total volatile organic compounds (TVOCs) were very low, at an average, across measurements, of 0.0737ppm.

At 6.32µg/m³, our average particulate matter (PM10) count was better than the market average, but the worst score of all parameters tested.

■ ANTHONY MARKLUND MCIBSE is a chartered mechanical engineer and ecologically sustainable development principal at Floth

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Energy efficiency building regulations: Part L

4 July, London

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4 July, London

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5 July, London

Practical controls for HVAC systems

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6 July, London

Designing water-efficient hot and cold supplies

6 July, London

Emergency lighting to comply with fire safety regulations

7 July, London

Air conditioning and cooling systems

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Energy strategy reports

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Mechanical services explained

11-13 July, Manchester

Building services explained

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ISO 50001

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Heat networks

26-27 July, London

LCC building design and EPC

1-2 August, London

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Scotland: Using daylighting performance to optimise façade design

3 July, Glasgow

With speaker Colin Rees, from Integrated Environmental Solutions

Resilient Cities Group: AGM

6 July, London

ANZ: Hybrid City Multi system

11 July, Belmont

Presentation by Mitsubishi, showcasing its new Hybrid City Multi system.

South West: Lighting – more psychology and art than science?

12 July, Bristol

Presentation by Henrik Clausen, director of Fagerhult's Lighting Academy in Copenhagen.

YEN London 10-year anniversary boat cruise

13 July, London

Join YEN London to celebrate its 10th anniversary with a cruise on the Thames. All welcome.

SoPHE: Thermoplastic manholes to BS EN 13598 and glass-reinforced epoxy piping systems

19 July, Manchester

Presentation by Peter Morris, of Pipex.

Yorkshire: How building services engineers can save civilisation

24 July, Leeds

With speaker Fiona Cousins, FCIBSE, of Arup. Cousins leads the sustainability and mechanical engineering teams in Arup's New York office, and is a frequent presenter on transformative sustainable building design.

South West: Summer social – Thatchers Brewery tour

28 July, Bristol

A guided tour of Thatchers Myrtle Farm, where you'll learn about how they craft their ciders – and get the chance to try a few, too.

ILEVE: AGM and technical day

6 September, London

ILEVE AGM, to be held as part of a technical day.

First International Museum Lighting Conference

11 September, London

The conference aims to facilitate a dialogue platform between academics and museum lighting professionals on the current research in the field of museum lighting. It is a joint effort from the Centre for Doctoral Training in Science and Engineering in Arts, Heritage and Archaeology, and the Society of Light and Lighting, plus UCL, Oxford and Brighton universities, the National Gallery, the Museums Association and the Colour Group UK.

SoPHE: Design and application of HIU systems

20 September, Manchester

Presentation by Chris Doherty, of Oventrop.

Home Counties North East: Membership briefing session

26 September, Cornhill

Briefing with a focus on Associate and Member grade applications, and registration with the Engineering Council.

HIGHLIGHT



Fiona Cousins, of Arup, will be at the Yorkshire Region event on 24 July

SLL Trotter Paterson lecture 2017 – Lighting in flux

6 July, London

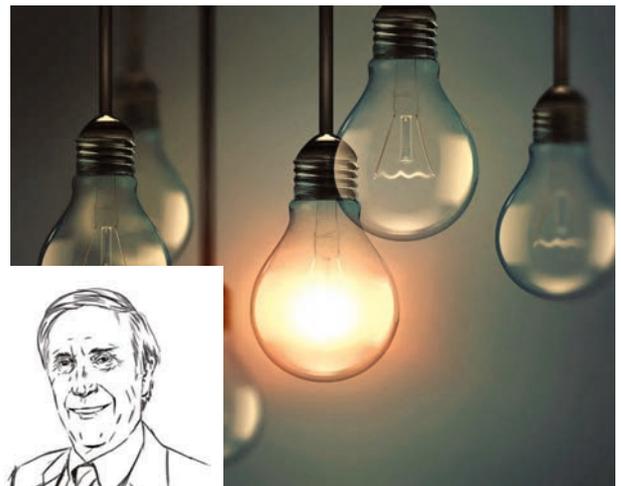
With keynote speaker Peter Boyce, professor emeritus at Rensselaer Polytechnic Institute in Troy, New York. Boyce (pictured) was head of human factors at Rensselaer, and his research into light and its effects on people is known throughout the industry. He is also the technical editor for the *Lighting Research & Technology* journal.

For many years, most interior-lighting practice has been founded on: two sets of metrics – photometry and colorimetry; one simple calculation – the lumen method; and two objectives – ensuring good visual performance without visual discomfort. Today, these foundations are increasingly being questioned.

Some of these questions arise from a greater understanding of the physiology of the eye and brain, others from problems and opportunities presented by solid-state lighting, and others still from ambitions to expand the role that light plays in people's lives.

This lecture will explore the nature of these questions and the reasoning behind them, and suggest what the answers should be.

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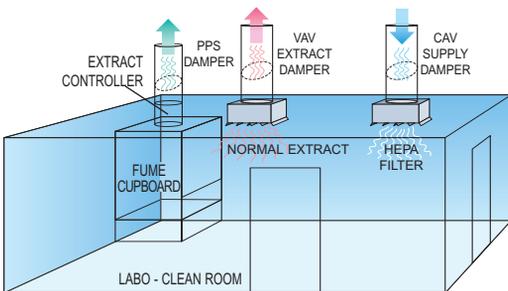


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