CIBSE JOURNAL

The official magazine of the Chartered Institution of Building Services Engineers

December 2015

CIBSE

WITH THIS ISSUE *Lighting Special*

POWER TO THE PEOPLE

Somerset House adds more public space after innovative low-energy upgrade

SECURITY CONCERNS
CIBSE conference focuses on protecting the built environment

ESOS ASSESSMENT
Energy auditors ensure thousands meet deadline

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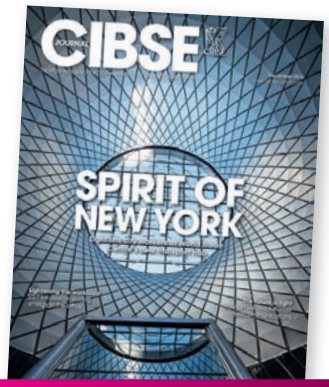

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Save and secure

Six months into its term of office, the Conservative government is finally starting to reveal its energy strategy. It's a tricky balance for Energy and Climate Change Secretary Amber Rudd, who must both ensure energy security for the UK and meet carbon targets laid out by European legislators.

Rudd's focus has been on securing energy supply rather than reducing energy demand (page 7). With barely any spare capacity in the National Grid, it is understandable that Rudd's government wants to focus on getting new power stations online as quickly as possible, but the policy should go hand-in-hand with promoting energy efficiency.

The sensible companies are already latching onto the benefits – Lord Deben told delegates at the CIBSE Building Performance Conference and Exhibition that Unilever was saving £250m per annum through energy efficiency measures (page 22), and Somerset House is cutting its energy bill by nearly 40% by upgrading its heating and cooling systems (page 26).

Others are being forced by necessity. In a disappointing trading update the budget chain Poundland revealed it was switching to LED lighting in its stores in order to cut costs and pay workers mandatory increases in the national minimum wage. Poundland's commitment is the equivalent of sticking your hand behind the sofa to find coins for the meter.

> Poundland's commitment is the equivalent of sticking your hand behind the sofa to find coins for the meter

A planned energy strategy is obviously the preferred route, and the Energy Savings Opportunity Scheme (ESOS) is the government mechanism for understanding what measures companies could take to reduce energy use and cut overheads. Our feature on page 30 looks at how the market is complying with the first phase of ESOS, which is to carry out an audit of energy use by 5 December.

The recent tragic events in Paris and further afield, have brought the issue of security to the fore. Protecting buildings from criminal activity was a key theme at the CIBSE conference. Speakers warned consultants of the risks of over-sharing detailed BIM drawings with external suppliers, and drew attention to the vulnerabilities of building control systems.

Access control systems are another area of weakness, and our feature on page 37 explains the levels of security to specify in order to assure appropriate protection from unwanted guests.

Alex Smith, editor
asmith@cibsejournal.com

ELTA STRENGTHEN DEDICATED BUILDING SERVICES BUSINESS

West Midlands based Elta Group Ltd has seen significant growth and development since its beginning in 1996. Now a £100M privately owned family business, the Group operates in 7 countries across 4 continents and is delighted to announce new investment plans which will see the business structured to support its growth and that of the UK construction industry.

The newly formed 'Elta Group Building Services' unites existing brands Elta Fans [Building Services & Residential divisions], Air Design, idealair group and Hydor Building Services under one umbrella, whilst each will retain its own distinctive brand identity within the portfolio.

The move sees the collation of a singular, comprehensive portfolio of commercial and industrial fans, air handling and heat recovery units, grilles, bespoke louvres and residential ventilation products. This range of highly competitive products will enable the business to satisfy larger and more diverse project specifications, whilst extending the reach of their exceptional customer service operations.

Committed to the growth of its people, Elta Group Building Services has invested in recruitment and training for both the internal and external teams. Supporting the business in the market place are a team of 14 expert external sales managers, including 3 managers dedicated to specification and a specialist residential team.

Elta Group Chairman, David Ball, commented: "Our activities worldwide have continued to achieve organic growth in the Group's principle markets, despite the worst recession in living history.

In Europe, our building services markets have been challenging during this period, although the developments initiated across our own building services brands through Group investments, for e.g. ErP compliant products to meet stringent regulatory standards, positions the Group to capitalise on growing demand for more energy efficient products in these markets.

> We are fully committed to the widening opportunities the building services markets provide, with a portfolio of brands to meet the more demanding requirements of today's markets.

"We are fully committed to the widening opportunities the building services markets provide, with a portfolio of brands to meet the more demanding requirements of today's markets."

The launch of Elta Group Building Services also sees a change to manufacturing operations. Currently operating across 3 sites, the brands will join together creating a focussed centre of manufacturing and assembly, a dedicated warehousing and distribution plant and an expert internal sales and customer service office located on the Pensnett Trading Estate, Kingswinford, West Midlands.

The investment program provides significant expansion to existing operations; delivering a 200% increase in finished goods space and a 33% increase in manufacturing space. The implementation of progressive lean manufacturing processes, combined with a multi-skilled workforce offer further improvements to productivity and flexibility throughout the premises.

Elta Group Chairman David Ball

Mr Ball continued: "With focused manufacturing and assembly operations we are able to drive forward with innovative product development whilst our distribution and warehousing plant supports our long term commitment to stock availability. Combined with the breadth of skills and knowledge our people hold, this gives us a firm base from which to serve our customers and the construction industry."

The relocation of operations is scheduled for completion by the end of 2015.

For more information please contact us at +44 (0) 1384 275800

ELTA GROUP LIMITED

Rudd criticised for ignoring energy efficiency in policy 'reset'

- **Focus on energy supply misses chance to reduce need for new capacity**

Energy and Climate Change Secretary Amber Rudd has come under fire for failing to address the need for energy efficiency in her latest policy statement.

In a number of high-profile speeches and radio interviews, she pledged to find a better 'balance' of energy production by consulting on closing all coal-fired power stations by 2025 and making new gas-fired plants a priority, while retaining a mixture of nuclear and offshore wind power. Rudd said this would create an energy system that 'puts consumers first, delivers more competition, reduces the burden on bill-payers and ensures enough electricity generation to power the nation'.

She pointed out that the country was suffering from decades of under-investment in power generation, which had created a legacy of ageing, often unreliable, plant and continued reliance on coal, 'the dirtiest fossil fuel'. 'A higher proportion of our electricity came from coal in 2014 than in 1999,' said Rudd (pictured, below). 'So, despite intervention, we still haven't found the right balance.'

She said opponents of nuclear power 'misread the science… it is safe and reliable'. However, the challenge was to deliver low-cost energy– so 'green energy must be cheap energy'. The minister pledged to hold 'power auctions' to support offshore wind generation with a view to growing capacity to 10GW by 2020.

However, CIBSE technical director Hywel Davies said that by focusing 'solely on energy supply', Rudd was missing a chance to 'reduce the need for new generating capacity'. 'Not using energy also puts consumers first, reduces the burden on bill-payers and ensures enough electricity generation to power the nation, so why is it not included in the statement?' he asked.

The UK Green Building Council said energy efficiency had become the 'Cinderella of government energy policy'. 'Reducing demand has to go hand in hand with new generation and is the most cost-effective way to keep the lights on, control bills and tackle climate change,' said campaign and policy director John Alker.

Building new gas power plants will not be enough to meet Rudd's agenda, according to the Association for Decentralised Energy. Director Tim Rotheray said 'putting productivity and efficiency at the heart of the reset' would help to 'decarbonise, improve security of supply and manage bills'.

EU leader says using less energy should be priority

EU Climate Commissioner Miguel Arias Cañete says European cities and regions should make energy efficiency their main policy priority when tackling climate change – with particular emphasis on improving existing buildings.

He said 75% of homes within the European Union were inefficient, and 'smart renovation' could cut the continent's energy demand by 40%.

The UK District Energy Association said this should encourage policy-makers drawing up the EU's first Heating and Cooling Strategy to 'lead with energy efficiency, consider a system approach and tackle challenges where the best solutions may be very local in nature'.

It added that the EU is expected to move towards electrification of heating and the wider use of heat pumps as part of the strategy.

Improving the energy efficiency of existing buildings would reduce spending on power generation across the EU by between €80bn and €153bn by 2050, according to research by consultancy Ecofys.

ATELIER TEN CELEBRATES 25 YEARS

Atelier Ten has marked its 25th anniversary by launching a new book, *Invisible Architecture*. It comprises a collection of essays written by staff and guest contributors, and focuses on the unseen elements of a building such as heat, light, air and sound.

Reflecting on more than two decades of design, Patrick Bellew, founding director, said: 'We use "invisible architecture" to design buildings that minimise energy use and greenhouse gas emissions. Our primary preoccupation is to deliver outstanding buildings for our clients with our architect collaborators.'

Atelier Ten has been behind a long line of award-winning buildings including the Gardens By The Bay in Singapore, pictured right, which won International Project of the Year at the CIBSE Building Performance Awards in 2014.

Contractors foot bill for HK water contamination

CIBSE Hong Kong Branch leads study of drinking water

Four contractors have agreed to spend HK$20m to cover the water bills of almost 30,000 Hong Kong residents affected by lead contamination in supply pipes.

The contractors will have to pay up to HK$660 to cover a year's supply for each affected home. They had already agreed to fit water filters to each property in the district as part of a clean-up operation, after the revelation that the amount of lead in the water supply was 80 times the legal limit.

Ben Chan Han-pan from the Democratic Alliance for the Betterment and Progress of Hong Kong, said the bill payment plan was 'a good start'. However, local unions are urging the contractors to set up a fund to compensate residents who may have developed health problems from drinking contaminated water.

MARIAIT / SHUTTERSTOCK

A report on incidents of lead contamination in public drinking water supplies was prepared by a team of CIBSE members, led by Peter Wong. It responded to concerns about the safety of drinking water in the Hong Kong Special Administrative Region, prompted by a member of the Hong Kong Legislature.

Wong, a former CIBSE vice-president, past president of the Hong Kong Institution of Engineers, and past chair of CIBSE Hong Kong Branch, led the preparation of the report, which was submitted to the Hong Kong judiciary last month.

It found that incidents of lead contamination in drinking water – initially found in one public housing estate – had spread more widely, fuelling extensive media coverage and worrying residents.

The study assessed how plumbing work using copper pipes and fittings was carried out in the housing estates, and whether the quality of drinking water was at risk. It focused on lead, as the residues can critically affect human health.

HKIE, the statutory institution for the engineering profession in Hong Kong, set up a task force to look at this episode, to inform the public on the engineering aspects involved.

Task force members came from CIBSE Hong Kong Branch and the building services division of HKIE, supported by experts from Australia, Canada, and CIBSE President Nick Mead from the UK.

E.On hit with fine for missing smart-meter deadline

Energy regulator Ofgem has ordered supplier E.ON to pay a £7m fine for failing to provide its business customers with smart meters by the stipulated deadline.

Fewer than 65% of 20,000 eligible users had received their meter by April last year. The fine will be paid to the Carbon Trust and E.ON must meet another interim target next year or face a further £7m penalty.

Ofgem is also considering a sanction to prevent E.ON taking on new business customers until it can supply them through a smart meter. It is also thought to be investigating the smart meter 'roll-out performance' of British Gas and Npower.

AN ILLUMINATING EXPERIENCE FOR STUDENTS AT OXFORD BROOKES

The RIBA award-winning New Student Centre at Oxford Brookes University has 'a personality that is evident throughout and has achieved immediate impact and popularity', according to the RIBA judges.

Lighting design practice Speirs + Major collaborated with architectural firm Design Engine on the 24,000m², £83m project. Its exemplar sustainable and energy efficient lighting design was developed to aid way-finding, differentiate public and private spaces, and to provide a sense of human scale.

Bespoke linear luminaires were developed to meet the practical requirements of the teaching, library and office spaces, while custom-designed fittings also feature in the glazed food hall.

A comprehensive lighting-control system provides flexibility to the overall scheme, for which Grontmij was the building services engineer.

CREDIT SPEIRS + MAJOR AND THE PHOTOGRAPHER (JAMES NEWTON

Call for RHI extension as UK set to miss green targets

- **Leaked letter reveals UK unlikely to generate 15% of its energy from renewable sources by 2020**

The UK is likely to miss legally binding targets on low carbon heat, according to think tank Policy Connect, which has called for an extension of the Renewable Heat Incentive (RHI).

The country is obliged to produce 12% of its heat from low carbon or renewable sources by 2020. However, the Policy Connect report – *The Policy for Heat: Transforming the System* – said this was now unrealistic without long-term commitment to the RHI subsidy scheme, the budget for which runs out in April 2016.

The Renewable Energy Association said the government was 'sending the wrong signals to investors and consumers' by allowing uncertainty around the RHI budget to continue.

Head of policy and external affairs James Court said the government could 'no longer muddle along in low carbon heat'. He said that failing to meet the targets would have 'serious consequences for other sectors of the economy'.

A modern biomass co-generation power plant

KONSTANTIN ROMANOV / SHUTTERSTOCK

Heat accounts for nearly half of the energy consumed in the UK and for a third of the country's carbon emissions. The electricity and transport sectors will have to increase their carbon-saving measures to make up the difference if heat misses its target.

Policy Connect's demand for the government to extend the RHI comes after the leaking of a letter written by Energy Secretary Amber Rudd. In it, she appears to confirm the UK would miss its larger target to generate 15% of its energy from green sources by 2020.

The Ecologist magazine obtained a copy of the letter, which suggested there would be a 'shortfall against the target in 2020 of around 50TWh... in our internal central forecasts (which are not public)'.

The UK could be subject to legal action in the European Court of Justice for missing emissions targets.

Business issue over climate change

More than 40% of business leaders dismiss climate change and the transition to a low carbon economy as a 'minor concern', according to Aston University.

Its report said business leaders struggled 'to identify and adapt to a low carbon economy' and that just 7% had made any provision for it in their corporate strategies. Of 1,002 decision-makers in firms of all sizes, Aston found that 38% did not see the transition as a concern, while 41% viewed it as a 'minor concern'. However, 66% did recognise they have a responsibility to alleviate climate change.

EC funding plan for energy projects

The European Commission is to make it easier for smaller energy efficiency projects to get EU funding. It plans to allow smaller schemes to be 'aggregated' into a larger programme that would prove a more attractive investment opportunity.

The initiative is being developed as part of the €60-€100bn that the Commission says must be invested annually in EU buildings to achieve 2020 energy-saving goals.

Construction to increase by 85%

The worldwide market for construction is expected to grow by 85%, to $15.5tn, by 2030, according to new research.

The industry will grow faster than gross domestic product (GDP), at 3.9% per year, with China, the US and India accounting for 57% of the total, claims the study by Global Construction Perspectives (GCP) and Oxford Economics.

Graham Robinson, GCP executive director, said China would record its 'first ever decline' in housing output this year, but new demand for healthcare, education and social infrastructure would keep Chinese construction on an upward swing.

He added that US construction would grow by 5% annually over the next 15 years, largely because of the economic recovery in the south of the country. India will overtake Japan to become the world's third largest market by 2021.

Kerry hails 'historic' decision on HFCs

US Secretary of State John Kerry has led the celebrations after a multinational deal to pursue an amendment to the Montreal Protocol in 2016 that would impose a phase-down on global-warming HFC gases used in air conditioning and refrigeration.

He said the agreement, reached in Dubai, was 'opening a new chapter in the fight against climate change' and could 'avoid 0.5°C of warming by the end of the century'.

The step towards reducing HFC use was hailed as a positive precursor to this month's UN Climate Change Summit in Paris. An amendment could prevent more than 100bn tonnes of CO_2-equivalent emissions, said Mark Roberts, senior policy adviser at campaign group the Environmental Investigation Agency.

Government under pressure to compromise over FIT cuts

Subsidies for PV installations due to be slashed by up to 87% from January

CIBSE and industry bodies have stepped up their pressure on the government to minimise reductions to the Feed-In Tariff (FIT) scheme used to subsidise solar photovoltaic (PV) installations.

Payments are due to be reduced by up to 87% from January, but the organisations say this will be counter-productive because it will: dramatically reduce the number of projects completed; lead to mass job losses; and make it more difficult for the sector to become self-sustaining.

The Solar Trade Association (STA) has offered a compromise to the government in the shape of an 'emergency rescue plan', which it claims could save 27,000 solar jobs by adding little more than £1 to household energy bills. It is calling for a tariff level that would still cut the government's budget from £250m to £93m and the burden on consumers from £6 per year to £1.06, but prevent the solar industry from 'unravelling'.

The STA said that, without this compromise, just 0.6GW of solar energy capacity would be installed by 2019 – whereas its plan would deliver 2.7GW. Payments would be gradually reduced until the sector was subsidy free.

BSRIA chief executive, Julia Evans, backed the compromise plan, which would set 'higher initial tariffs to make it viable to invest in solar, with automatic reductions in the tariff based on deployment, to allow the government to control costs while giving the industry certainty on where it stands'. She said the government needed to stop giving the impression that energy and carbon-reduction issues were 'a burden, which is inhibiting not only the industry, but the economy at large'.

The NAPIT trade association said the proposed FIT cuts would throw 'a stick into the spokes of the industry', which it claimed was on the brink of becoming 'subsidy free'.

In a survey, 70% of NAPIT members said the proposed tariff changes would affect the financial stability of their business, and many said they would leave the solar PV industry if the cuts were introduced. Four out of five said they would expect the changes to reduce the number of installations they are able to complete by at least 80%.

ZSTOCK / SHUTTERSTOCK

Retraining plumbers could help solve building services' skills crisis

Demand for new operatives in all sectors of the building services industry will rise over the next four years, leading to major skills shortages, according to research from the Building Engineering Services Association (BESA).

However, many workers who came into the sector during the recession, and missed out on formal training, could be upskilled to plug gaps in the workforce, delegates at BESA's Meeting the Industry's Skills Challenge conference heard.

Plumbers could be redeployed into other sectors of the industry, according to Mike Hammond, who carried out the research on behalf of the association. He predicted a massive 'under-supply' in every sector of building engineering services between now and 2018, apart from in plumbing. Ductwork was already 'in crisis', he said, although shortages will be less severe in air conditioning and refrigeration.

'The number of apprentices has been declining at a rapid rate since 2008,' said Hammond, who added that the level of retirees was creating a 'real headache' by reducing the number of people in the industry with management-level skills.

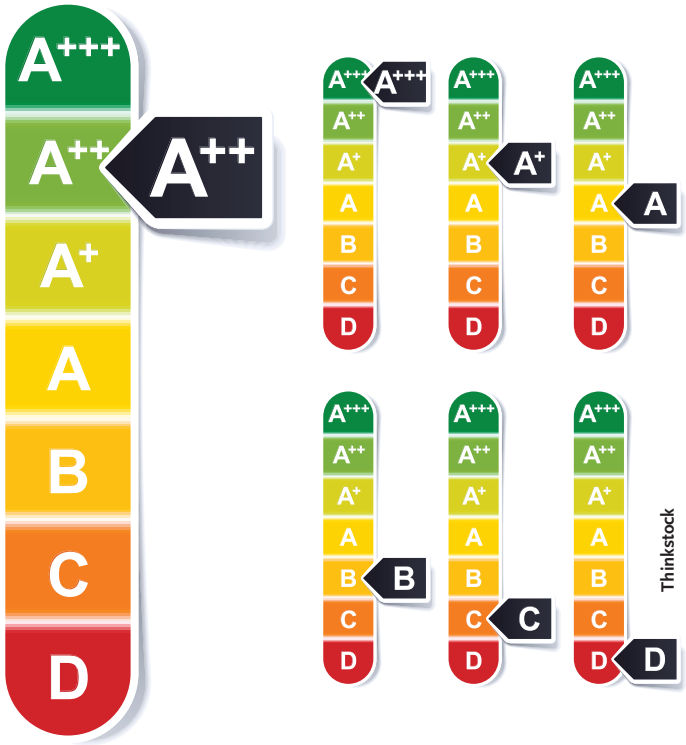
'The market has gone doolally. There are too many people in some areas and not nearly enough in others – but if you accept the premise that you can retrain plumbers, there is a possible solution.'

Lord O'Neill, who chaired the recent conference, said these figures had 'frightened the living daylights out of us, but also given us some hope'.

He said politicians may be tempted to look for quick wins, such as shortening training periods, but this problem was far more complex and needed to be addressed properly.

New scheme puts contractors at heart of building energy efficiency

Despite the turmoil over reducing government support for renewable energy, energy efficiency continues to offer major commercial opportunities for clients, service providers and manufacturers. When ECA members carry out installation or maintenance they are often best placed to help a client choose the most cost-effective energy solutions available. Paul Reeve CEnv, ECA Director of Business Services, explains a new scheme to help it all happen...



In recent months, there have been plenty of headlines about government cuts to solar PV subsidies and reversals of green energy policy. Despite the current difficulties for renewable power sources, **energy efficiency** continues to be the most cost-effective way of dealing with the UK's carbon reduction targets. In addition, no plan for producing power comes close to energy efficiency as a cost- effective means of helping to meet future energy demand. While some of the new technologies offer a brighter energy future down the line, many finance directors now realise that energy efficiency can improve the bottom line, sometimes within months.

New 'Energy Efficiency Advisor' scheme

When working with clients, a building services contractor can be in an excellent position to advise on energy solutions. Yet, too often, the client simply does not register that the contractor is a great source of practical advice in this area. With this in mind, the ECA has partnered with Schneider Electric to produce an online course that helps ECA members to harness their knowledge and experience and be able to **show** clients they really can advise on energy efficiency.

The new 'Energy Efficiency Advisor' (EEA) course – free to ECA members – involves 12 online modules from an extensive online library. Once all the modules have been successfully completed, the contractor must carry out a trial energy survey and attend a final – and expertly facilitated - seminar on the subject, to become a certified **ECA Energy Efficiency Advisor.**

Expert energy solutions advice

All ECA members, including the new EEAs, also have full access to expert 'energy solutions' support from the ECA, which includes a suite of free 'energy solutions' guidance. This features checklists for both clients and members on how to identify cost effective energy-saving measures, plus cost analysis spreadsheets.

The new EEA accreditation is already being used by ECA contractors and the ECA–Schneider Electric scheme should give clients even more confidence that they can utilise an ECA contractor as their Energy Efficiency Advisor.

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For more information on the EEA or the ECA's 'energy solutions' service and checklists, please contact: bill.wright2@eca.co.uk

ECA
ENERGY EFFICIENCY ADVISOR

Poor IAQ undermines clear thinking

Even relatively small improvements in indoor air quality (IAQ) and environmental conditions could have a profound impact on concentration levels and the ability of people in offices to make clear decisions, according to a new study.

The Healthy Buildings Programme – at the Harvard Centre for Health and the Global Environment – studied 24 people exposed to a variety of indoor conditions over six working days. The researchers found that their 'cognitive scores' were on average 61% higher on days they were working in buildings with low pollution levels, than on days in a conventional building.

When they reduced levels of carbon dioxide as well, cognitive scores were 101% higher than in conventional buildings, according to the study, which was published in Environmental Health Perspectives.

Cowlard joins Daikin

Bob Cowlard has been appointed managing director of air conditioning company Daikin Applied (UK). This follows the company's name change from McQuay (UK) earlier this year.

Cowlard, who moves from controls company Carel, said he felt fortunate to be given 'one of those rare opportunities where the new MD gets to join an already successful business with an existing senior management team in place'.

BSRIA launches Legionella guide

BSRIA has released its second free 'at-a-glance' topic guide on the subject of Legionella. It is aimed at those looking for basic information including definition, history and prevalence. There is also guidance on the relevant legislation and supporting documentation, alongside some risk management tips to ensure compliance.

The guide is free to download at **http://bit.ly/1HXmbju**

Lord Deben urges engineers to drop the 'boys' toys'

Lord Deben

Former minister addresses CIBSE conference

Building services engineers should become less interested in 'boys' toys' and focus more on making sure every building they design 'automatically' saves energy, according to former Environment Minister John Gummer – now Lord Deben.

During his keynote address to the CIBSE Building Performance Conference, he said engineers needed to stop focusing so much on technology and put more effort into communicating their ideas in plain English, so that the general public could buy into the concept of energy saving.

He said too many UK businesses were missing out on major cost savings 'because they can't accept the primacy of energy efficiency'. He also blamed a series of Energy Ministers, who felt the need to build 'monuments' to mark their time in office – with the proposed Hinkley Point nuclear power station being the latest example.

'I am looking forward to a time when an Energy Minister doesn't put up any monuments, but helps every business in the country by getting them to cut their energy use instead,' Lord Deben told delegates at the QEII Conference Centre in London.

He also attacked the 'doom and gloom merchants' who say energy efficiency is too difficult. 'They don't need to give anything up – we can do all the things we do now, but with half the energy consumption.'

Lord Deben pointed out that Unilever was now saving £250m a year by making its buildings more efficient, and highlighted one large energy user that cut its annual electricity bill from £10m to £1.5m by replacing its lighting systems with modern LEDs.

BIM can expose buildings to cyber attack, engineers warned

Government security specialists are becoming increasingly concerned that Building Information Modelling (BIM) is creating a 'soft underbelly' in buildings that could be exploited by terrorists and cyber criminals to create havoc in highly sensitive facilities.

A number of speakers at the CIBSE Building Performance Conference said engineers needed to be more 'security minded' when sharing information via BIM models, and warned that many were giving 'unfettered access' to sensitive and compromising information that extended beyond the buildings being designed into neighbouring infrastructure.

Many models show details of critical elements of sensitive sites; the location of hidden cables and access facilities; and even blast calculations for steelwork on tender documents sent outside the UK.

Hugh Boyes from the Cyber Security Centre at Warwick University said: 'We should be really worried about where our technology is taking us in terms of security'. He warned that the vulnerabilities being created by unsecured building engineering elements were as significant as weaknesses exploited by web hackers.

'BIM models can be turned into tools to help people pull off criminal acts,' said Boyes, who pointed out that many project teams and their clients had no idea how their information was being used, and who had access to models that were freely posted on the internet. Often design teams will share complete building models with suppliers, which should only have access to the specific parts relevant to their activity.

CIBSE NEWS

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New archive material online

The CIBSE Knowledge Portal now holds 113 titles from the Energy Efficient Best Practice Programme. Old publications are no longer supported, but are frequently referenced and sought out by building services engineers and others interested in energy, so are valuable.

The documents can be downloaded in PDF form, and users will be notified if the content may be out of date. **Visit http://bit.ly/1S44SgZ**

Sign up for the 2016 symposium

Booking is now open for next year's technical symposium, which will be held in Edinburgh.

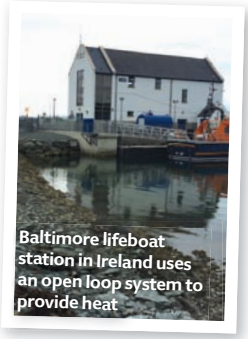
The sixth annual event, titled 'Integration for whole life building performance', will be held at Heriot-Watt University from 14-15 April. As well as talks from industry practitioners, academics and members of research organisations, a wide range of papers will be presented. A reception will be held on 14 April at Edinburgh Castle. Book your place at **www.cibse.org/symposium**

Code aims to raise standards of water source heat pumps

- **New publication covers entire project life-cycle**

CIBSE will publish its Code of Practice on surface water source heat pumps in December. The document has been produced in association with the Ground Source Heat Pump Association (GSHPA) and the Heat Pump Association (HPA), with support from the Department of Energy & Climate Change.

The code aims to raise standards in the design, implementation and operation of water source heat pumps, and covers the entire project life-cycle.


Baltimore lifeboat station in Ireland uses an open loop system to provide heat

It is focused on the use of surface water – harnessing energy from the sea, rivers, canals and lakes – and does not cover ground water such as that held in mines, caverns and aquifers.

Members will be able to download the publication for free at **www.cibse.org/knowledge**

For more information about the code, read 'Coming on Stream' in *CIBSE Journal*'s May 2015 products supplement or visit **www.cibse.org/CP2consultation**

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Renewals can also be completed at **www.cibse.org/members**, by telephone with a debit/credit card, or by sending a cheque made payable to CIBSE. To check we have your correct contact details, visit **www.cibse.org/members**

If you have retired from full-time employment, are out of work, on maternity or paternity leave, or are earning less than £7,500, you can apply for a reduced membership subscription of £48. Visit **www.cibse.org/fees** for details.

New members, fellows and associates

FELLOWS

Bateson, Ashley Ewart
London, UK
Cheng, Ping Keung Kenny
Kowloon, Hong Kong
Lee, Ho Kin
Fanling, Hong Kong
Lockhead, Stuart Anthony
Aberdeen, UK
Piper, Richard Anthony
Colne, UK
Sutherland, Julian Bruce
Emsworth, UK
Syed, Ekram Ali
Doha, Qatar
Williams, David Robert Spencer
Godalming, UK
Wong, Tsz Yat
New Territories, Hong Kong
Yick, Chung Hin
Hung Hom, Hong Kong

MEMBER

Ali, Mir
Macclesfield, UK
Bryne, Conor
Meath, Republic of Ireland
Chan, Kin Wai Damon
Tsuen Wan, Hong Kong
Chiu, Ping Nam
Aberdeen, Hong Kong
Crabbe, Ryan Marc
Sydney, Australia
Eseonu, Vitalis Emeka
Calgary, Canada
Fan, Kai Yip
Tin Shui Wai, Hong Kong
Fok, Chun Cheong Walter
Yau Ma Tei, Hong Kong
Hung, Ka Ming
Tuen Mun, Hong Kong
Jennings, Stephen
Solihull, UK
Keane, Justin
Doha, Qatar
Kelleher, John
Ballincollig, Republic of Ireland
Korwin-Piotrowski, Piotr
Warszawa, Poland
Lai, Chun Wing
Sai Wan Ho, Hong Kong
Lam, Hoi Pang
Chai Wan, Hong Kong
Lee, Chee Yuen Eric
Ap Lei Chau, Hong Kong
Lee, Kwok Wa
Kowloon, Hong Kong
Legge, Angela
Impington, UK
Leung, Ming Fai
Tsuen Wan, Hong Kong
Liaqat, Omar
Seabrook, Australia
Lo, Ka Chun
Quarry Bay, Hong Kong
Macdonald, Ross Gavin
Dubai, United Arab Emirates
Masouros, Gerasimos
London, UK
Miyangar, Rickesh
Leeds, UK
O'Connor, Neill
Dublin 3, Republic of Ireland
Robilliard, Todd
Fitzroy, Australia
Sacha, Barbara
Sharjah, United Arab Emirates
Sze, Wai Ching
NT, Hong Kong
Tse, King Kong
Chai Wan, Hong Kong
Wan, Kwok Wah
NT, Hong Kong
Wang, Yuan
Wanchai, Hong Kong
Yun, Byeonghee
Wanchai, Hong Kong

LICENTIATE

Bulmer, Matthew
Leeds, UK
Carter, Shaun Richard
Plymouth, UK
Day, Adam
Ipswich, UK
Hall, Andrew
Beckenham, UK
Hickey, David Robert
Croydon, UK
McAllister, Paul
Irvine, UK
Mead, Martyn John
Colchester, UK
Morgan-Beale, Luke
Colchester, UK
Street, Nicholas
Manchester, UK
Thomas, James William
Scholes, UK

John Anderson (centre) receives the silver medal from CIBSE President Nick Mead FCIBSE (left) and Gerard Hosford

Industry talent rewarded at President's Dinner

- **Christopher Northey, Kevin Kelly and John Anderson all receive silver medals**

The annual President's Dinner recognised and rewarded industry talent with a number of awards, showcasing newly qualified and experienced engineers:

Hays Building Services President's Prize

Kaitlin Allen, from the University of Nottingham, won the CIBSE Undergraduate Award and a prize of £500. Allen studied for a MEng in architecture and environmental design, and won the accolade with her final-year project, entitled 'Smart Windows – a window for dynamic control'.

The award, sponsored by Hays Building Services, is designed to encourage students to develop their potential and aim for excellence. It is presented to those in their final year of a building services course accredited by CIBSE, and recognises their academic achievements.

A trophy was also awarded to the University of Nottingham to acknowledge its achievements, while Jolyon Axelrod, from London South Bank University, and Aimee Desert, from the University of Sheffield, were runners-up in the category and each received a prize of £100.

Kaitlin Allen (right) receiving her award from CIBSE President Nick Mead and Richard Gelder, of Hays Building Services

Richard Gelder, of Hays Building Services, presents Dr Yupeng Wu (right) with the prize for the University of Nottingham

Lt Col Steve Lumley accepting his award from CIBSE President Nick Mead and Buro Happold's Peter Smith

Happold Brilliant Award

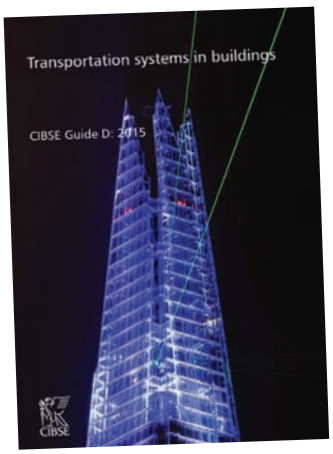
This accolade, which recognises excellence in the teaching of building services engineering, was this year presented to the Royal School of Military Engineering. The award was accepted on behalf of the school by Lieutenant Colonel Steve Lumley.

CIBSE President Nick Mead with Christopher Northey and Steve Vaughan

CIBSE President Nick Mead with Kevin Kelly and David Doherty

CIBSE medals

The nominations panel gave silver medals each to Christopher Northey, Kevin Kelly and John Anderson, in recognition of their contribution to the industry



Fifth edition of Guide D launched

A new edition of *CIBSE Guide D: Transportation systems in buildings* was recently launched at the annual lift symposium.

The guide is a key source of information for those who work in the vertical transportation industry, and is also a valuable source of information for architects, developers and those involved in the management of estates and buildings.

This fifth edition is the result of an extensive review and revision by a dedicated team of lift and escalator specialists and building service engineers. It covers a whole range of topics, including planning and design, legislation, and fire and safety.

The purpose of Guide D is to provide guidance to practitioners. It will also be of interest to architects and developers, plus facilities and building managers, students embarking on a career in mechanical, electrical or building services engineering, and those wishing to enhance their knowledge in this area.

Copies of CIBSE Guide D are available at **www.cibse.org/knowledge** The CIBSE Lifts Group is free to join – visit **www.cibseliftsgroup.org**

Feedback

This month, CIBSE LinkedIn Group members discuss the lack of access in buildings for maintenance engineers

William Roberts
Think of the poor maintenance engineer next time you design a building. I was faced with a refurb with package AHU, which had only 8in between AHU panels and the wall, in a ceiling void and cupboards below – access was via ladder and battens. This was designed... please remember that it may be me who needs access next time.

Cameron Steel
All designs need to look more carefully at the ergonomics. It may look good on paper, but what are the practicalities of installation, commissioning, maintenance, refurbishment and decommissioning. A sanity check has to been done on the design with respect to the whole life-cycle of the plant or equipment.

John O'Keeffe
The people responsible for maintaining the facilities must be included in the design stage and have the opportunity to view works as they occur.

Tony Thurgood
I have been in this industry, on both sides of the contracting fence, for nearly 50 years and have been saying this all my working life, as well as trying to get fellow designers and consultants to think this way as well. But guess what? The cheapest way wins every time at the capital-expense stage – and hang the consequences down the line because I will not be on site then.

Alan Kitching
Design for maintenance... you mean that consultants/designers don't have a specific review of their designs to ensure easy maintenance and hence low life-cycle costs? Surely not! I'm still seeing on sites – and designs – electrical accessories positioned behind radiators, and radiators not fitting under windowsills. If the basics can't be mastered, then maintenance and life-cycle must be low on the their agendas.


There are no access issues in this large industrial boiler room

DARREN BRODE / SHUTTERSTOCK

Howard Tomlinson
Documents are regularly issued unfit for tender – much less installation – and designers rarely have any real or practical experience of working on sites and reading drawings. Meaningful site supervision in the client's interest rarely takes place on any but the largest projects.

Three factors control any project: cost, time and quality. Only one factor can ever lead – the other two must be lesser by definition. Anyone and everyone in contracting knows that you can have it cheap, or you can have it fast, or you can have it done well – you cannot have it all.

Cameron Steel
The design has to be correct from the maintenance perspective right at the start of the project. The design team needs to engage properly with the maintenance team to ensure the installation can be maintained. This then needs supervising throughout the construction process.

> You can have it cheap or you can have it fast or you can have it done well – you cannot have it all

Graham Smith FCIBSE
I have refused to accept the services on a number of occasions, yet the building is still handed over. I have reported on sites where maintenance of AHUs is potentially lethal due to unsafe access at height, yet there was considerable reluctance to do anything to protect the maintenance engineer.

Peter Hill
A fundamental problem is the 'working in silos' approach to building design, and the communication between parties taking place too late (if at all).

Rupert Lodge
A market driven by lowest (first) cost means the client gets the engineers and installers and installation that he deserves.

And, after the VW debacle, the auto industry is not a shining example. Indeed, on my Astra, I had to take the front wheel off to change a headlight bulb. An appalling bit of design.

Rosie Caley
Often, the installation is limited by some other issue during construction that is no longer apparent after the dust has settled. More opportunity for coordination between consultants, contractors and installation/maintenance specialists at the design stage is the only way to mitigate these hangovers. It can smoke out the potential limitations of the design during construction as well as for ongoing maintenance.

Tony Thurgood
The answer is for people to take their legal and moral responsibilities seriously and actually to do the job that they are supposed to be doing.

CIBSE Journal welcomes readers' letters, opinions, news stories, events listings, and proposals for articles.
Please send all material for possible publication to: editor@cibsejournal.com, or write to Alex Smith, editor, *CIBSE Journal*, CPL, 275 Newmarket Road, Cambridge, CB5 8JE, UK. We reserve the right to edit all letters.

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EVERYBODY NEEDS GOOD NABERS

An Australian energy-rating scheme is so commonplace in the country's commercial property market that government and commercial tenants insist they will only occupy buildings with a minimum standard. **Hywel Davies** looks at how Nabers transformed a sector and made the country's property companies among the greenest in the world

Globally, buildings use 40% of the world's energy, release 40% of its carbon emissions and use 20% of the available drinking water, according to the World Economic Forum.

In Europe, buildings account for 46% of energy use. Legislators the world over are trying to make buildings more energy, waste and water efficient.

Australia's government and industry have been working together to improve the energy efficiency and wider sustainability of commercial buildings for more than 10 years. They have successfully developed a rating scheme for buildings based on measured performance, which is now widely adopted in the country's commercial property sector. Consequently, Australian property companies are now acknowledged to be some of the greenest in the world.

The National Australian Building Environmental Rating Scheme, or Nabers, provides a simple indication of how well one building is managing its environmental impacts compared with similar buildings, enabling owners to measure their assets against those of market competitors. Once an occupier understands the environmental impact of a building or tenancy, it is possible to identify how to make that building or tenancy more sustainable.

Nabers provides environmental rating tools for energy, water, waste and indoor environment, to measure the actual operational performance of existing buildings and tenancies.

The scheme covers commercial offices, shopping centres, hotels and homes, although only offices are covered by all four tools.

One common argument in the UK around energy or environmental rating tools relates to the so-called 'landlord-tenant divide'. Landlords are concerned that operational energy ratings do not distinguish between the energy-using habits of the landlord and their tenants, while Energy Performance Certificates measure the efficiency of the fabric and fail to address operational energy use.

ESFERA / SHUTTERSTOCK

Should we take a leaf out of Australia's book? Nabers provides a star rating to a building or tenancy based on 12 months of operational performance data

> Far from trying to suppress evidence of operational performance, the property sector in Australia is embracing the scheme

In contrast, Nabers can be used to rate the performance of a tenancy, the base building or the whole building. The tenancy rating includes only the energy or resources that the tenant controls. A base building rating covers the performance of the central services and common areas, which are usually managed by the building owner or landlord.

A whole building rating covers both the tenanted spaces and the base building, and is typically used in an owner-occupied building, or where there is inadequate metering to obtain a base building or tenancy rating.

Key to achieving this for energy is a rigorous protocol for measuring the energy used in the various parts of the building, with a comprehensive metering strategy. Often the landlord and tenant have separate supplies, and meters. In this respect, at least, the Nabers approach is unique, and allows the ratings to use real, measured energy (or water) use data to communicate the result in a clear and simple way, based on star ratings.

The result is a credible programme of building-performance star ratings, which are used in the Australian market to drive better performance by recognising the best, and challenging the rest to follow suit.

Nabers uses engineering information – primarily energy use in kilowatt hours – and communicates it in a way that non-engineers, especially finance directors, can understand and act upon.

Nabers gives a star rating to a building or tenancy, based on 12 months of measured operational performance data for energy, water or waste.

To compare the building fairly against its market peers, the rating takes into account the climate in which

the building operates, its hours of use, the level of services provided, the sources of energy supplying it, and its size and occupancy.

It then compares the performance of the building or tenancy to benchmarks representing the performance of similar buildings in the same location, and calculates a star rating reflecting the performance relative to those comparable buildings.

A six-star rating demonstrates market-leading performance, while one star means the building has considerable scope for improvement. Nabers ratings are valid for 12 months, and the annual review ensures they accurately represent current operational performance.

A rating prepared by an accredited assessor confirms what is working well and what could work better. It allows meaningful improvement targets to be set for the building or tenancy, and also allows the rating to be publicised. Self-assessment is a quick and easy way to get an idea of how well a building or tenancy is performing, but this cannot be promoted or published.

Nabers star ratings are now common language in the Australian marketplace, with government and many commercial tenants insisting that they will only occupy buildings or tenancies that have a minimum standard. This, in turn, is driving investors to favour the greenest properties and their managers, and is transforming the commercial property market in Australia. Far from trying to suppress evidence of operational performance, the property sector in Australia is embracing the scheme – in contrast to some recent efforts by government in London.

It seems Australia is better than England at more than just rugby. Is it time for the UK to learn from Australia's building rating scheme and look to develop one that measures real performance and recognises it?

● **HYWEL DAVIES** is technical director at CIBSE **www.cibse.org**

THE TRUE MEANING OF GOOD DESIGN

In his speech at the Young Engineers Awards, where he won the IMechE Construction and Building Services Division prize, **Mark Skelly** said check-box 'sustainability' was hindering good design

We are coming to a pivotal moment when we have the momentum and the opportunity to take more of a lead and make key high-level and strategic decisions about what we do and why we do it.

As an industry, we have let the term sustainability become pigeon-holed and downgraded. It is no longer a goal, but a separate discipline, a subject heading, a series of tick boxes.

To me, a sustainable building is a well-designed building, architecturally and holistically.

Essentially, good design produces the best solution that can be achieved given the brief, the constraints and the context, where the brief is to design a building that has a goal to be 'sustainable'.

Given that no two buildings should ever have the same brief, constraints and context, all well-designed buildings should be different. This means that trying to define good design is a multi-dimensional and highly complex thing that it is not easy to simplify in a series of generic requirements.

Fifteen years ago, before the term sustainability was as mainstream as it is today, I worked on a school building that had to fit within the rural context of an area of outstanding natural beauty, while doubling the amount of teaching accommodation on site. The building won a RIBA award and, despite having double the teaching area, it halved the energy consumption.

At the time, Breeam was starting to become more established and the client suggested we get the building assessed. It got a 'pass' – not quite a 'good', and nowhere near a 'very good' or 'excellent'.

The problem is that, too often, Breeam is used to drive the design process, and it frequently fails to identify good design because it is a fairly generic tool to improve the performance of relatively bog-standard projects. It cannot easily cope with the nuances of the real world and how a design adapts to them.

Farmiloe building

Another recent example is the redevelopment of the Victorian Grade II listed Farmiloe building, in Islington, which had to be connected to the local district heating network to adhere to London Plan requirements.

Our strategy focused on ensuring the design was robust enough to work passively, using natural ventilation and exposed thermal mass, while still providing an integrated low carbon cooling and mechanical ventilation system to meet the commercial brief.

To keep relatively high floor-to-ceiling heights in the new-build extension, we used ducts cast into the post-tensioned concrete slab. This solution was coupled with heat-recovery chillers that collect the casual and solar gains from the spaces and store them up in phase-change vessels ready for next morning's warm-up. This meant the building had little need for heat from the district heating network.

So we proposed to the planners that, instead of connecting to the network, the client would make a financial contribution to the extension of the network to serve the street that the building was on. The Greater London Authority and the district heating company agreed, but the planners dug in their heals and insisted on making the client connect.

> Let's get away from describing good design as sustainability and just focus on good design

When you are in this situation, you are fighting a common sense argument against the state and, therefore, society. In this case, the planners' mentality was a potential barrier to the best design solution for that site and building.

This project highlights another hurdle to innovation that has materialised in the past 20 years – while computers have got more powerful, the software we use to model complex design options has not progressed, from a technical analysis point of view. The focus has been on developing the tools for compliance and better usability, rather than proper analysis.

On the Farmiloe building, we were unable to model the controls options for the innovative strategies we were testing, so had to model these outside our tools, ignoring them when it came to producing Energy Performance Certificates and compliance figures. This is really frustrating.

If good design was the focus – rather than compliance, with checklists and targets – then software may develop to allow us to test design ideas and possible innovations. Let's get away from describing good design as sustainability, and just focus on good design.

As building services engineers, our contribution to that 'good design' starts with the built environment, which is informed by an understanding of physics and human psychology, and includes delivering robust and efficient systems to complement that environment.

Every member of that process needs to be trained to understand, and buy into, the bigger picture – and be given the tools to innovate.

MARK SKELLY is founding director of Skelly & Couch

Security and innovation were two of the key themes at the CIBSE Building Performance Conference and Exhibition. **Alex Smith** and **Liza Young** report on the highlights of the 2015 event and pick out the issues and technologies most likely to transform the building services industry in the next few years

SECURE IN THE KNOWLEDGE

Lord Deben opened the CIBSE Building Performance Conference and Exhibition by making an impassioned plea for engineers and clients to focus on energy efficiency in buildings.

The chairman of the UK's independent Committee on Climate Change said he was tired of hearing firms suggest that energy efficiency was too difficult. 'They don't need to give anything up – we can do all the things we do now, but with half the energy consumption,' he said.

Lord Deben pointed out that Unilever was saving £250m a year by making its buildings more efficient and cited one large energy user that had cut its annual electricity bill from £10m to £1.5m simply by replacing its lighting systems with modern LEDs.

As the keynote speaker, Lord Deben set the tone of the conference, exhorting the building services industry not to 'undervalue' itself. He said CIBSE 'had a big role to play' in delivering better buildings and contributing to the UK's ongoing economic recovery. (See 'News' on page 12.)

Hugh Boyes

Vladimir Masinsky

The conference brought together experts from across the industry to discuss the efficient and effective design, construction, maintenance and operation of buildings.

A key theme of the first day was security and the risk that criminals could exploit a new generation of building systems connected over the internet (see 'News' on page 12). Hugh Boyes, principal fellow at the Cyber Security Centre, WMG, University of Warwick, said the situation could become even more serious with the development of 'smart cities' and the Internet of Things (IoT), as cyber criminals could exploit connected elements to attack infrastructure such as transport systems.

'Building services engineers have to think about the vulnerabilities they are building into designs because they will be there for years into the future,' said Boyes.

Concern about security vulnerabilities in buildings has resulted in the fastest created British Standard, PAS 1192-5, which shows project teams how to put strategies in place to ensure sensitive building information

Canary Wharf's future city

Cognicity is a future city project, set up by Canary Wharf Group, to identify and accelerate the development of smart city technologies.

Vladimir Masinsky, Smart City Programme specialist at Entiq/Cognicity, said the idea was to identify, accelerate and procure interoperable smart city solutions to feed the 'integrated city of the future'.

The aim is to develop technologies that help improve efficiency and reduce costs for people living and working in the city. Masinsky cited recent projects that had received £50,000 and a guaranteed pilot, including Pavegen – paving slabs that convert footsteps into energy.

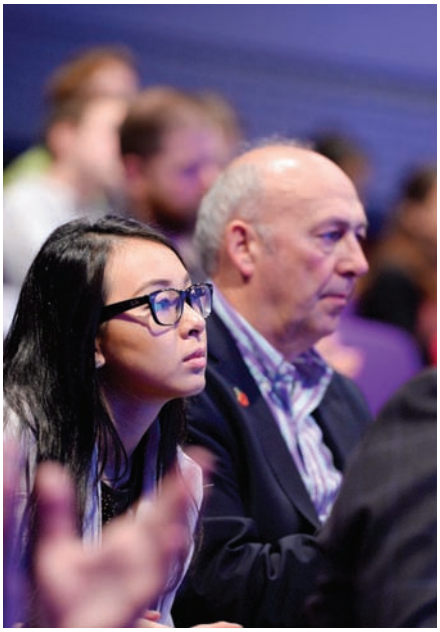
Cognicity also supported Strawberry Energy, a Serbian street-furniture company that has developed solar-powered 'smart benches', incorporating phone-charging points, air quality data and an emergency call button. It is being trialled at Canary Wharf in London.

Lord Deben


Rob Manning


Ann Marie Aguilar

Alexi Marmot



> Security could become more serious with the Internet of Things, as criminals could exploit connected elements to attack infrastructure

is not compromised. Andrew Sieradzki, head of security at Buro Happold, said a whole industry was being created around information management and he urged building services engineers to make use of the elements now available to secure data contained in BIM models.

The increasingly sophisticated controls systems in buildings can also create security weaknesses, according to Ian Ellis, immediate past president of the Building Controls Industry Association (BCIA). 'More building management systems (BMS) run on 'open' protocols because this drives energy efficiency, but these protocols are in the public domain and can be directly accessed from the internet. So security needs to be in place before the system is used,' he said.

In a session on BIM, ECA technical director Jim O'Neil, said only one in six of the respondents to an ECA survey was fully ready for BIM Level 2, and a worrying 59% did not have a BIM planning group.

Rob Manning, of the Government Level 3 BIM Team, Engineering Construction Strategies, said that BIM would change the role of consultants. 'Some of the tedium of design will be removed using digital information provided by suppliers of products and systems.' He also predicted that construction trades would move into the factory, as BIM would demand more precision in design and installation.

Sainsbury's head of engineering, Mark Hawker, chaired a session on the concept of reliability-centred maintenance (RCM), which the supermarket giant has adopted to minimise maintenance costs. RCM is well-established in the airline industry, and is based on the idea that equipment is checked regularly for signs of impending failure.

Sainsbury's applied RCM to its biomass boilers to minimise breakdowns and improve performance. Once it understood the root causes of potential failure, it created a standard manual for maintaining the boilers. *CIBSE Journal* will feature RCM early next year.

As part of the session on adapting UK buildings to a changing climate, Ann Marie Aguilar, of Arup, focused on the importance of meeting the needs of an expanding older population and the disabled, by making small changes that will enhance their wellbeing and quality of life. Examples include improving lighting for people with cataracts, or designing hospitals to help people with dementia.

She said: 'There's no single model of human behaviour that could be used in a design project, but building design can encourage wellbeing and health.

'About 25% of people who visit hospitals have dementia, so why don't we adapt hospital layout and signage to help them? Poorly designed care environments can lead to further impairment.'

Alexi Marmot, of Alexi Marmot Associates, said cultural expectation also had a bearing on building management, citing the demand for air conditioning regardless of its need or effectiveness. She said there was a direct link between our working environment and our job satisfaction, which – in turn – related to productivity. Facebook, for example, maintains its office room temperature at 15°C to keep meetings short and increase productivity.

On average, we use just 19% of total office space productively, said Marmot. 'Most buildings are over-lit, over-heated, over-cooled and, therefore, underused.'

Engineering for people

Matt Colmer, of Innovate UK, asked why buildings fail to perform in real life as they do on paper. 'Are client expectations misleading promises or a disappointing reality?' He said that commissioning and handover are either inadequate or overlooked. 'A lot of money is invested in having systems to manage buildings in a robust way, but – because they are not implemented or managed properly – they are pretty much useless.'

Mike O'Mahony

Dave Worsley

Paul Jones

Colmer cited the Bluebell Health Centre, in Liverpool, where heat pumps, solar thermal and electrical immersion have been installed because planning policy dictated it must have 10% renewable contribution. However, all the centre's domestic hot water needs could have been met through the electrical immersion units alone.

'Ask what you are to gain and what the requirement is, and remember – buildings are for people. You can engineer a building, but you cannot engineer people,' said Colmer.

Stephen Pearson, head of building services at the University of Oxford, said that – from a client perspective – occupants do not always use the building's systems as the designer intends. He added: 'New buildings do not work. Or rather, they do not work as you might expect them to. Instead of asking why, maybe a better question is: "How can we make them perform better"?'

To do that, you must think like a user, train the building users and optimise your buildings, said Eimear Moloney, associate building engineer at Hoare Lea. The consultancy is working with the University of Oxford to optimise the building management systems for its entire estate.

'First of all, find out what's happening on site by monitoring and analysing data, make changes and, finally, monitor those changes to make sure they have had the desired impact.'

Mike O'Mahony, managing director of Andrew Reid & Partners, said commissioning was the Achilles heel of building performance: 'Cutting corners is simple; when the pressure is on, something has to give and – most of the time – it's commissioning.'

He added: 'To succeed, you need to recognise the uniqueness of each scheme, agree success criteria early on, and make the culture shift; we are in it together and, if one fails, we all fail.'

In the last session of the conference, on innovation, Dave Worsley and Paul Jones, from Swansea University, shared their knowledge about a new technology that


The panel for the 'Built for Living' session

they are developing to create 'buildings as power stations'.

Worsley told the delegates that, every day, more solar energy falls on Earth than humanity will use in 27 years. He said it could be harnessed with flexible PVs developed and used to power buildings. The firm's prototype three-bedroom house, he added, was not out of reach for developers, costing £125,000.

CIBSE President Nick Mead said he was proud to see CIBSE acting as thought leaders on so many topics, including adapting the UK building stock to climate change, legislation, and building performance.

'It's about putting your head above the parapet,' he said. 'We are good at what we do, we are changing the industry – now we need to raise our profile and shout about it.' **CJ**

● The presentations from this year's conference are available to view on the CIBSE Knowledge Portal at **www.cibse.org**

CIBSE BUILDING PERFORMANCE CONFERENCE AND EXHIBITION 2016

17 and 18 November 2016
Dates for next year's Building Performance Conference and Exhibition have now been announced, with the exhibition planned to be twice the size of this year's.
Book the dates into your diary now.

SMOOTH AS ICE

Somerset House is an important venue for arts and culture in London. To support its further expansion, an energy performance contract was used to upgrade the building services at the Grade I listed structure and guarantee energy savings of £235,000 a year. **Alex Smith** reports

London's Somerset House comes to life in winter. Its illuminated neoclassical façades form a sparkling backdrop to the open-air ice-rink that, each year, attracts thousands of pre-Christmas revellers.

Until the end of the 20th century, it was a more austere place, housing many government departments, including the Inland Revenue. That changed in the 1990s, when the Somerset House Trust was set up to develop the building and its open spaces for public use. The civil servants moved out, the car park was replaced with fountains, and upmarket restaurants and art galleries occupied former offices.

The Trust continued to open up the building over the next decade, introducing more eateries and event spaces, and letting out workspace to creative industries. But it had a problem that threatened to scupper its expansion plans. While Somerset House was in prime central London location, with room to expand, it had an outdated heating and cooling system that was struggling to keep up with the requirements of its growing number of tenants.

It suffered from poor electricity infrastructure and had two inefficient electric chillers, while the heating was being handled by 40-year old gas boilers running at 75%

CEDRIC WEBER / SHUTTERSTOCK

efficiency. The Trust realised it could not expand and open more restaurants unless it upgraded its systems; failure to do so would reduce potential revenue and limit its ability to maintain the historic building. This would be an expensive undertaking, however, made more costly and risky by Somerset House's Grade I listed status. Electrical grid reinforcement alone was estimated at £1m.

The Trust's remit is to turn Somerset House into a profitable enterprise and, any failure in the new systems would have an impact on its bottom line. To minimise its risk, the Trust turned to energy performance contracting (EnPC), whereby a company designs, buildings, services and HVAC systems while guaranteeing performance. In return, the client uses the energy savings to fund the investment.

Cynergin has completed EnPCs in the NHS and museum sectors, which means it designs, builds, finances and operates energy schemes, and takes on all the risks of performance. For the public sector there are procurement frameworks with established contract models and tendering processes. The frameworks feature EnPC service providers that have proven expertise in developing a project, plus a track record of honouring guarantee commitments. (See panel, 'How energy performance contracting works' on page 28).

EnPC frameworks are increasingly being used by local authorities, museums and universities. Somerset House Trust turned to Cynergin to provide an energy solution that would meet its heating and cooling requirements, while reducing its capital costs and minimising energy bills and its carbon footprint.

Technical director Keith Nord examined the energy profiles and likely future energy demand of Somerset House, and came up with a solution that mixed efficient new plant and existing pipework and chillers. 'There was an existing chilled water circuit and this has been incorporated into the new, extended system to ensure the absorption chiller is used as effectively as possible,' he says.

Director of sales Howard Stone adds: 'There is no point throwing out perfectly serviceable assets such as the existing chillers. As we are technology independent we propose the right solution for the project that produces sufficient savings, such as the absorption chiller supported by the existing chillers.'

It recommended installing two new high efficiency boilers running at 95%, and a 530kW gas-fired CHP as the primary source of heat and electricity, which could run in island mode in the event of a power failure.

CEDRIC WEBER / SHUTTERSTOCK

HISTORIC HEATING

Originally, heating at Somerset House came from many fireplaces throughout the building, as indicated by the numerous chimneys present on the roof. The CIBSE Heritage Group Archive indicates, in a 1932 catalogue, that the building was being heated by Beeston (hot water) Robin Hood Boilers and Radiators. A 1900 catalogue of Robert Boyle & Son states that Somerset House was provided with Boyle 'Air Pump' Ventilators, which supplied natural ventilation. On the CIBSE Heritage website, a biography of Robert Boyle reveals that he was a fierce opponent of mechanical ventilation. View the document at **bit.ly/1OiG7g1**

> Because of the building's listed status, the heat-rejection units and adiabatic condenser could not be sited in any visible area

The excess heat from the CHP is being used to provide cooling, via an absorption chiller, thus creating a combined cooling, heat and power system. This satisfies the requirement for air conditioning in the new restaurants, as well as providing an efficient cooling system for the building. The existing chillers have been retained, but will only be used to top up cooling on warm days, as they are more expensive to run. There is a new chilled water ring main and an enhanced control system to run systems more efficiently.

Working within the fabric of the 200-year-old building was a major challenge. One substantial technical difficulty was the positioning of the heat-rejection units and the adiabatic condenser for the absorption chiller. Because of the building's listed status, these could not be sited in any visible area.


The old boilers had to be cut up before removal

See the schematic
See this feature online at www.cibsejournal.com

> The success of an EnPC contract depends on getting the interface between installation, design and operation exactly right

How energy performance contracting works

Since becoming an energy service company (Esco) in 2009, Cynergin has won many energy performance contracts, including those for NHS Foundation Trusts at Warrington & Halton Hospitals and Yeovil District Hospital.

To prove that the company had the financial, technical and management skills to guarantee the performance of HVAC systems, it had to meet the criteria of several frameworks, including the Carbon Energy Fund and Essentia. The former funds, facilitates and project manages complex energy infrastructure upgrades for the NHS and public sector, while Essentia is the trading arm of Guy's and St Thomas' NHS Foundation Trust.

'These stand as NHS-endorsed business models,' says Cynergin managing director Nick Ray. 'If you fit within them – bingo! A lot of other public markets look at the standards set by the NHS, and think they must be pretty high.

'It's more than just a list; it's a really pro-active business model. You can't get on the list unless you know what you're doing.'

To get on a framework, companies must demonstrate both a financial and technical understanding. 'We are putting our money where our mouth is, so we have to assess the customers' current position, identify the savings, and design a solution that fits within the financial model,' says Ray.

To guarantee energy savings, the Esco must be rigorous in the way it designs, installs and maintains the system. 'Performance is absolutely essential – our profit is critically dependent on it,' says Ray.

As savings are shared with the customer, Ray says it is important to be as transparent as possible when bidding for deals: 'The methodology by which savings are calculated are clear, and agreed with customers as part of the contract, so there can be no disputes.'

Although Esco companies have been around since the 1980s, Ray says the market is maturing as specialists learn to bring together the financial, legal and technical elements that need to be integrated to design and manage the contracts successfully.

'I would say I have been working to this model for 20 years and, for a long time, we were ploughing a bit of a lone furrow because we were the only ones doing it,' he says. 'People thought it was too good to be true, but what has helped the market is the emergence of frameworks that are specifically for EnPC-type projects. You can't get on there unless you are proven at delivering them.'

Ray believes EnPCs will only get more popular with clients who need to make carbon reductions but don't have the capital to make the necessary investment. 'They have pressing needs for their limited capital elsewhere. So if we can unlock it for them by bringing new money and a different approach and expertise – that shows there is a way to unlock it without having to do without the new scanner they need or the wing they want refurbished – it's a great solution.'

'There were no roof areas suitable as they had to be out of sight, and ground space is very limited. As a result, they are concealed in a light well,' says Nord. This had sufficient airflow to provide the cooling, but was not visible from the exterior of the building.

Taking the heat rejected from the CHP and absorption chiller meant threading pipework through walls 1m to 1.7m thick. In load-bearing walls, lintels needed to be positioned above and below the opening to take the weight of the structure, before ductwork was installed. Removing old equipment was not straightforward either. The four 1.5-tonne old boilers had to be cut up before they could be removed from the boiler room, and bricks had to be taken out of an exterior wall to allow the CHP unit to be installed.

Space was also very tight in the light well, to the extent that a 10mm eyelet, securing anti-


The new absorption chiller is installed

IAIN MCGILLIVRAY / SHUTTERSTOCK

The heat-rejection units are eased onto a specially built frame in the light well

bird netting, had to be removed to allow the half-tonne, custom-made heat-rejection units to be placed in by crane. These units, and a new 1.2m header, are supported by an iron frame installed in the light well.

Stone says the success of an EnPC contract depends on getting the interface between installation, design and operation exactly right. 'Some EnPCs can get complicated. It is the interaction between the contract, finance and the technical design that is at the heart of what we do. If you don't know how they interact, you can get in the quagmire pretty quickly.'

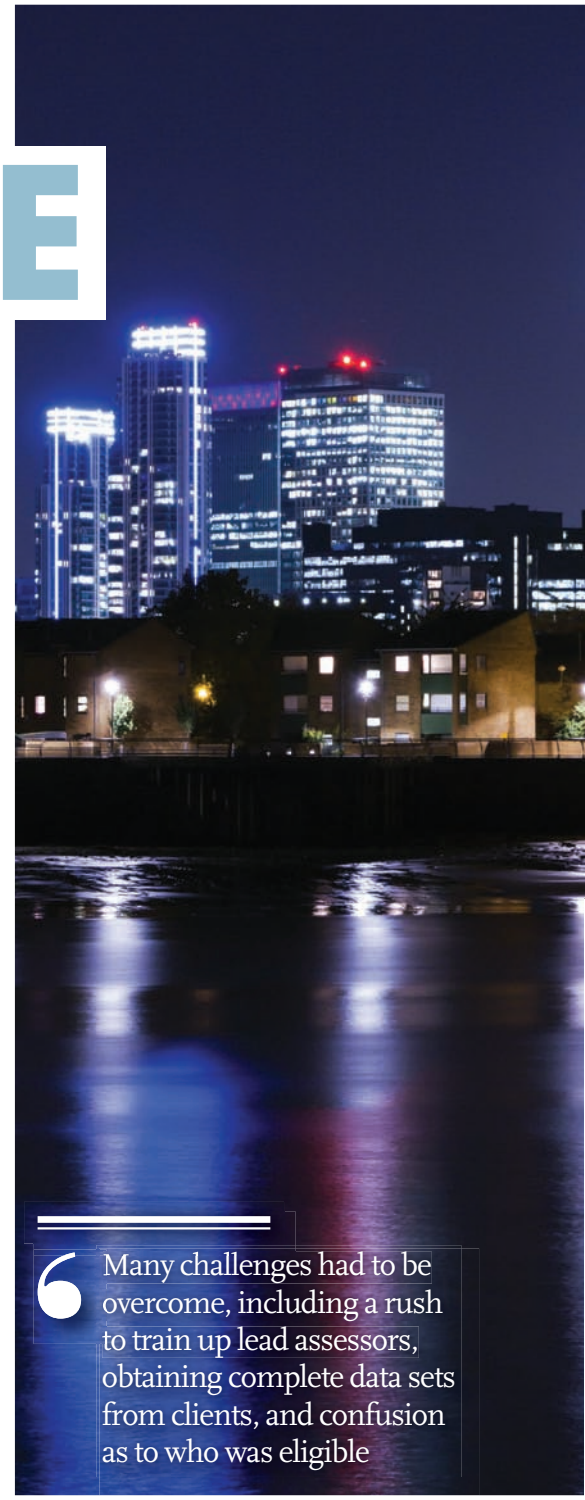
Cynergin offered Somerset House Trust a 15-year operation and maintenance contract, and a guarantee that the new assets would save it energy costs, from the former £600,000 per year to a projected £365,000 at contract utility prices. Annual carbon emissions are forecast to be reduced by 16%. 'It's a sizable return on investment with very limited risk,' says Stone. The cost of the project was £1.8m.

Verification of the performance is essential within a EnPC contract, as the share of savings agreed between the energy service company and client is dependent on targets being met. The savings are measured to meet the International Performance Measurement and Verification Protocol. The company monitors projects from its Reading base and has service-level agreements with customers that stipulate response times to any faults in the system.

The new systems at Somerset House were switched on in time for the skating season, and performance testing starts this month. The building now has the infrastructure it needs for future expansion, a lower energy bill is guaranteed, and savings can be put towards making it an even more desirable destination for tourists and Londoners. **CJ**

FALLING INTO PLACE

With only days until the deadline for the first phase of the Energy Savings Opportunity Scheme, **Liza Young** finds out the challenges for businesses on the road to certification



Large UK organisations have until 5 December to register their Energy Savings Opportunity Scheme (ESOS) compliance with the Environment Agency (EA). However, after assessors reported that getting complete data from companies was taking longer than expected, the EA effectively extended this deadline to 29 January 2016 for firms that confirm they have a plan in place to comply with the policy by that date.

Head of CIBSE Certification Andrew Geens says: 'There has been a mixed response from firms; some are grateful for the extra time because it takes the heat off a bit, and others have decided to stick to the December deadline to uphold their reputations.'

The route to compliance has not been straightforward; some consultancies were dissatisfied with the government's lack of preparation when the scheme was launched.

From a standing start, there were many challenges that had to be overcome, including a rush to train up lead assessors, obtaining complete data sets from clients, and confusion as to who was eligible.

Although some consultancies thought the government had done insufficient groundwork for the scheme, others praised its efforts, with some clients even acting on their ESOS evaluations.

Babraham Hall, at the Babraham Institute, is ESOS compliant

CREDIT: BABRAHAM INSTITUTE

> Many challenges had to be overcome, including a rush to train up lead assessors, obtaining complete data sets from clients, and confusion as to who was eligible

Despite a poor start, ESOS is proving to be a useful tool for focusing the UK's boardrooms on energy efficiency and management.

Dissemination

Lead assessor Sebastian Gray, of GEA Consulting, says there was a perceived lack of preparation around the launch of ESOS, causing confusion about the requirements for compliance.

Not only did accreditation bodies have to rush to set up registers of qualified

The deadlines

The Environment Agency, which is managing the ESOS scheme, says companies that show they have a plan to comply with the policy by the original 5 December audit deadline will be given an extension until 29 January 2016 to become fully compliant.

It also confirmed that penalties would only be applied for non-compliance three months after the new 29 January deadline.

Firms using ISO 50001 as a route to compliance will be given until 30 June if they have audited in time for 5 December, but require corrective action to iron out any non-conformities.

The window can also be used by those with a non-certified energy management system in place, or one that has not been UKAS accredited.

QQ7 / SHUTTERSTOCK

consultants, he says, but the lack of time between introduction and compliance left some consultancies' lead assessors without the necessary competencies to provide the required services to their clients. Gray adds: 'While the majority of large organisations were aware that they must comply with ESOS, smaller companies were surprised that they must also meet the compliance criteria.'

In June, when Gray presented at the Facilities Show, he found that there was significant confusion about the procedures and requirements of ESOS; many had only just started budgeting for compliance and fewer still had taken the step of appointing a lead assessor.

George Crone, partner at environmental consultants Novus Consulting, believes the government has done too little to promote the potential benefits of ESOS to business, and 'certification bodies have focused on maximising the supply of lead energy assessors rather than the quality'.

He adds that this combination has created a race to the bottom on cost. 'In future, government engagement with institutions such as the Institute of Directors could help raise awareness and focus on the issue.'

It appears that some assessors had been charging more as the deadline approached. ESOS lead assessor and ISO 50001 lead auditor Tony Lindsay, of West London Energy Assessors, says he has come across many cases where clients had been advised of a more expensive route to compliance – or overcharged. He says this has the potential to cause reputational damage to an accreditation body and the industry as a whole.

'In one specific case, I was told the cost of the 50001 work had been costed around the £25,000 mark, when I knew they could have achieved compliance for less than a 20th of that,' he says.

'Another client advised that they had been quoted a daily rate of £2,500 for five days to deliver ESOS compliance – and that was for one person.'

Geens defends the government, saying it has been promoting ESOS and has contacted company directors, as well as facilities and energy managers. 'They can write to people, but they cannot make them read it. It could be that the letter went to the wrong person, or to someone who thinks it's not their problem.'

He says the government and EA have been using all available channels to make people aware of ESOS and to publicise its benefits. 'There has been a lot of coverage in industry press, and the Environment Agency has run roadshows in different parts of the country.

'The only thing more they could have done is write it into the *EastEnders* or *Coronation Street* storylines,' adds Geens.

The challenges

Lindsay says that, in many cases, clients didn't understand the routes to compliance and wanted to 'just sign off' the work they had already done. He adds: 'I have lost count of the locations I have audited where the organisation had been guided down the 50001 route when a cheaper, easier ESOS-compliance route would have been possible.

'In those instances, it was clear they had been badly advised – and, if they had read the possible routes to compliance, they didn't understand what they were. But I have found that once clients understand what is possible, the routine is generally straightforward.'

One of the main challenges for GEA Consulting was the time it took to organise audits, says Gray. 'Bringing the relevant – and often disparate – personnel together has been difficult, especially with the lack of interest sometimes shown by those in higher management positions.'

Audit planning requires good communication between all parties, he adds. 'Failure to respond by a single person could quickly prevent progression.'

The greatest challenge for GEA Consulting, however, has been trying to obtain the necessary data to determine energy use, especially when it comes to 'grey fleet' transport information – such as that of employees' company cars and vehicle expenses – from organisations not used to tracking energy consumption.

Gray's client Ian Jones, buildings and environment director at leisure management company Circadian Trust, agrees. 'The main challenge was making sure we had all the data available, and that it was validated before passing it over to the consultants. Making sure all display energy certificates (DECs), combined heat and power quality assurances (CHPQAs), CHP and photovoltaic (PV) data were also included.'

> Since its ESOS assessment, the Circadian Trust has invested in renewables and made improvements in LED lighting

The laboratory and science building at the Babraham Institute, which has had an ESOS audit

CREDIT: BABRAHAM INSTITUTE

Assessed: London Heathrow Marriott Hotel

CREDIT: LONDON HEATHROW MARRIOTT HOTEL

The benefits

Gray believes ESOS has been a necessary wake-up call for organisations in the UK, bringing a focus on energy efficiency and management into the boardroom.

As for clients, Jones says having a complete overview of all energy used at the Circadian Trust has been beneficial. 'Having your business energy analysed independently by the consultants is a good way of measuring performance. It also offers a second view on where additional improvements, or savings, can be made.'

Jones says the trust constantly looks at ways of improving efficiencies and reducing its carbon footprint. Since completing an ESOS assessment, it has invested in renewables and made improvements in LED lighting. 'Rainwater harvesting is the next project for us, as well as solar hot water for our swimming pools.'

Crone believes ESOS has great potential to raise the profile of energy management and increase assessment standards. He says companies with good ISO 14001 systems were the most proactive, aware of the regulations in advance and able to plan for compliance.

'Those with strong internal reporting structures have had to spend less time gathering verifiable energy-consumption data, which means they have had to spend less time on compliance.'

Next steps

Geens says the government has done a good job of implementing regulations in a pertinent way. 'I would expect ISO 50001 to be used in the longer term for ESOS compliance because, once organisations start thinking about energy, it makes sense to put an energy-management system in place.'

He says ESOS could potentially support other regulations – for example, the forthcoming legislation on minimum energy efficiency standards (MEES), which will prevent landlords from letting buildings with an Energy Performance Certificate below an E rating.

As part of the ESOS process, the assessor would identify a number of poorer-performing buildings and the areas for improvement, giving people time to get them sorted by 2018, when MEES comes into force.

Geens believes we will have a clearer idea of what energy regulations in the UK will look like after the government's consultation 'Reforming the business energy efficiency tax landscape'. 'I would be quite pleased if the government uses ESOS for any rationalisation of energy regulations it is doing. Existing schemes may somehow be merged with ESOS requirements – perhaps with annual reporting of energy use,' he says.

Gray assesses the London Heathrow Marriott Hotel

ABM UK has been ESOS audited

'It could be that ESOS assessments are carried out more frequently than every four years, without the detailed work of improvements. But the hope is that, once people are told what they are spending on energy, they might make improvements anyway, and start monitoring consumption.

'If companies do that, then things will be in the right place to report again in 2019.'

Gray adds: 'Although there is no requirement to undertake the recommendations from an ESOS audit, we hope it will give company directors an insight into how their organisations consume energy, and the cost implications of doing nothing.'

Geens agrees: 'Most companies think about how they can improve the bottom line, and making a clear business case means they will listen. Ultimately, the skill of the ESOS assessors will decide the success of the scheme.' **CJ**

● See page 58 for CIBSE ESOS-accredited energy assessor training dates, or visit **www.cibse.org/esos**

BUZZ FEED

How people experience spaces is informed by what they hear, as much as by what they see. **Mike Bedford** explains how Hoare Lea designed an audio-visual system that transported people into a gold medal-winning beehive

The Hive's immersive design transported visitors into the world of bees

PROJECT TEAM

- **Client:** UK Trade & Investment
- **Artist and creative lead:** Wolfgang Buttress
- **Architecture, landscape architecture, civil engineers, environmental engineers, lighting design:** BDP
- **Fire engineer:** Hoare Lea Fire
- **Acoustics, soundscape design and audio-visual design services:** Hoare Lea
- **Physicist and bee expert:** Dr Martin Bencsik
- **Structural engineers:** Simmonds Studio
- **Manufacture and production:** Stage One
- **Creative Agency:** Squint/Opera
- **Audio show control and programming:** Robin Whittaker (TiMax show control); Andy Coates (feature lighting)
- **Photography credit:** Courtesy of UKTI

A hidden, self-powered speaker in the Meadow

> Six sub-bass loudspeakers relayed sounds in direct response to the behaviours of honey bees located 870 miles away in Nottingham

Using sound to highlight the crucial role of pollination in keeping the world fed was the challenge Hoare Lea undertook for World Expo 2015.

The consulting engineers designed integrated audio-visual systems and a soundscape for the UK's gold medal-winning pavilion at the Expo, which was held in Milan from 1 May to 31 October.

More than 140 countries were represented at the event, which had the theme 'Feeding the Planet, Energy for Life', and was a platform for exchanging ideas about food and promoting innovation for a sustainable future.

The UK's response to the theme was The Hive, a 14m^3 aluminium structure that used light and sound to connect visitors to the activity in a beehive. Designed by award-winning British artist Wolfgang Buttress – and inspired by the research of physicist and bee expert Dr Martin Bencsik – The Hive drew attention to issues such as food security and biodiversity, and highlighted the crucial role of pollination in the world's food supply.

Visitors to the pavilion followed the dance of a honey bee through a series of landscapes, including an orchard, a wildflower meadow and, finally, the 'hive'. While it was designed with visitor circulation and aesthetics in mind, careful attention was also paid to the experience of sound.

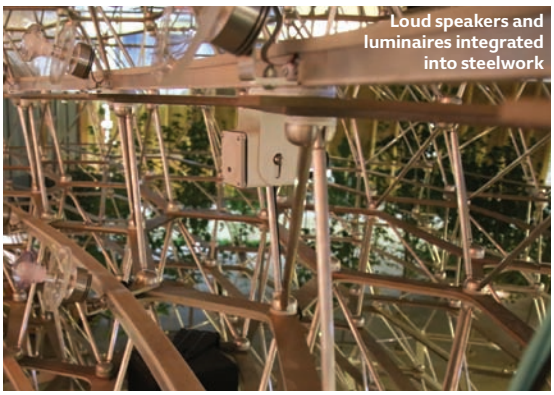
The way in which people experience spaces is informed not only by what they see, but also by what they hear. Their impression of a space relates both to its landscape and its soundscape, and successful, immersive designs 'transport' the listener – influencing their mood, emotions and perceptions. Visual cues are also an important aspect of an immersive experience and need to be linked to the soundscape compositional content.

Hoare Lea worked with Buttress, Dr Bencsik, architects BDP, engineers Stage One, and sound and light programmers Robin Whittaker and Andy Coates to develop systems to implement The Hive's soundscape. This featured compositions by musicians who have recorded with artists such as Spiritualized, Sigur Rós and The Orb.

Orchard entrance wall with integrated loud speakers

Loudspeaker and amplification equipment used for soundscape systems must be carefully placed and be capable of reproducing original recorded or live sound with exceptional quality. Equipment must also include components that can produce a wide dynamic range – from quiet intricate sounds through to deep bass.

The Hive's system was designed to move sound around visitors. A 360° arrangement of carefully placed loudspeakers – comprising both an upper and a lower ring each of nine mid/high-range units – were integrated into the pavilion's lattice structure. Low-frequency sound, meanwhile, was provided by six sub-



Loud speakers and luminaires integrated into steelwork

bass loudspeakers, fixed at floor level. These relayed sounds and triggered musical parts in direct response to the live behaviours of honey bees in Dr Bencsik's beehives, located 870 miles away in Nottingham, England.

The programming followed the time of day and night to reflect changes in bee activity, to create a range of listening experiences.

Very sensitive accelerometers were placed within the live bee hives in Nottingham, capturing the vibrational 'conversations' between the bees. In Milan, live computer analysis of the amplitude and frequency of the live-streamed vibration data enabled noise gates to be triggered at particular thresholds, producing responsive playback of pre-recorded musical stems, initiated in harmony with sequenced sounds from the bee colony.

The bed of the soundscape composition comprised: a low-frequency 'hum' of many bees; intermittent 'static noise' of the crackle of bees walking on the wax; and short pulses of distinct vibrational signals from individual bees. Cellos and vocals were recorded live while musicians listened to an amplified live stream of bee activity. Each of the 900 LED fittings in The Hive were individually addressable for control of RGB colour intensity flicker effect, from the same live vibration data used for the soundscape triggers.

Mike Bedford, principal, Hoare Lea Intelligent Buildings, said: 'The listening experience was designed with interaction between the zones of the soundscape. As the listener approached the hive from the meadow, for example, low-frequency "bass" sound energy would emanate from the floor and build within the meadow soundscape, adding to their sense of anticipation.' **CJ**

● **MIKE BEDFORD** is principal, Intelligent Buildings, at Hoare Lea

UK PAVILION FACTS AND FIGURES

- Designed, created, manufactured and built by Wolfgang Buttress/Tristan Simmonds/Stage One/BDP
- Footprint of 100m x 20m
- 14m^3 aluminium lattice hive sphere weighing 50 tonnes
- 169,300 individual structural components
- More than 890 LED lights illuminated the hive and relayed information live from Dr Bencsik's beehives in Nottingham, UK, 870 miles away
- Meadow planted with traditional British species, including heathers, buttercups and sorrel

CREDITS: HUFTON+ CROW, COURTESY OF UKTI; MIKE BEDFORD

Inside The Hive at dusk

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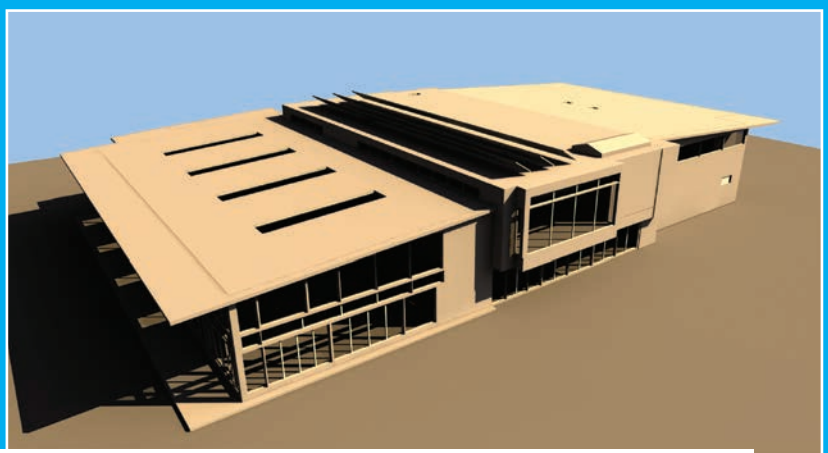

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This month: Token cloning in access-control systems; protecting the BMS specification; plus two corporate giants integrate BMS and IT networks

FOTOSENMEER / SHUTTERSTOCK

The risk of token cloning of access-control systems can be eliminated if steps are taken to include appropriate levels of security, says **Dave Hughes** at Stanley Security Products

CODE-BREAKING AND ENTERING

Cloning of tokens used in access-control systems is a serious issue faced by many organisations in various fields, from housing associations and hospitals, to hotels, commercial premises and high-security environments.

Badges, radio-frequency identification (RFID) tags or entry tokens can all be used for granting entry to a facility or restricted areas. With token-cloning technology easily available to anyone, and third-party tokens being cheap, duplicating a token can be done in a few seconds with the right equipment.

Access-control systems provide the essential services of authorisation, identity authentication, access approval and accountability. Electronic credentials are stored in the memory of a card or token and, theoretically, it is possible to create a process to clone any of them.

Technologies used for storing data in tokens are usually based on open standard hardware, which is easy to duplicate. This is not always the case, however, and the key word here is 'theoretically'. But it is important to remember, when it comes to access control, various levels of security are available.

There are several reasons why people clone tokens and cards. Sometimes it is done with criminal intent, but often it is simply to obtain duplicates in case of loss to avoid paying official fees for replacement devices. This puts landlords, institutions and individuals at risk, as tokens end up in the wrong hands, making it difficult to control usage patterns.

Mechanical or electronic access

A question that crops up in response to this is whether it is better to use mechanical locks and keys – rather than electronic access-control readers and RFID tags – to avoid the issue of token cloning altogether.

While physical key-based locks are, by far, the most popular form of door security, keys can also be copied and locks are vulnerable to picking. Cloning a token is, generally, a more complex process, requiring a device to read and reproduce the RFID signal in a blank token.

But the question really isn't the right one to be asking; the starting point should be to decide what level of security you require, and what you need from the system. Where a higher degree of security is needed, electronic solutions are a better fit. What's more, they offer the user a wide range of added benefits that are particularly useful for larger sites and/or with larger volumes of 'key holders'.

With electronic access, your single entry token or access code allows you through every door to which you need access, so there's no chance of you forgetting the key for a particular door. If you get to a site where you need access but you are not recognised by the system, a network operator can add you or your supervisor to the list instantly.

An additional benefit of electronic access control is complete history logging. This can be an invaluable tool when investigating vandalism or theft, or for tracking response times or technical activities internally. Furthermore, when an outside contractor or visitor needs access, the door can be opened remotely without any effort.

Electronic access can be instantly revoked

Employing an electronic access-control system provides you with the ability to revoke access instantly. If a physical key is lost, there is no way to block it or be sure that it has not fallen into the wrong hands. The only way of blocking access to the lost key would be by replacing the lock. This is not the case with electronic credentials, as revoking access privileges is as easy as telling the system to stop trusting the revoked key. No further work is necessary.

Selecting appropriate security levels

An access-control point can be a door, turnstile, parking gate, elevator or other physical barrier where access can be electronically controlled.

Systems can vary from basic solutions that simply read a card number or PIN and forward it to a control panel, to the more secure intelligent readers that comply with strict security rules and an externally tested, and recognised, certification, such as AES-128.

Depending on the level of security needed, manufacturers offer different types of access control and each has its own use. It is always advisable to consult your manufacturer or installer, and do a risk assessment of the site, to find out the best solution for your application. If high security is a must, a system that features an AES-128bit certification might be best.

AES is available in many different encryption packages, and is the first publicly accessible and open cipher approved by the US National Security Agency (NSA) for top-secret information when used in an NSA-approved cryptographic module.

AES-128 encryption is one of the most secure, and the only known attack to break it successfully requires about 38 trillion terabytes of data, which is more than all the data stored on all the computers on the planet. As such, this is only a theoretical attack that has no practical implication on AES security.

AES-128bit encryption is available from manufacturers, with affordable readers that can be easily installed on top of a legacy system to upgrade it to a smart system. Smart readers, used in conjunction with smart credentials, offer highly secure access control suitable for any commercial or residential environment.

Manufacturers can incorporate processes and systems to ensure that electronic credentials remain safe and secure from those who would want to duplicate them. As technology evolves, many manufacturers introduce new readers for higher security that prevent unauthorised entry and access token cloning.

The new smart readers can be incorporated into existing systems without too much effort or costly procedures, and offer a secure solution. If security or unauthorised entry is of concern, speak to an installer or manufacturer to learn more about smart readers. **CJ**

DAVE HUGHES, global product manager at Stanley Security Products

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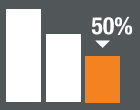

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NURSED BACK TO HEALTH

Building management systems are often prematurely discarded by project teams unfamiliar with the original specification, according to Sauter's **Gary Williams**, who says insufficient maintenance of controls is often the reason for a deterioration in performance

TYLER OLSON / SHUTTERSTOCK

'Failing' BMS systems are often discarded when they could be nursed back to health

BMS is often blamed for deficiencies in other areas of building services – such as poor maintenance on main HVAC plant. When this happens, the end user client is often persuaded that the best thing to do is replace the existing system with a new one.

But is replacing a complete system always the correct thing to do? Does it offer the end user best value for money and additional benefits? Our experience suggests this is not always the case.

About 12 years ago, Sauter installed a system in a public health building that was constructed under a private finance initiative (PFI) scheme. The incoming facilities management (FM) team was from the same organisation as the construction team, but had a different set of goals and objectives to meet when running the building.

At first, we looked after the BMS they had installed and all was fine. However, as part of cost-management exercises, the maintenance of the BMS went out to tender and was taken on by another company.

The new maintenance company committed to maintaining the competitor's system with trained personnel, who were able to use the system software. However, without on-going training, it is practically impossible to maintain appropriate, up-to-date, knowledge of the system.

Without appropriate training the system slowly deteriorates and plant is left running inefficiently, or potentially not running at all. Alarms are not necessarily managed properly or followed up and this can often lead to a proposal being put forward to replace 'a failing system'.

> The products are backward compatible, so it is not difficult to bring an old system up to date

In this case, the approximate cost of replacement was high – £1.5m – as networks and software would need replacing, and the work would have to be done out of hours.

The alternative was to get the system to work as originally intended and return it to full functionality within three months. This required a greater level of manpower than would have been needed to maintain the system correctly in the first place, but the cost is a fraction of a replacement system.

Any replacement would be a like-for-like system, so the end user would get no additional benefit other than a different name on its BMS equipment. It would still be doing the same job.

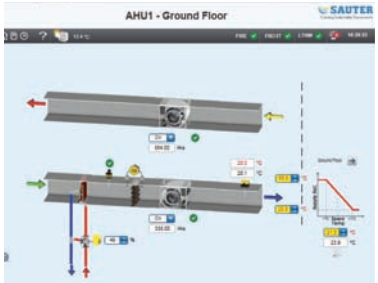
Under a PFI, the capital equipment can be replaced twice in the lifetime of the contract. If they just upgrade the existing equipment, the client could replace the system as and when required with the latest technology offering greater functionality. So why is it worth staying with the original equipment?

Like many other technologies, BMS has developed rapidly and communications protocols have changed. The head-end – the management level interface between the user and the BMS, such as a PC and screen with the relevant software installed – has changed, and adapts to meet different needs. It now includes an energy management option, negating the need to spend even more money on a different system.

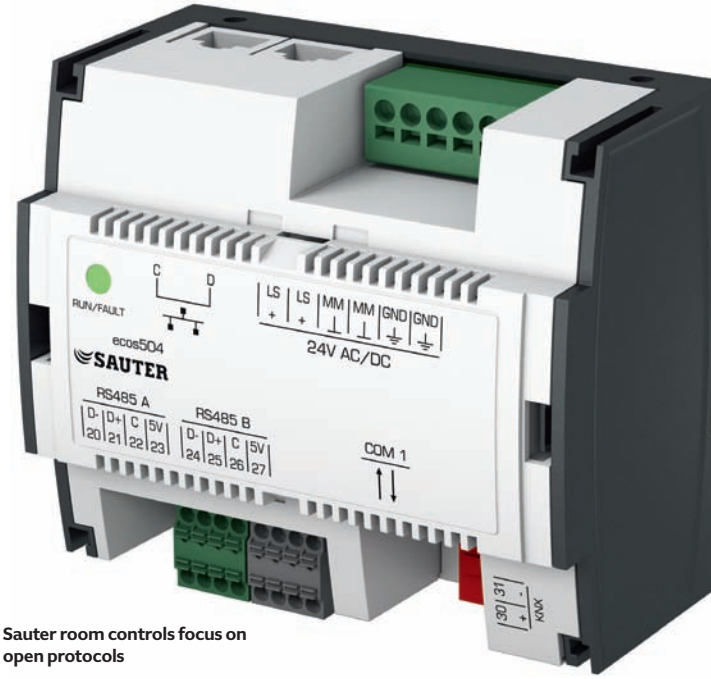
The products are backward compatible, so it is not difficult to bring an old system up to date. A piece of equipment may be deemed obsolete if it is no longer manufactured, but many of the internal parts are retained within the new range, and support for old equipment carries on long after production has ceased.

Products are now available that use open protocol BACNet over IP and have interfaces specifically designed to work with KNX, Dali, EnOcean and many others. Ultimately, this means we can build in efficiencies such as lighting interfaces and control, metering, automated-room control and much more without inflating costs. The client gets a new BMS, without major disruption, as well as a greater level of functionality.

If we are asked to look at a BMS system, we won't necessarily recommend replacing it with one of ours; we ask one of our partners to look at it and see if it can be upgraded. The long-term objective is to spread the understanding that not everything needs to be thrown away if we think it's not working correctly. In the case above, the PFI client decided the best option was to talk to us first and see what could be done – and we hope to work with them to minimise costs and provide real benefit.



GARY WILLIAMS is a business development executive at Sauter Automation



Sauter room controls focus on open protocols

Putting the E into BMS

Building management systems (BMS) are often treated as bit-part players in the construction industry. They deserve more attention.

BMS was originally BEMS – building and energy management systems. Somewhere along the line, the energy bit got dropped. In some cases, it has crept back in, but overall it keeps getting left out. In reality, it should be BEEMS – building, energy and efficiency management systems.

People are forgetting the contribution BMS can make in cutting carbon. In energy management projects, attention is focused on cutting electrical usage by, for example, switching to LEDs, installing meters or specifying variable frequency drives.

If you look at the profile of most commercial and public buildings, however, heating and cooling systems account for up to 70% of energy use, with electrical use just 20%. So why so much attention on this?

We in the BMS – sorry, BEMS – industry need to take up the challenge far more and show we know our stuff.

By visiting an existing installation and selling the concept of optimisation, BEMS firms could show that their systems are not just a fit-and-forget solution. By calibrating that wayward sensor, for example, they could save that building's occupier 15% of the heating and cooling bill.

BEMS are not a commodity. Yes, they are based on mechanical devices that, you could argue, are manufactured commodities; however, to get them to work properly, you need an intelligent human being who can put together a system, the network and the software, and then commission it and get it working to everyone's satisfaction. The problem is that price is often the number one consideration.

It is not acceptable to over-inflate a price for services and products, but neither is it acceptable for those higher up the contractual chain to focus only on price and treat BEMS as a commodity. And that's where CIBSE members really can play their part. They have the skills to determine what is really needed – they write specifications and set performance targets. Knowing that key designs are likely to be 'value engineered', could they not take a stronger line and say 'No' more often?

If we are really going to make a difference to the built environment and contribute to a better environment for future generations, we need to get it right now and stop chopping out the 'E' in BEMS.

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GIANT STRIDES

Technology giants Johnson Controls and Cisco have merged the BMS and IT technologies at a Cisco HQ in the UK on a single platform, and are generating savings of £120,000 per building per year. **Alex Smith** reports

The building services sector is in the midst of a technology revolution. Until now, buildings have often been controlled via proprietary networks – building management systems (BMS) – but with the rise of the internet protocol, building services controls have become increasingly isolated.

By integrating BMS and IT networks, there is the potential to cut the energy used in smarter buildings substantially. HVAC systems can be monitored through a common interface, and can be intelligently linked to lighting and occupancy data to ensure environmental conditioning is provided only when it is needed.

Four years ago, corporate giants Johnson Controls and Cisco – specialising in BMS and IT respectively – signed an agreement to provide converged network systems and services to building owners, operators and tenants. The aim of the alliance is to increase energy efficiency, improve safety and operational performance, maximise real estate value and enable the incorporation of future technologies. Its goal is to enable building operators to view, monitor and control the BMS and IT technologies from a single user interface.

Bedfont Lakes

Cisco's European headquarters, in Bedfont Lakes, Hounslow, is where the companies focused on merging their networks. After six months of development, Johnson Controls integrated its BMS with Cisco's IT system, known as the service delivery platform.

The project is part of a global programme for client facilities in San Jose, USA, Bangalore (India), Rolle (Switzerland) and Dubai – the linking of these installations provides the development team with opportunities to test alternative scenarios. The programme includes tying local BMS for energy monitoring and scheduling integration, adding digital signage to the facilities to notify and inform building occupants, and providing IP phone control for conference rooms.

At Bedfont Lakes, the project scope included the integration of these solutions into Building 9, an approximately 13,000m² facility housing office space, a large demonstration centre and laboratories. The system covers 29 conference rooms and includes about 50 IP phones and 25 digital signs.

The BMS portion of the project, including network supervision and control, also involved the installation of 132 electric and thermal meters and a complex lighting-control system using a direct addressable lighting interface (Dali) bridge.

The interface to the Cisco network uses the open protocol oBIX (open Building Information Exchange) with a configured gateway solution by the controls supplier.

The results

BMS is a critical system for Cisco's operations in Bedfont Lakes. Not only does it monitor and control traditional commercial facility systems providing for occupant safety and comfort, it also manages the HVAC systems that supply cooling to labs at the heart of the

Johnson has integrated its BMS Metasys with Cisco's service delivery platform at Cisco's UK headquarters

company's solution development and support.

Before the installation of the system, the buildings were operating on an outdated and no longer supportable BMS. The replacement provides a highly supportable BMS platform with available parts, service and a long-term commitment to enhancements and migration.

Integrated into the new BMS is a lighting-control system – with sensors in each conference room – that adjusts the lights based on a combination of inputs. The system uses Dali and, in addition to the typical control scheme based on occupancy and the momentary light switch in the room, the BMS also receives commands from the IP phone in the room. Lights in each conference room can be set for use in combination with overhead projectors, and can be set to 25%, 50%, 75% and 100% of full brightness.

The lighting-control solution also allows for daylight in the open office areas. During illuminated times, the lighting will be dimmed to meet the room lighting setpoint as outside light becomes more intense, enabling effective daylight integration for that room.

> An important element of the integration is the ability to monitor overall and sub-metered energy consumption

HVAC and thermal energy

The system determines energy consumption associated with the use of hot and chilled water in the HVAC systems. The information is supplied dynamically to the system for early identification of problems and management of energy consumption.

The linked management systems determine the setpoints of the temperature of the conference rooms. When the building is unoccupied, the BMS uses the unoccupied temperature setpoint for the entire building. However, during occupied hours, the setpoint for the conference room is established by the network facilities management system, which informs the BMS of meetings in the room.

If a meeting is scheduled, the BMS uses the occupied setpoint and, when no meetings are scheduled, the BMS uses a standby setpoint that allows the BMS to heat or cool the room rapidly should it become occupied.

Energy conservation scheme

An important element of the integration is the ability to monitor overall and sub-metered energy consumption, enabling higher productivity and the potential for energy savings and carbon emission reduction.

All electrical circuits are metered for consumption and fall into one of the three measurable categories: lighting, HVAC and plug load. The facility energy usage is also segregated between office and laboratory areas. To facilitate these measurements, new multi-circuit meters were installed and connected directly to managing systems.

Integration of the building management system with software and services to measure and manage the energy use allows for the measurement and verification of 94% of the building energy consumption. This means the building owner can receive and control data from the IT infrastructure, as well as from the building services, and receive return-on-investment savings projected at £120,000 per year per building. The work is currently being extended to two more buildings.

Johnson Controls and Cisco are striving to offer the same level of integration and energy savings to their customers' buildings. Given their size and global reach, the potential to reduce energy in buildings across the planet could be significant.

If an IT upgrade was able to involve the overhaul and integration of the BMS, then companies could end up not only with a better integrated IT solution, but also savings in their energy use and reduction in their environmental impact. **CJ**

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Ensuring safe and robust hot water flow and return pipework

This module examines the latest UK standards for potable hot water systems, practical system applications and factors affecting the lifetime of installed systems

Selection and sizing of systems to deliver potable water in buildings is often focused on the central source of heat – which is, of course, important for ensuring that the system is energy efficient and environmentally responsible. However, every such system will include potentially extensive pipework that must meet new – as well as recently updated – standards. This article will consider the key driver of these updates, the practical system application, and how the very factors that provide a healthy and safe system can influence longevity of the installed systems – particularly those that are made of thermoplastic.

Setting the standards

In the UK, the principal standard setting the requirements for potable hot water supply systems in buildings – often referred to as domestic hot water service (DHWS) or secondary hot water – is BS EN 8558 *Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages*. This is explicitly complementary guidance to BS EN 806. With the very recent update of BS 8558, these two standards have now fully replaced the long-standing – and now withdrawn – BS 6700.

The September 2015 release of BS 8558 incorporates changes that mainly relate to the control of the risk posed from legionella in water supply, and to provide appropriate continuity between the parts of BS EN 806 so that the provisions of the relegated BS 6700 are properly supplanted. It links in with last year's publication of the UK Health and Safety Executive's (HSE's) HSG 274 *Legionnaires' disease – technical guidance* (specifically, Part 2: *The control of legionella bacteria in hot and cold water systems*), and the 2013 (and fourth) edition of the approved code of practice L8, *Legionnaires' disease. The control of legionella bacteria in water systems*. BS 8558:2015 was released – and linked with – the new British standard, BS 8554 *Code of practice for the sampling and monitoring of hot and cold water services in buildings*, which has been introduced to provide guidance and recommendations for good water sampling practice for hot and cold water services in buildings. The earlier edition of BS 8558 was lacking the informative annex with pipe-sizing calculations that originally appeared in BS 6700 – an omission that has now been rectified.

The technical requirements for DHWS are explicitly covered by the five parts of BS EN 806 *Specification for installations inside buildings conveying water for human consumption* – general; design; pipe sizing; installation; and operation and maintenance.

Legionnaires' disease

Legionnaires' disease is a type of pneumonia caused by a bacterium called legionella pneumophila (Figure 1). Legionella is not transmitted from person to person, but is acquired by the inhalation of the bacteria, typically in a contaminated aerosol. Legionella bacteria are destroyed swiftly at temperatures above 70°C. However, between 20°C and 46°C – as found in many HVAC water sub-systems – legionella growth is abundant, with the optimum temperature around 37°C. At 20°C, there is little growth in bacteria and, at 60°C, it has been shown that 90% of the legionella pneumophila are killed in just two minutes – compared with several hours at around 50°C. At low temperatures, legionella becomes dormant, but it is ready to multiply when the opportunity presents itself. Biofilms are created through a combination of nutrients, scale and corrosion at appropriate temperatures, and provide an ideal breeding ground for legionella.

The underlying need to produce systems that are resistant to the multiplication and distribution of legionella has been discussed

in previous CIBSE CPD articles, including the July 2012 module – which provides some detail on the sources and prevention of Legionnaires' disease – and the April 2014 CPD, which further considers the updated HSE L8, as well as its application. However, as is reiterated in BS 8558, there are several statutory instruments in the UK that, although generally consistent with the standards, may alter some of the detailed requirements. The Water Regulations Advisory Scheme (WRAS) website provides a useful summary of, and links to, the principal regulations and byelaws that control this area (see **http://bit.ly/waterregs**).

The requirements

The practical aspects that determine the requirements for DHWS pipework design are described in BS EN 806:2006 Part 3, and have been abstracted here. However, if undertaking design, it is important to refer to the primary source.

Perfectly hygienic potable water contains bacteria and the nutrients that fuel legionella (and other microorganism) growth, and biofilms develop in all systems irrespective of the material used. In order to reduce risks, there are several factors that should be avoided:

- Stagnation of water in pipes, cisterns and other storage vessels
- Water temperatures within the range of 20°C to 45°C in any part of the system
- Nutrient ingress, by ensuring that contamination is minimised in components, pipework and storage
- Sediment and biofilm that provides an undisturbed and nutritious breeding area
- The use of materials with high potential to harbour, or provide nutrients for, bacteria and other organisms
- Waste products from pipe-cutting and jointing remaining in pipework system
- Scaling and corrosion of pipe and fittings
- The potential for aerosol production

In terms of the final point of supply, hot water temperatures at an outlet should reach 50°C (55°C in healthcare premises) within one minute of turning on the tap, and in the case of a thermostatic mixing valve – which are increasingly used as a means of preventing scalding – the temperature should also be at least 50°C within one minute of running the water.

In most commercial systems, this will require a recirculation loop – providing a flow back to the heating source – that should be designed to give a returning temperature of at least 50°C (55°C in healthcare premises); there should be temperature measurement points so that this may be monitored.

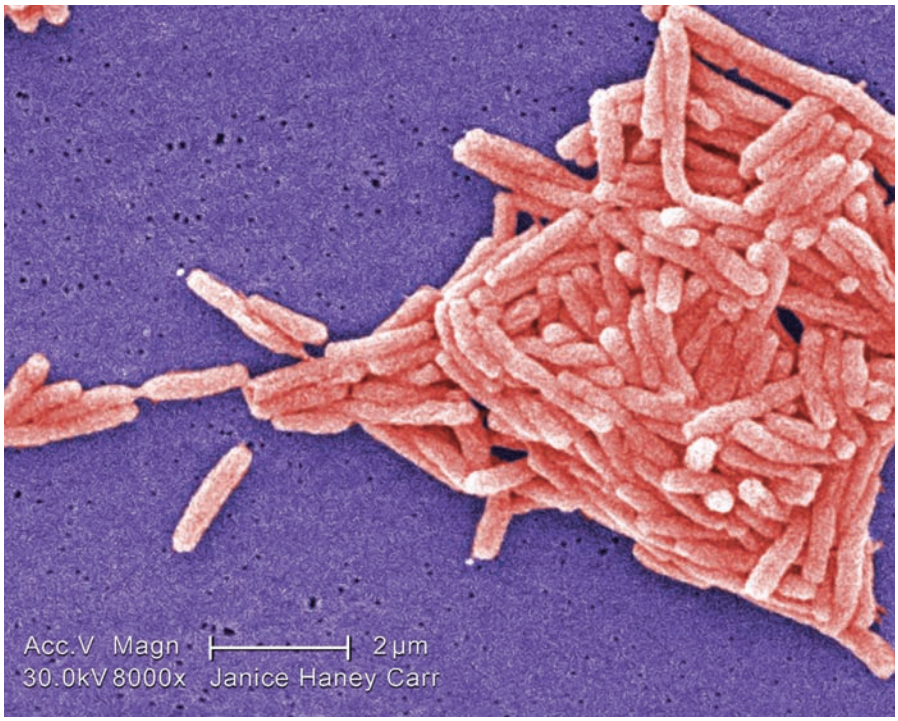

Figure 1: Legionella pneumophila bacteria (Source: http://phil.cdc.gov/ ref 11128)

Chlorine dioxide

Chlorine dioxide (ClO_2) is an oxidising biocide capable of reacting with a wide range of organic substances, including many of the constituents of bacterial cells. Chlorine dioxide does not hydrolyse when it enters water; it remains a dissolved gas in solution. Chlorine dioxide is approximately 10 times more soluble in water than chlorine.

The relatively low levels of chlorine dioxide used in drinking water are able to inactivate bacteria because of oxidation disrupting a number of different cell processes.[1]

If it is not practical to use pipework to recirculate hot water back to the heating source – typically, a hot water calorifier/storage tank or a tankless/instantaneous water heater – or where the minimum return temperature cannot be guaranteed, a single-pipe system with electrical self-regulating trace-heating cables may be used. Trace heating could also be seen as a solution if there was likely to be an unreasonable length of time to draw off water before it became useably hot.

DHWS deadlegs should not exceed a volume of 0.5 litres – so, for example, a 20mm cross-linked polyethylene (PEX-c) pipe (internal 15.5mm) would have a maximum allowable deadleg length of 2.6m. This requirement is driven by the need to reduce legionella bacteria, but also reduces the risk of stagnation, ensuring better water quality.

If it can reasonably be foreseen that sections of the distribution circuits will be used less often than those connected pipe runs – for example, those serving kitchens or showers – check valves (non-return valves) should be fitted to prevent backflow from the less-used branches. This will reduce the risk of relatively stagnant water contributing to biofilm colonisation of the other outlets. When equipment or outlets are permanently removed, the branch pipework should preferably be removed rather than simply being capped off, so leaving an unwanted deadleg.

Circulating pump design, the correct commissioning of balancing valves, and positioning of non-return valves are key issues to ensure flow throughout all parts of the hot water system – particularly the hot water return legs – to avoid long lengths of stagnant pipework.

BS EN 806 recommends that standby pumps should not be used, as non-operating pumps create stagnant pockets of water that pose a legionella risk. Another oft-used pipework system component – the automatic air vent – should not be used, as it creates a stagnant store of water. Good pipework design, and properly installed and supported pipes, can be used to ensure that any air is rejected as the water flows from the outlets and does not obstruct the return flow

Continuously operated recirculating systems provide fewer opportunities for

bacteria reproduction, by reducing stagnation risk, as well as maintaining the temperature of the water. And, of course, the original objective of using a return loop in DHWS was to provide hot water swiftly when the outlet was opened, so reducing water wastage – as well as delivering a more acceptable service.

To reduce corrosion of, or prevent excessive scale formation in, system pipework and components, materials used in the piping systems must be compatible with the physical and chemical characteristics of water supplied to the building. Domestic water systems must not use materials that support microbial growth, such as those containing natural rubber, hemp, linseed oil-based jointing compounds and fibre washers. Similarly, any synthetic materials used should not adversely affect water quality by supporting microbial growth. However, studies in Europe that compared plastic with copper pipes have concluded that the development of legionella does not vary between the two materials.

Even systems that are well designed are likely to require disinfection at some point (as well as flushing through with potable water). This may be, for example, at the initial commissioning of the systems; as part of a regular maintenance regime; after works on the system; or after an 'incident' or evidence of contamination. It could simply be when the system has not been used for a long period – this may be as little as two or three weeks, but the period will depend on the ambient temperature, condition of the water system, potential for exposure to aerosols, and the susceptibility of users.[2]

There are two main approaches to disinfecting continuously operated recirculating systems. These both present a health and safety risk, and appropriate checks and records of activity, and the state of the system, should be kept for all of the work. These are described in detail in the 2015 publication PD 855468 *Guide to the flushing and disinfection of services supplying water for domestic use within buildings and their curtilages.*

Thermal disinfection of hot water services can be carried out by raising the temperature of the whole contents of the circulating water to 60°C (or above) for at least an hour. Every hot water outlet throughout the system must then be flushed and allowed to flow for five minutes at full temperature.

Chemical disinfection of a water system is normally based on chlorine dioxide (see boxout) being dosed at 50mg/L for a minimum contact period of one hour, at the end of which the concentration should not be less than 30mg/L free residual chlorine (mg/L ≈ ppm). The normal maximum level in potable water is just under 1 mg/L.

However, lower concentrations and longer contact times are considered acceptable, as set out in PD 855468. After disinfection, and before the system is brought back into use, the disinfectant should be thoroughly flushed from the system.

Even in the best-designed and operated hot water system, sediment will accumulate because of the continuous replenishment of the water with oxygenated mains water that contains dissolved solids as well as suspended particulates. These will support the growth of legionella (and other microorganisms), as well as reduce the effectiveness of the system, and should be removed on a regular basis. This can be undertaken by continuous methods of sediment removal – for example, by filters, strainers or separators, or by manual flushing and cleaning (particularly of heating devices).

Effect of operational parameters on lifetime expectancy of non-metal pipework

Two thermoplastic materials that are applied in UK recirculating hot water pipework systems are multilayer cross-linked polyethylene (PEX-c) and polypropylene (PPR). Solid wall PEX-c and polybutylene pipework are not suitable for recirculating systems, as there is potential for accumulation of leached chemicals from the pipe surface.

The chlorine content in the water and the temperature will significantly affect the lifetime of such a piping system.

Using a manufacturer's modelling tool[3] for an example application, the predicted life of PEX-c and PPR have been determined at different water chlorine dioxide levels, as shown in Figure 2. The life expectancy for this system, using 0.5ppm of chlorine dioxide, is 66 years for the PEX-c pipework, and 23 years for the PPR. At 1ppm of chlorine dioxide, the life expectancy falls to 46 years for PEX-c and 16 years for PPR. Therefore, in this case, a doubling in chlorine dioxide results in a 30% reduction in useful life, indicating that appropriate chemical dosing of the water is important not only for human health, but also for system longevity.

● Thanks to Gabrielle Fletcher, at Wavin, for modelling the performance of the pipework.

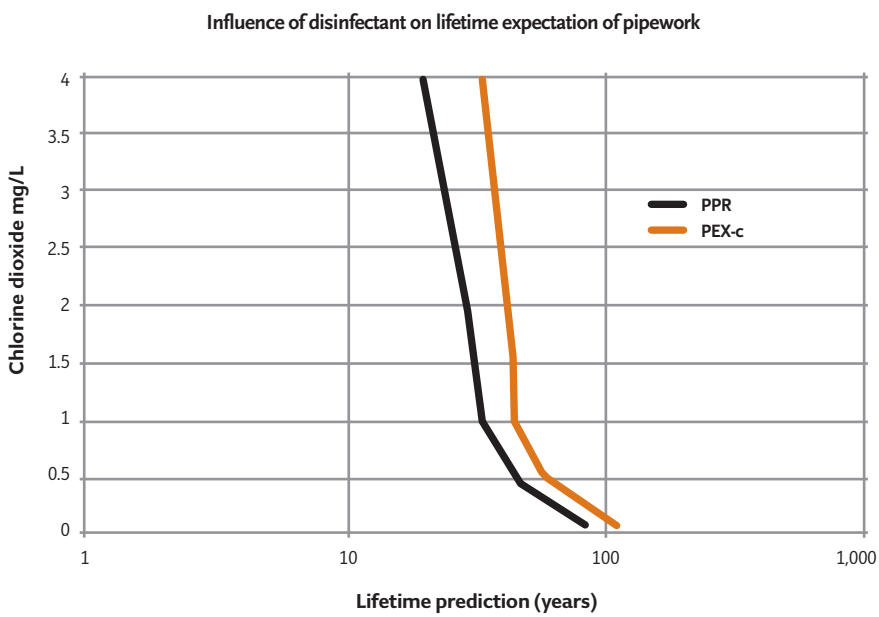

Figure 2: Influence of chlorine dioxide on simulation of life expectancy for PEX-c and PPR pipework (Source: Wavin)

Further reading:

CIBSE TM 13:2013 *Minimising the risk of Legionnaires' disease, legionella and the prevention of legionellosis*, World Health Organization (WHO), **www.who.int/water_sanitation_health/emerging/legionella.pdf.** Health and Safety Executive (HSE) website **www.hse.gov.uk/legionnaires.**

References:

1 BSRIA TN 2/98 *Chlorine dioxide water treatment for hot and cold water Services*, BSRIA 1998.

2 HSG274 *Legionnaires' disease – Part 2: The control of legionella bacteria in hot and cold water systems*, HSE 2014.

3 Wavin lifetime assessment tool.

Turn over page to complete module

Module 87

December 2015

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CONNECT TO BETTER

1. In what year was the HSE L8 document last updated?

☐ A 2010
☐ B 2011
☐ C 2012
☐ D 2013
☐ E 2014

2. What is the maximum allowable deadleg length of 20mm PEX-c pipe in a DHWS?

☐ A 1.1m
☐ B 1.6m
☐ C 2.1m
☐ D 2.6m
☐ E 3.1m

3. What minimum temperature does 'thermal disinfection' require?

☐ A 50°C
☐ B 55°C
☐ C 60°C
☐ D 65°C
☐ E 70°C

4. Which is the document that is particularly aimed at guiding the flushing and disinfection of water services?

☐ A BS 6700
☐ B BS 8558
☐ C BS EN 806
☐ D BS EN 8558
☐ E PD 855468

5. In the example of the life expectancy of PPR and cross-linked PEX-c pipes, what is the predicted reduction in useful life when the chlorine dioxide concentration is doubled?

☐ A 10%
☐ B 20%
☐ C 30%
☐ D 40%
☐ E 50%

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Telephone: 0207 880 7633 **Email:** greg.lee@redactive.co.uk

New AET Flexible Space equipment for First Point, Gatwick Airport

AET Flexible Space, manufacturer of underfloor air conditioning systems, has received an order for replacement equipment for the First Point, Buckingham Gate building.

The property is one of the Grade A offices located next to Gatwick South Terminal.

Underfloor systems are commonly installed in office environments, using the plenum beneath a raised floor as the ventilation zone.

AET is currently surveying other floors within the building with a view to further equipment upgrades.

● **Call 01342 310 400, email lucy@flexiblespace.com or visit www.flexiblespace.com**

Introducing Airflow's new range of MHVR units

Airflow Developments launched its Duplexvent Rotary range at UK Construction Week 2015.

Seen as a significant advancement in the construction of high-performance mechanical ventilation with heat recovery (MHVR) systems, the range uses a rotary thermal wheel principle. Heat is picked up from the exhaust air stream in the top half of the rotation and given up to the fresh-air stream, creating a higher flow of air through the unit, despite a more concise space.

● **Visit www.airflow.com, follow @AirflowD on Twitter or search Airflow Developments Limited on Facebook**

Aquatech Pressmain Aquavent helps prevent pressure shocks

The Aquavent, developed by the specialist team at Aquatech Pressmain, is an automatic, combined air release, anti-vacuum and surge protection valve.

It has been designed to help with the draining down and refilling of pressure-boosted water supply pipework by preventing potentially damaging pressure shocks from occurring.

The Aquavent can be supplied and fitted by Aquatech Pressmain to existing water systems in buildings where cold water booster sets are in use.

● **Call 01206 215 121, email marketing@aquatechpressmain.co.uk or visit www.aquatechpressmain.co.uk**

FDS provides smoke ventilation systems for East London project

Smoke ventilation contractor Fire Design Solutions (FDS) will supply a number of systems for the residential element of a new London development.

The Royal Gateway consists of five apartment buildings, featuring floor-to-ceiling windows, balconies and open living spaces. The development will also host a large commercial space.

Over the coming months, FDS will supply, install and commission mechanical smoke ventilation systems for the residential blocks in order to meet the required fire safety standards.

● **Visit www.firedesignsolutions.com**

LED experts Future Designs gain CIBSE CPD accreditation

Future Designs is delighted to announce that its educational presentation, *LED v Fluorescent Lighting*, has been accepted by CIBSE as official CPD course material.

LED technology reduces energy consumption by between 25% and 70%, depending upon the application. 'Payback' of the capital expenditure is approximately three years when combining energy and carbon reduction with a product life that is double that of fluorescent lighting.

The life expectancy of LEDs can be up to 80,000 hours.

● **Email light@futuredesigns.co.uk**

Space no longer at a premium with Advanced Air UK

A unique split-level, space-saving fan coil unit has been designed and developed by Advanced Air UK. While it has many applications, the most popular to date is for the unit to fit into wardrobes or cupboards suitable for residential, educational, leisure or hotel installations.

The lower deck of the unit comprises the coil, valves and control, with a slimline connecting duct to the upper deck. The high-level discharge from the upper deck is achieved with horizontally mounted, slow-speed ECM fans, which can achieve more than 2.5kW of cooling.

There is a significant saving in floor space compared with a conventional, vertical-mounted fan coil. The unit can be adapted to fit a wide range of configurations, making it very popular when space is at a premium. The units use ECM motor technology, so it is very easy to vary the speed of the fan for an infinite number of air volume settings.

● **Email tchambers@advancedair.co.uk or visit www.advancedair.co.uk**

Evomax boilers get full marks at Adams' Grammar School

Thirteen Evomax wall-hung condensing boilers, from Ideal Commercial Boilers, have been specified and installed to provide high-efficiency heating and hot water at Adams' Grammar School, in Newport, Shropshire.

The Evomax boilers are supplying heating and/or hot water for the admin block, the outdoor swimming pool, the new sixth-form centre, the canteen and Longford Hall, which provides accommodation for 50 pupils.

● **Call 01482 492 251, email commercial@idealboilers.com or visit www.idealcommercialboilers.com**

Lochinvar upgrades CPM boiler range

Boiler and water heater manufacturer Lochinvar has upgraded its CPM range of fully condensing, gas-fired, stainless steel, wall-hung boilers, in line with the requirements of the European Eco-design of Energy-related Products Directive (ErP).

The range offers low NOx, high-efficiency operation for a wide variety of heating applications, using either natural gas or LPG. Full product details – including energy labels, product data tables and fiches – are available via the Lochinvar website to support the use of CPM boilers in ErP-compliant systems.

There are six models in the range, offering outputs of between 58kW and 175kW, with operating efficiencies of 95.2% gross calorific value (GCV). Standard features include a cascade control system with the ability to manage up to 12 boilers in sequence.

All boilers come with a modulating pre-mix burner and the heat exchanger is manufactured from stainless steel, to improve performance and reliability.

● **Visit www.lochinvar.ltd.uk**

kamstrup

A winning combination

Kamstrup smart energy meters – complete with multical calculator, Ultraflow and sensors – offer longevity, flexibility and incredible accuracy.

The meters are for heat, cooling and water, and work with a variety of smart energy types – allowing customers to select the right method of data collection for them.

Kamstrup meters are compliant with the Renewable Heat Incentive (RHI) and approved under the Measuring Instruments Directive, and provide a great variety of remote-reading solutions.

The company offers automated meter reading and smart metering systems that range from handheld devices to long-distance networks – cabled or wireless – together with a user-friendly data management program.

● **Call 01787 319081 or email info@kamstrup.co.uk**

BDA agreement for Kingspan pipe installation

After extensive testing by Kiwa Group, Kingspan's Kooltherm FM pipe-insulation system has been awarded BDA Agreement BAP 15-036/01/C. The independent certification confirms that the product will perform as expected when installed in accordance with the certificate guidelines. The document can also help streamline procedures and approvals.

The Kingspan Kooltherm FM system is the first pipe-insulation product to attain certification under the scheme.

● **Call 01544 388 601, email info@kingspaninsulation.co.uk or visit www.kingspanindustrialinsulation.com**

Grundfos aids new era for Alder Hey Hospital

Caring for 270,000 young people and their families each year is the mammoth task that Alder Hey undertakes.

During 2015, the hospital – which opened in 1914 – entered a fresh era with the opening of its much-heralded new £237m building.

Grundfos assisted with the specification and supply of more than 70 speed-controlled pumps and booster sets, as well as pressurisation units and ancillary equipment. The system is supported by BACnet – an international data communication technology used in BMS worldwide.

During its history, Alder Hey has been associated with medical excellence and pioneered many firsts that have put it at the forefront of innovation.

Treating unwell children and giving them the support they need – in the best environment possible – is at the heart of the new Alder Hey, and Grundfos is proud that its pumps will be playing a supporting, but crucial, role.

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

MSPS designs safe foundation solution for Seabraes footbridge

Morgan Sindall Professional Services (MSPS) has provided a temporary works design for Seabraes' new 56m-long footbridge.

The designs and associated safety checks were required to construct the bridge safely, within a tight timeframe, and ensure it would fit into a space with a margin for error of only a couple of millimetres.

The single-span steel bridge, near Dundee rail station, was assembled and installed in a prepared area adjacent to the railway in just eight weeks.

● **Call 01789 208 252 or email clare.k.white@morgansindall.com**

National Library of Wales chooses Remeha boilers

The National Library of Wales, in Aberystwyth, has installed Remeha boilers to provide more reliable and resilient heating.

The boilers will maximise the library's energy and carbon savings, while also helping to preserve its prized collections and archives.

Contractors Aber Heating installed three Remeha Gas 310-500 Eco Pro boilers into the main boiler room serving the library's offices. Three Remeha Gas 610-1000 Eco Pro boilers were also put into the book-stack boiler room, which serves the critical cells where the collections are stored.

'The quality of Remeha's boilers and service has earned them a good reputation with us over the years,' said Aber Heating's Mark Sandford.

● **Call 0118 978 3434, email boilers@remeha.co.uk or visit www.remeha.co.uk**

Rehau Rauthermex installed at new Soho Farmhouse

The recently opened 125-acre Soho Farmhouse estate and members club, in Great Tew, Oxfordshire, features more than 7km of Rehau's Rauthermex pre-insulated polymer pipework.

The high-performance pipe – which comes in 16 different diameters, from 25mm to 160mm – is being used to distribute heating and hot water to 45 buildings around the estate.

There are also two, 10,000-litre, bespoke thermal stores and a low loss header to help ensure optimum operational efficiency for the boilers.

● **Visit www.rehau.co.uk**

Cathedral chooses Remeha in major restoration project

Three Remeha Gas 310 Eco Pro boilers have been installed at Durham Cathedral as part of its ambitious exhibition programme.

Open Treasure aims to restore some of the most spectacular areas of the cathedral and transform them into exhibition spaces. Careful consideration was needed to achieve the environmental conditions to protect and conserve the medieval building and its cultural artefacts, including the Anglo Saxon relics of Saint Cuthbert.

The Remeha boilers were specified by M&E Consultant TGA Consulting Engineers to meet the need for reliability and ease of installation. The M&E contractor was Vaughan Engineering, with commissioning by GFA Gastech.

● **Call 0118 978 3434, email boilers@remeha.co.uk or visit www.remeha.co.uk**

Enterprise remote monitoring and facilities management software

Capturing critical data from across your estate, the user-friendly interface of ActiveFM allows you to manipulate large volumes of data into an easy-to-digest, interactive format.

Because it is web-based, your data is accessible whenever and wherever you need it. With the ability to set up email alerts, however, you don't need to log in to know when your system needs your attention. ActiveFM ensures that assets are protected and your system is operating efficiently, to minimise costs.

● **Call 0141 810 2828, email sales@resourcedm.com or visit www.resourcedm.com**

Rinnai scores with Welsh rugby club

Rinnai has helped put Maesteg RFC's hot-water provision in the premier league, with a conversion using its latest Infinity low-NO_x, heavy-duty condensing units.

Club sponsor and current player Mark Hiller-Rees, of Bridgend-based CST Renewables, said: 'The project entailed replacing the ancient stored hot-water system serving the showers, changing rooms and toilet facilities. I originally ordered two Infinity HDC 1500 units, but Rinnai's latest low-NO_x HDC 1600 heater – with 107% efficiencies – had just become available, so we put in two of them, plus a 300-litre buffer vessel.'

● **Visit www.rinnaiuk.com**

Sontay reaches maximum velocity

Sontay has launched an updated air velocity transmitter, which has a built-in self-test feature. The AV-622 also gives users the ability to manually override the output to 0%, 50% or 100% to aid commissioning.

It comes in a flame-retardant housing and has selectable output signal, available in 0-10Vdc or 4-20mA.

The AV-622 has a number of impressive key technical points: the ambient temperature ranges between -10°C and +50°C and its measured speed of response is just three seconds with a 90% change rate.

● **Email sales@sontay.com**

PRODUCTS & SERVICES

Telephone: 0207 880 7633 **Email:** greg.lee@redactive.co.uk

Carrier Rental Systems gears up to support customers

After a cold-weather warning for this winter, temporary heating and cooling specialist Carrier Rental Systems (CRS) is gearing up to ensure it is able to support customers.

CRS has expanded its heating rental fleet, to respond to requests for emergency top-up heating and replacement systems for plant breakdowns. The company has also invested in a new range of high-efficiency boilers, integrated heating packages, fan-powered systems and radiant heaters as part of its plans to support customers this winter.

● **Call 0800 026 4717, email info@carrierrentalsystems.co.uk or visit www.carrierrentalsystems.co.uk**

Wavin provides Pilsdon Community with updated drainage system

The Pilsdon Community offers accommodation and work to homeless people suffering from mental health issues. As part of its redevelopment, Wavin donated OsmaDrain pipe, fittings and inspection chambers to the Dorset-based facility to bring the below-ground drainage system up to standard.

More than 70 metres of 110mm drainage pipe was required. OsmaDrain pipe contains at least 50% recycled product, but performs just like virgin pipe.

● **Visit www.wavin.co.uk**

Mikrofill tees off at Redditch Golf Club

Founded in 1913, Redditch Golf Club was relocated to its current site, at Callow Hill, in 1972 because of the building of Redditch new town.

In 2014, a Mikrofill Extreme domestic hot-water loading cylinder was installed as part of a comprehensive refurbishment of services at the club. Designed to pass through a standard doorway, the stainless steel cylinder can deliver more than 2,500 litres an hour at 60°C, while optimising condensing boiler efficiency. The 500-litre, unvented cylinder is sized to provide daily hot water to the club's kitchen and shower areas.

● **Call 03452 606 020 or visit www.mikrofill.com**

DIRECTORY

Your guide to building services suppliers

Telephone: 020 7880 7633 **Email:** greg.lee@redactive.co.uk

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Air Conditioning

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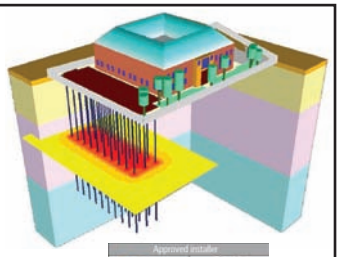
Energy Efficiency



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Our client is the Electrical Contractors Association. They have asked Badger Associates to identify an outstanding Technical Manager from within the Electrical Industry to work closely with the Director of Technical based in the organisation's Hammersmith office. The successful applicant will lead, develop and deliver technical support services.

You will work with the Director of Technical to co-ordinate and provide high quality and authoritative support of ECA technical policy on relevant regulations, legislation, standards and competence requirements of members across the full electro-technical sector, along with the provision of technical guidance and support for all stakeholders. You will also provide representation on National, European (CENELEC) and International (IEC) standards setting bodies on behalf of both ECA members and the electro-technical sector.

To be considered for this important role the successful applicant will have up-to-date and relevant technical skills as well as extensive Design knowledge. You will have good awareness of Quality Assurance and CAD/BIM Systems along with demonstrable knowledge of Technical Legislation, Regulations and Health and Safety. Skills in report writing, recording and preparation of meeting notes/minutes, training, facilitation and IT along with software skills (Amtech, Design Genie) will be evident in your CV.

You will have extensive experience of electrical building services design, preferably in a contracting environment. In addition you will have knowledge of technical skills in design and installation of a broad spectrum of electro-technical systems. Almost certainly you will be educated to degree level in electrical engineering.

The role commands an excellent salary and benefits package.

All applications should be emailed to Michael Bolger at Badger Associates Limited on mb@badgerassociates.co.uk and should include a covering letter setting out how you believe your experience and background suits you to this role.

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TFT

Tuffin Ferraby Taylor LLP is a national consultancy with global reach in delivering for high profile commercial investor clients.

You will play a key role in the growth and development of the Mechanical & Electrical services engineering (M&E) team as an M&E Consultant specialising in Technical Due Diligence (TDD) reports, performance design and general consultancy for commercial clients.

You will have a strong track record as a Senior Engineer in a commercial consultancy, with the desire to provide a range of M+E consultancy services to various clients and colleagues, across all commercial sectors.

Ideally you will have achieved the following:

- Degree in Building Services Engineering
- CIBSE Member/Chartered Engineer
- Strong technical due diligence report writing skills
- Commercial awareness

TFT offers excellent career progression and development opportunities to continue to progress and support your career.

If you would like to find out more about the opportunities available please contact Alistair Allison in confidence on 07793 455 023.

To view the full job description, or find out more about TFT please visit www.tftconsultants.com

Let CIBSE help you find a brighter future with professional membership and registration.

CIBSE

CIBSE has introduced the MCIBSE IEng route for people with an accredited undergraduate degree in engineering who are working at a high level in the industry. CIBSE aims to support you on a day to day basis and help you develop professionally within the building services industry.

STANDARD ROUTE

Hold Exemplifying Qualifications *

Application + Engineering Practice Report

Professional Review Interview

Assessment + Approval by CIBSE Registration Panel

IEng MCIBSE

"

CIBSE have made my progression towards chartership more transparent with simple clear objectives and a manageable approach for younger engineers. MCIBSE IEng was the next logical step in my career providing me with a solid stepping stone into a senior engineering role.

Joshua Eckett, Buro Happold
MCIBSE IEng

***Exemplifying qualifications for IEng MCIBSE**

- An accredited Bachelors or honours degree in engineering or technology.
- An accredited HNC (8 level H units) or HND in engineering or technology (for programmes started before Sept 1999).
- An HNC (8 level H units) or HND started after 1999 (but before Sept 2010 in the case of the HNC) or a foundation degree in engineering or technology, plus appropriate further learning to degree level.
- An NVQ4 or SVQ4 which has been approved for the purpose by a licenced professional engineering institution, plus appropriate further learning to a degree level.
- European qualifications recognised under FEANI.
- International agreement (Sydney Accord) overseas qualifications.
- Individually assessed qualifications in similar areas.

To find out if your qualifications meet the academic standard contact membership@cibse.org

UK applications for MCIBSE IEng will be accepted on 1st February and 1st August each year.

International applications can be submitted anytime.

Interviews are held across the UK and Ireland, Hong Kong, UAE, Qatar, Australia and New Zealand.

Interested in applying?

We can help you find which one of our 8 grades of membership is right for you.
Get in touch by emailing **membership@cibse.org** or call **+44 (0) 208 772 3650**

Events & training

NATIONAL EVENTS AND CONFERENCES

CIBSE Technical Symposium
14-15 April 2016, Edinburgh
The 2016 Technical Symposium will take place at Heriot-Watt University, Edinburgh. Titled 'Integration for whole life building performance', the symposium will once again see more than 60 papers presented across the two days.
www.cibse.org/symposium

CIBSE Building Performance Conference and Exhibition 2016
17-18 November 2016
Dates for next year's Building Performance Conference and Exhibition have now been announced, with next year's exhibition set to be twice the size of this year's. Book the dates into your diary now.

CPD TRAINING

For more information, visit **www.cibse.org/mcc** or call **020 8772 3640**

Energy monitoring
1 December, London

Building services explained
2-4 December, London

Intro to electrical services in buildings
4 December, London

Energy building regulations: Part L
8 December, Manchester

IET wiring regulations (including July 2015)
11 December, London

Mechanical (HVAC) services explained
15-17 December, London

Practical controls for HVAC systems
15 January, London

Electrical services explained
26-28 January, London

Air conditioning and cooling systems
27 January, London

Energy efficiency building regulations: Part L
29 January, London

ENERGY ASSESSOR TRAINING

For more information visit **www.cibse.org/events** or call **020 8772 3616**

LCC/DEC training
1-3 December, London

ESOS training
7 December, London

LCC/EPC training
15-16 December, London

ESOS training
13 January 2016, Manchester

LCC/EPC training
21-22 January 2016, Leeds

ESOS training
25 January 2016, London

LCC/DEC training
26-28 January 2016, Birmingham

CIBSE GROUPS, REGIONS AND SOCIETIES

For more information, visit **www.cibse.org/events**

SoPHE: Uponor hygiene pipe solutions
1 December, London
Presentation looking at piping systems in relation to water hygiene, and includes a look at drinking water hygiene and life cycle of a domestic water installation.
www.cibse.org/sophe

SoPHE Scotland seminar
2 December, Edinburgh
Presentation looking at creating the ideal washroom environment, by Geberit.

Yorkshire Region: Energy from waste facility tour
3 December, Leeds
Clugston Construction have kindly offered to host WSCP and CIBSE Yorkshire for a tour of the new Veolia Energy from Waste facility at Cross Green, Leeds. During the tour, you will be accompanied by members of the team, and will have the opportunity to find out more about the building, the build process and the equipment housed within.

North West Region and YEN North West: Membership briefing
3 December, Manchester
Find out about the CIBSE application and interview process by attending our free membership and registration briefing sessions. These sessions provide an excellent opportunity to discuss your application with CIBSE staff and registered interviewers.

West Midlands Region: Annual dinner
4 December, Birmingham

Ireland Region: Christmas lunch
4 December, Dublin

WiBSE Role model series: Part 4
8 December, Glasgow

SLL & East Midlands Region: Lighting session
8 December, Kegworth
An evening event hosted jointly by the East Midlands Region and the Society of Light and Lighting.

East Anglia Region: Hydraulic interface unit CPD and Christmas social
10 December, Suffolk
A Hydraulic Interface Unit CPD, followed by a Christmas Social at the Greene King Brewery, including tour and tasting.

SLL and Merseyside and North Wales Region: Lighting controls
10 December, Merseyside
An evening seminar arranged by the Merseyside and North Wales Region.

North East Region: Sustainable buildings are better
15 December, Newcastle upon Tyne
An evening technical seminar organised by the North East Region.

East Midlands Region: Electrical regulations
12 January 2016, Kegworth

North East Region technical meetings: LED truths
12 January 2016, Newcastle upon Tyne

West Midlands Region technical meeting: Human centric lighting in practice
13 January 2016, Birmingham

SLL lighting for the built environment Guide *LG10: Daylighting*
20 January 2016, London
A look at *LG10: Daylighting*, a guide for designers, by Ruth Kelly Wasket of DeMontfort University.

SoPHE Scotland seminar
20 January 2016, Edinburgh
Mechanical valves and systems to combat Legionella in hot and cold water systems, by Kemper

SoPHE: Continuous flow water heating as an innovative method of satisfying regulatory and energy demands
20 January 2016, Manchester
Presentation by Chris Goggin and Mike Wheeler, of Rinnai UK.

Southern Region: Energy and building regulations
21 January 2016, Chichester

CIBSE Building Performance Awards

24 February, London

The shortlist for the 13 categories of the 2016 Building Performance Awards has now been revealed.

This year's awards introduce four new categories for Project of the Year: Commercial/Industrial/Retail; Leisure; Public Use; and Residential buildings.

Another key theme to emerge from the judging panel's deliberation was that the housing sector is becoming increasingly important for building services engineers, who must face the problem of reducing the industry's energy consumption and waste while maintaining comfort and wellbeing.

The awards judge how a building performs, not just its design. By introducing these new categories, CIBSE is responding to a growing recognition of building performance and building performance innovation in different sectors. It's a very positive sign that performance is being taken seriously across a whole range of industries.

These new categories were joined by familiar awards given in previous years, including the Energy Saving Project of the Year and Energy Management Initiative Award.

Awards host, presenter Louise Minchin (pictured) will be announcing the winners at the Building Performance Awards on 24 February 2016 at London's Grosvenor House Hotel.

To book your place, and join the best in industry talent to see who wins, visit **www.cibse.org/bpa**

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CMR Controls manufactures low air pressure and air volume measurement sensors and control systems for standard air conditioning, clean rooms, sterile laboratories, containment facilities, and fume cupboard extract systems.

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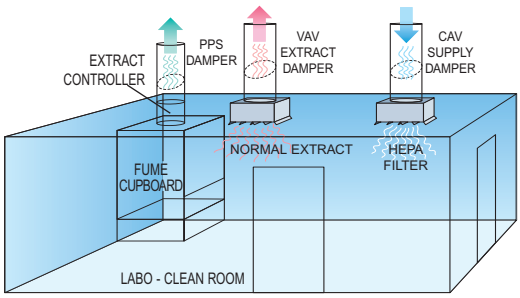

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PPS Damper

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