

CIBSE

JOURNAL



The official magazine of the Chartered Institution of Building Services Engineers

March 2015

STAR PERFORMERS

CIBSE Building Performance Award winners take a bow

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Italian COOL

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"We can't afford to take risks when we appoint outside contractors"

Robert Marsh

Robert Marsh, Director (Electrical),
Johnathan Hart Associates



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The rebel yells

Have engineers been collectively hiding their light under a bushel? Influential architect Ken Shuttleworth thinks so. He launched a broadside at his own profession during the CIBSE Building Performance Awards last month (page 16), claiming that starchitects with ‘dazzling shirts and big watches’ have been taking all the credit for brilliantly engineered buildings. Referring to himself as a ‘rebel architect’, Shuttleworth said it was time for engineers to stand up to those who had been ‘kings of the castle for far too long’.

Shuttleworth’s speech delighted the guests at the awards, and set the tone for a celebration of the best in building services talent. Engineers often don’t have the time or inclination to beat their own drum. They are too busy trying to save the earth’s resources by solving technical conundrums – often of the architect’s making.

Engineers should have more influence over the design process because they understand the science that underpins complex modern building design. No matter how aesthetically pleasing the construction, its design has failed unless it’s heating and cooling efficiently, and providing comfort for the occupants.

One area in which engineers do need to make their voices heard is health, wellbeing and productivity. Recent reports, and a new

wellbeing certification scheme, have put the topic in the spotlight. Rating buildings according to their productivity would be attractive to clients keen to differentiate properties in a crowded market, but any measurement criteria must have sound, scientific evidence to back it up.

A lot of research has already been done on factors affecting thermal comfort, by people such as Adrian Leaman and Bill Bordass.

However, they warn that the ‘killer variables’ affecting productivity and health often lie outside existing areas of research, and are too complex to be summed up in a single metric. Our roundtable debated the pros and cons of certification, and concluded that the biggest issue was a lack of feedback from managers and occupants to designers. Soft Landings are part of the solution, and it is encouraging to see CIBSE ANZ and BSRIA working together to integrate them into Australasia’s successful NABERS display energy certificate (DEC) scheme. It is a shame that we have to go to the other side of the world for encouraging news on DEC’s. Dispiritingly, the UK government is proposing to take them out of some buildings, in a woeful attempt to woo eurosceptic voters (page 7.)

Alex Smith, editor

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MAX FORDHAM MAKES CONTACT

Max Fordham has been appointed as part of the Sheppard Robson-led team for the £6m remodelling of the Contact Theatre in Manchester.

The project marks a return to the site for the practice, which provided environmental engineering on the original project, designed by Alan Short and Associates, which opened in 1999.

'This is one of the first – if not the first – naturally ventilated auditoria of the modern era,' said Matt Dickinson, senior partner in charge of Max Fordham's Manchester office. 'The principles we employed here are very similar to those seen at Liverpool's Everyman Theatre.'

The revamp will increase the theatre's capacity and overhaul the back-of-house, public and hospitality spaces.

The original fabric of the building will remain unchanged, with the distinctive 'H-shaped' chimney pots acting as acoustically attenuated ventilators for the building.



Fury at government plan to abolish DEC's

● Changes would enable 'public sector bodies to hide their wastefulness'

The industry has reacted furiously to the government's proposal to abolish Display Energy Certificates (DECs) for 54,000 public buildings in England and Wales.

The Department for Communities and Local Government (DCLG) has started a consultation process aimed at 'removing the legal requirement' for DECs, to help 'streamline and improve' the current system. It added that scrapping DECs would be 'in line with government policy not to gold-plate European Union directives – ie, not to go further than the minimum requirements'.

'The objective is to simplify the regulatory regime as it applies to public buildings, taking appropriate advantage of the flexibilities afforded by the directive, while continuing to improve the energy efficiency of buildings and minimising unnecessary burdens upon the public purse and, ultimately, the taxpayer,' the consultation document states.

However, CIBSE technical director, Hywel Davies, said the proposal demonstrated 'bizarre' double standards. 'At the same time as the government is proposing these changes, it is requiring the private sector to provide accurate metering data for billing,' he said. 'It seems bizarre for the Department for Business

Innovation and Skills to introduce these regulations, while DCLG is trying to enable energy-profligate public sector bodies to hide their wastefulness.'

Davies added: 'There is no evidence base to justify these changes, and it is very likely that it will be far more expensive to respond to Freedom of Information requests for the information currently in DECs, than to maintain and take advantage of the DECs.'

Public buildings of more than 1,000m² have had to have a DEC since 2008. Buildings

of more than 500m², but below 1,000m², have to have one every 10 years and, in 2011, the government said it would extend this requirement to all commercial buildings. David Frise, head of sustainability at the Building and Engineering Services Association, said the U-turn was 'political point scoring' ahead of the General Election.

DCLG has said it is aware of concerns that reducing the frequency or reach of DECs could make it more difficult to manage energy performance of large public estates.

THE HOLE IN THE MIDDLE OF ENERGY POLICY by Bill Bordass



On 14 February, David Cameron, Nick Clegg and Ed Miliband signed a joint climate pledge that included a commitment 'to accelerate the transition to a competitive, energy-efficient low carbon economy'. How do you know if a building is energy efficient? By making its in-use performance visible and actionable. Which policy instrument helps to do this? DECs. They have revealed major performance gaps between expectations and outcomes, but massive potential for cost-effective improvement, as seen at the Department of Energy and Climate Change's Westminster HQ, and DCLG's offices in Birmingham.

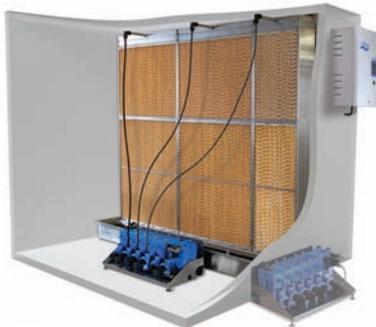
So shouldn't buildings and energy policy converge to get a good DEC and then improve it – for public and commercial structures? The 2011 Energy Bill, supported by the UK Green Building Council and others, proposed this. Incredibly, the Treasury removed the clause, regarding DECs as red tape.

DECs can be cheap and easy to do, but – having failed to support them properly – DCLG now wants to abandon them, dismissing what ought to be the focal point of energy policy as 'gold plating' of an EU directive. What planet are they on? Certainly not the low carbon one to which our party leaders gave their pledge.



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Energy improvements neglected by ministers

● Emphasis is on switching suppliers not on tackling energy waste

The Trade Unions Congress (TUC) has attacked the government for failing to help businesses cut their energy consumption.

The organisation's report *Money to Burn* claims energy efficiency improvements have 'flatlined' since 2007 because of 'failing and overly complex' government policies. It suggests that the government has neglected energy efficiency measures – such as better heating, ventilation and lighting – to focus on increasing power generation. As a result, British businesses spend millions of pounds more on energy than they should.

The report also says there has been too much emphasis

on encouraging energy users to switch suppliers in search of a better tariff, rather than tackling the root causes of energy waste.

The TUC has also attacked Energy Performance Certificates rules – including those designed to force landlords to improve rental properties by 2018 – as not being ambitious enough to make any difference.

'Clamping down on energy waste is a win-win for businesses, the government, and the environment. Even small businesses can save far more from energy efficiency measures than by switching suppliers,' said TUC general secretary Frances O'Grady. 'Better regulations – backed by access to finance, energy advice, and encouraging green workplaces – would help tackle this pointless and expensive frittering away of energy.'

Make to put tower in Tower Hamlets

Tower Hamlets Council has given the go ahead for a 53-storey, mixed-use skyscraper on the Isle of Dogs, in East London.

The Meridian Gate scheme, designed by the architectural firm Make, will provide 400 homes, along with office space, cafés, public gardens, and a children's play area at the foot of the tower.

Local planning officers said the development would be an 'elegant tower which makes a positive contribution to the skyline'. Make partner Frank Filskow added that its 'slender design maximised the opportunity to provide a significant new park for residents and the local community' close to the West India Docks.

The consultation drew 24 objections to the scheme from neighbours concerned about loss of daylight and, the size of the building being out of keeping



with the surrounding area.

But the council report said that the tower read as part of the Canary Wharf cluster of high-rise buildings.

The development will include 104 affordable and social housing properties.

Southampton MP attempts to close landlord loophole

● New regulations exclude up to a million multiple-occupation houses

Southampton MP Alan Whitehead is trying to get Parliament to close a 'loophole' in new regulations designed to prevent landlords from letting energy-inefficient homes.

From April 2018, landlords will be legally required to upgrade properties to an Energy Performance Certificate (EPC) rating of at least Band E, but 'houses of multiple occupation' (HMOs) are excluded. There are thought to be around a million such properties.

Whitehead said the regulations were good news, but they would not apply widely enough and would still leave many tenants at the mercy of landlords unwilling to improve their accommodation.

'The failure to bring HMOs within the scope of this legislation will leave a substantial amount of the private-rented sector unprotected against leaky, cold properties.'

He said he was trying to address the issue through a Private Members' Bill, but added that it would 'urgently need addressing by the next government'.

Financial support to help landlords upgrade properties would be made available through the Green Deal and Energy Company Obligation. From April 2016, tenants will have the right to request efficiency improvements, which the landlord cannot unreasonably refuse.

A property is defined as an HMO if it has three or more tenants each with a separate rental agreement.

ASHRAE call for modelling event

ASHRAE is inviting international presenters to take part in its energy modelling conference: Tools for Designing High Performance Buildings, which takes place in Atlanta, Georgia, from 30 September to 2 October.

The conference will use case studies to focus on the practical aspects of energy and building simulation 'from start to finish'.

To submit an abstract, or for more information, visit

www.ashrae.org/EMC2015

Ruskin launches natural ventilation business

Ruskin Air Management has launched a new natural ventilation business.

Called Airoolution, the service will provide complete natural ventilation solutions for commercial buildings, including: system design; supply of equipment; controls; installation; and commissioning.

Ruskin sales and marketing director David Fitzpatrick said design engineers would be able to verify performance claims before, during and after commissioning.

Fitzpatrick added, Ruskin could make sure ventilation designers were involved early enough in the process to make sure it is appropriate for the building in question.

Obama wants US\$48bn for green incentives

US President Barack Obama has included provision for US\$48bn in his 2016 budget proposal to Congress, to cover tax incentives in support of renewables and energy efficiency improvements over the next decade.

The budget invests in clean energy, improving energy security, and enhancing preparedness and resilience to climate change, said a White House statement.

The budget also includes subsidies for 'alternative fuel' vehicles and energy efficient homes that will increase the budget deficit by US\$5.8bn.

First for Bristol as council sets up municipal energy company

Bristol City Council plans to set up a municipal energy company.

Bristol Energy would be one of the first such firms owned by a local authority to support the provision of a municipal energy supply, delivering 'social, economic and environmental benefits'.

Bill Edrich, director of the council's Energy Service said: 'Customers would be guaranteed competitive, fair and simple energy tariffs with any profits reinvested back into local communities.'

'The company will also provide low carbon electricity... with a focus on sourcing power from local places,' he said.

Bristol Energy will also become



1000 WORDS / SHUTTERSTOCK

the vehicle for delivering domestic energy efficiency initiatives and investment in local 'sustainable' energy projects, according to the council, which is also developing

plans for district heating networks, consisting of a system of underground pipes supplying businesses and public sector organisations.

Straw homes 'could cut bills by 90%'

Seven Bristol townhouses, with external walls built largely from straw, have been completed, following research by the University of Bath that suggests their owners could receive fuel bills up to 90% less than an equivalent brick-built house.

The researchers also said the houses, created using a factory-built straw panel design, developed at the university, cost much less to buy than the average Bristol house.

The houses have received BM Trada's Q-Mark certification, meaning developers and homebuyers can now insure and secure mortgages against houses, schools and offices built using this method.

Developer Connolly and Callaghan said using the 3.2m by 2.9m ModCell straw panels, constructed within an airtight design, along with triple-glazed windows, mean the new houses will need 'significantly less conventional heating'.

In brief

BRE JOINS FORCES WITH UNITED STATES FIRM

BRE is working with US-based energy efficiency firm Green Generation Solutions (GreenGen) to help UK companies prepare for new EU energy efficiency regulations that will come into force in 2018. These will make it illegal to rent a building with an energy performance certificate (EPC) rating below E.

BRE will carry out energy audits on buildings to identify 'quick wins and long-term improvements', while GreenGen will provide 'cost-and-return data to clients' and manage delivery of the improvement projects.

'We have a tried and tested method for assessing and implementing energy efficiency solutions that provides real economic benefit and improved profitability to our clients,' said GreenGen CEO Brad Dockser.

'The built assets in the UK and Europe will be challenging because of the age profile, but we have BRE's expertise – and years of data in this field – to ensure we continue to achieve positive financial results.'

SKANSKA ANNOUNCES MULTIMILLION-POUND PROJECT

Skanska is to build a £300m research centre and corporate headquarters for drugs company AstraZeneca in the UK.

The Herzog & de Meuron-designed HQ will be on the Cambridge Biomedical Campus and is expected to be completed in 2017. It will be home to AstraZeneca's research into cardiovascular and metabolic disease, and will also be the company's largest centre for oncology research.

BALFOUR BEATTY GETS THIRD OFFSHORE POWER LINK

Balfour Beatty has snapped up the power transmission network for the Gwyn y Môr wind farm, off the north Wales coast – its third sea-to-land power system.

The company will jointly own the £352m transmission system with infrastructure investor Equitix. The network includes more than 80km of sub-sea cables and three substations connecting the 160-turbine farm with the National Grid.

Government departments among the worst late payers

● MP brands unfair payment 'as unethical as tax evasion'

Public sector clients are among the worst late-payment offenders, according to two major new reports. Surveys by the National Audit Office (NAO) and the Specialist Engineering Contractors' (SEC) Group have revealed that up to 90% of government departments withhold payment from contractors, pushing many to the brink of collapse.

Freedom of Information requests from the SEC Group showed that public sector managers withhold as much as 10% of contract amounts owed in the form of payment 'retentions', to bolster their working capital. SEC Group chief executive, Rudi



Klein, said the situation was 'scandalous', given that the bulk of retention cash is provided by small firms that have major difficulties in accessing finance'.

Oldham East and Saddleworth MP, Debbie Abrahams, is leading a parliamentary campaign to tackle late payment. 'The public sector should be the foundation on which we build a fair payment culture,' she said, adding unfair payment was 'as unethical as tax evasion'.

The NAO was also highly critical of government departments for failing to check whether payments were reaching small firms down the supply chain. In many cases, it suggested the government's approach was simply 'boosting the working capital of main contractors'.

The Cabinet Office is responsible for ensuring fair payment practices across government departments, but the NAO discovered it was one of the worst offenders. Only 25% of public bodies in England even monitor their payment record, its report showed.

The NAO noted the damage this does to small firms' cash flow, putting jobs at risk. It called for wider use of project bank accounts by government to stop main contractors abusing the process.

PIKSOOZ / SHUTTERSTOCK

Bidders given cash in EDR 'auction'

The Department of Energy and Climate Change (DECC) has awarded £1.28m to 18 organisations to reduce peak electricity demand, as part of the UK's first Energy Demand Reduction (EDR) 'auction'.

Participants in the pilot made applications based on how much energy they could save, and at what cost. The funds went to firms that are running projects – such as LED lighting or efficient motors – that could save energy in the cheapest way possible.

The 18 successful bidders will receive payments once savings are delivered and evidence is received. All the winners are required to achieve a minimum

reduction of 100kW between 4pm and 8pm; as a result, at least 1,855,548kWh will be saved across the country during the winter peak period, claims DECC.

'We want to see if reducing demand on the electricity grid can be a cost-effective solution that will work alongside building new power stations – guaranteeing our energy security, cutting emissions and lowering energy bills,' said Energy and Climate Change Secretary, Ed Davey. 'This "auction" is the first of its kind in Britain. If this goes well, demand reduction could compete alongside new generation in future capacity auctions.'

Projects threatened by skills shortage

Up to 27,000 construction projects could be at risk because of the worsening skills shortage. The Royal Institute of Chartered Surveyors (RICS) has predicted that 54% of businesses in the surveying sector will be turning down work by 2019.

In a survey by RICS, 85% of respondents said that a shortage of qualified candidates meant they had problems recruiting in 2014; 43% of surveying firms said they had turned down an average of five

contracts per year because of a lack of skilled staff. RICS believes the number of companies turning down work will grow by 11% in the next four years.

Alan Muse, director of built environment professional groups at RICS, said: 'It's very unlikely that we'll have the capacity or the capability to fulfil



NG Bailey apprentices

planned projects.'

Specialist contractors, meanwhile, are increasing their prices to reflect demand for their skills. The latest survey by the

National Specialist Contractors Council found that 44% had increased their tender prices in the fourth quarter of 2014.

Make your voices heard, urges 'closet engineer' Shuttleworth

● Awards speaker dreams of world without starchitects

Building services engineers have been urged to stand up to 'starchitects' and shout about their skills and innovation.

Ken Shuttleworth, founding partner of Make Architects, told the audience at the CIBSE Building Performance Awards 2015 that 'prima donna' architects had been 'kings of the castle for far too long' and it was now the time of the engineer.

The guest speaker said: 'Never has there been a more exciting time to be an engineer. You have the skills to produce the cool stuff that we all need. You can make a difference. The timing is perfect for you to come out of the shadows and get your voices heard. Don't hold back,



make that difference. The planet needs you – just go for it.'

Shuttleworth added that, for far too long, architects have taken all the credit for the hard work of engineers, and it was time for that to change.

He instructed the 700-strong audience at Grosvenor House to tell architects to 'sod off' when they tried to call the shots.

'Starchitects have taken over, with their dazzling shirts, big watches, and big, pointy, shiny buildings. This has to stop,' he said. 'I have a dream of a world without "starchitects", where engineers lead the charge. A world where buildings no longer need their own personal power plants just to keep going. A world where buildings work in harmony with nature.'

A self-proclaimed 'closet engineer', Shuttleworth told the audience: 'This is the new age of the engineer. This is your time. This is your moment in the limelight.'

● For more from the CIBSE Building Performance Awards, turn to page 16.

Sinfonia hits energy high notes

A project to improve the energy efficiency of early 20th-century buildings, as well as those from the 1950s to the 1980s, has been launched by 25 organisations from eight EU countries.

The aim of the five-year, EU-funded 'Sinfonia' project is to produce design templates to replicate in member states' cities. Innsbruck, in Austria, and Bolzano, in Italy, are developing urban master plans to deliver 'primary energy savings of between 40% and 50%, and increase the share of renewables by 20%'. The project will also involve the integration of intelligent control systems for district energy grids.

The power of PCMs

Phase change materials (PCMs) can help keep classrooms comfortable in summer and meet compliance criteria for the Priority School Building Programme (PSBP), according to a study at Belvoir High School, Nottingham. The 2013 study compared the air temperatures of two identical classrooms, one of which had 50% of the ceiling tiles replaced by Armstrong Ceilings' Coolzone tiles, incorporating BASF's Micronal PCM. The room with PCMs achieved consistently lower temperatures – 1°C cooler on average than the standard classroom. 'The 1°C was enough to ensure we were hitting the (PSBP) output specification,' said Jeremy Sumeray, head of sustainability at Armstrong Ceilings.

Cambridge shines in light festival

Cambridge landmarks were transformed with new lighting technologies during the city's e-Luminate festival last month.

To mark the event – which celebrates light and its role in sustainable technology – a series of illuminations were set up around the city.

This year, the festival was part of UNESCO's International Year of Light – a worldwide celebration of

the way light-based technologies aid sustainable development.

Lighting designs were projected on St John's College Tower and King's College Chapel, and there was a light hub at Parker's Piece. A 'dark concert' was held at Great St Mary's Church.

Meanwhile an installation by Ross Ashton, Panasonic and Hawthorn, projected elaborate patterns onto Senate House (right).



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Call for guidance on future homes

CIBSE's Homes for the Future group has called for guidance on good practice in building services and environmental design for the homes sector. This includes houses, apartments and care homes.

Research has highlighted serious performance-gap issues in the housing sector, and CIBSE is seeking tenders to produce a technical memorandum on the best practice in home design.

The deadline is 9 March. For more details and submissions see <http://bit.ly/1zOiq9J>

Lifts Symposium

The fifth Symposium on Lift and Escalator Technologies will be held on 23-24 September, at Highgate House, Northampton.

It will bring together industry experts, academics and postgraduate speakers presenting peer-reviewed papers. For more information, or to submit an abstract, visit www.liftsymposium.org

Student scoops £1,000

Fernando Vásquez Rodríguez, who completed his MSc in renewable energy (technology and sustainability) at the University of Reading, has won the Building Simulation Group Student Prize 2014.

The annual prize is awarded for the best research project – at Master's degree level or equivalent – on the application and development of advanced simulation techniques and/or software for predicting the performance of buildings and environmental control systems.

Rodríguez won £1,000 for his postgraduate dissertation 'Simplified tool for preliminary design of mechanically ventilated PV façades'.

The prize is open to UK and overseas students, and the 2015 winners will be published at www.cibse.org/bsg

Engineering needs you



● Research highlights growing demand for skilled workers

The number of engineering apprentices and graduates entering the industry will need to double to meet projected demand, an EngineeringUK report has said.

According to research published in *The State of Engineering* report, meeting the demand for new engineering jobs will generate an additional £27bn per year for the UK economy from 2022 – the equivalent of building 1,800 schools or 110 hospitals.

The report analyses the industry's capacity and capability for growth, and details engineering in education, training and employment.

It shows that engineering accounts for a quarter (24.9%) of UK turnover – 9% higher than at the start of the recession. However, engineering companies will need 182,000 people per year with engineering skills in the decade to 2022, and there is a current annual shortfall of 55,000 skilled workers.

Vince Cable, Secretary of State for Business, Innovation

and Skills, said: 'A strong British engineering sector is vital to the long-term sustainability of our economic recovery, and increasing the supply of engineers is at the heart of this.'

'We're working hard to make sure we have the skills we need in 2022 and beyond, but we need to work with industry to make sure we inspire the engineers of tomorrow, today.'

CIBSE is working to ensure that the profile of building services is included in the drive to attract talent into the industry. It supports pan-engineering organisations, such as EngineeringUK, which is well funded to attract talented people into our sector.

The Institution also works with Tomorrow's Engineers, The Big Bang, E4E, the Construction Industry Council, and the Royal Academy of Engineering, plus many others, to promote and celebrate engineering.

More than 100 CIBSE members act as science, technology, engineering and maths (STEM) ambassadors, to inspire young people to choose subjects that can lead to engineering as a career choice. CIBSE members in the regions also go to careers fairs, and take part in enrichment activities in schools and colleges.

The full Engineering UK report is available to download at <http://bit.ly/1D4mXaw>

CIBSE support

CIBSE funds BSE Challenge, a hands-on activity – developed in 2014 and delivered by the Smallpeice Trust – that gives a taste of the design and practical challenges faced by building services engineers, and the positive environmental impact their work can have.

The Institution also sponsors two annual Arkwright Scholar awards, which support budding engineers in their sixth-form studies and into university. Additionally, CIBSE backs the Design Engineer Construct! programme, run by Class of your Own and recognised by Ofqual. It delivers GCSE-equivalent qualifications in construction to 14-16-year-olds in participating schools.

CIBSE, alongside a major commercial sponsor, co-funds the production of all its online learning materials, bringing real construction engineering projects into schools.

Careers Panel under new leadership after 10 years

● New chair to continue driving careers strategy

David Cooper FCIBSE is the new chair of the CIBSE Careers Panel. The founding partner and director of LECS (UK) takes over from Doug Oughton, CIBSE past president, who set up the panel in 2004 to bridge the gap between educators and employers in the building services sector.

Oughton has chaired the panel since its inception and has seen much progress made in those 10 years.

Cooper (pictured) is involved in the CIBSE lift group and runs the Lift Academy, which promotes careers in this sector of the industry.

He also sits on the CIBSE Training and Development Panel, as well as the Lift and Escalator Industry Association Trailblazer



Committee for apprenticeships.

Carilyn Clements, director of membership, said: 'We are very pleased that David has agreed to take on the role.

'His passion and enthusiasm for careers in the sector is evident and we look forward to him continuing to drive forward the strategy over the coming years.

'We must extend our appreciation to Doug

Oughton, who has been a great advocate for careers activities at CIBSE.'

Cooper will continue to progress the careers strategy, which aims to connect schools, colleges and universities with employers, as well as increase the flow of qualified and motivated entrants to technical and professional careers in the building services sector.

Sustainability Survey 2014

CIBSE's sustainability survey 2014 drew responses from 622 members from 30 countries.

The majority of respondents (44%) were from consultancies, mainly in the education, retail and industrial sectors.

Most of those taking part put natural resource efficiency, and working within environmental limits to meet

current and future needs, as most relevant to their view of sustainability.

The areas of sustainability activity ranked most relevant to peoples' work were (in order of importance):

- Energy and carbon emissions
- Building management, measurement and performance

- Legislation and regulatory compliance
- Adaptation to climate change
- Materials, procurement and resource efficiency

The top three CIBSE resources that people found most useful for sustainability were: technical guidance; the Knowledge Portal; and *CIBSE Journal*. For full survey results see www.cibse.org

New members, fellows and associates

MEMBER

Baker, Matthew
East Hoathly, UK

Behan, David
Oxford, UK

Bradford, Helena Maria Maureen
London, UK

Clement, Virginia Louise
Portobello, UK

Corbett, Paul Richard
Manchester, UK

Corke, Carl Francis
Birkenhead, UK

Dhondee, Vinobah
Quatre Bornes, Mauritius

Dhooky, Aruna Nilma Devi
Phoenix, Mauritius

Florian Valbuena, Diana Carolina
London, UK

Gardner, Philip Andrew
Uxbridge, UK

Gillies, Peter John
Olney, UK

Hibner, Katarzyna
London, UK

Ho Wing Cheong, Johnny
Tin Shui Wai, Hong Kong

Holcz, Andrew
Warrington, UK

Hopfe, Christina Johanna
Loughborough, UK

Maxwell, Paul
Sunbury-on-Thames, UK

Mellon, Shane Thomas Joseph
Oxford, UK

Mitchell, David Graham
Portsmouth, UK

Mohammed, Afroze
London, UK

Rahman, MD Mizanur
West Avenue 4, Republic of Singapore

Roberts, Ben
Bridgwater, UK

Shiple, Paul Martin
Newark, UK

Shoard, Robert Andrew
Hythe, UK

Simkus, Edvinas
Bournemouth, UK

Siu, Ka Ling

Cheung Sha Wan, Hong Kong

Siu, Kin Sum

Mongkok, Hong Kong

Williams, Ruth Nicole

Auckland, New Zealand

Williams, Graham Thomas

Glasgow, UK

Zhang, Xingxing

Shanghai, People's Republic of China

LICENTIATE

Gonzales, Nikolas Michael Antonio

North Woolwich, UK

In brief

QATAR REGION WANTS SPARK BACK

The Qatar Region is looking for new committee members to help reinvigorate its activities.

The region - which has almost 100 members - is looking for people to take on the following roles: events officer, membership officer, and industry liaison officer.

They will join chair Ekram Syed, head of MEP and sustainability at White Young, event coordinator Douglas Hannell, design manager at Hastie International, and past chair Peter Carew, senior building services engineer at Astad Project Management.

The committee meets on a quarterly basis and is looking to strengthen its numbers in order to provide regular events for CIBSE members in Qatar.

For more information visit <http://bit.ly/1zxXizL>

CIBSE is also looking to recruit new interviewers for membership and registration interviews.

To be considered, email a brief CV and why you are interested to Carilyn Clements at membership@cibse.org

TRAVEL BURSARY UP FOR GRABS

The Ken Dale Travel Bursary 2015 is open for entries.

The award offers between £1,500 and £4,000 to CIBSE members - in the developmental stage of their career, - who wish to spend three to four weeks abroad researching aspects connected to their field of work.

Last year's winner, Kit Stormont - based in Buro Happold's

Dubai office - travelled to Canada, Mexico, Australia and Malaysia to investigate the potential for natural ventilation in tropical climates, measuring its success in commercial high-rise towers compared with residential buildings.

Stormont said: 'This is an amazing opportunity for a young engineer to experience areas of their interest in the real world.'

The closing date for entries is 17 April. For more information about the bursary, and to enter, visit www.cibse.org/awards



Around the Regions CIBSE North East

CIBSE North East Region has close links with Northumbria University, helping to ensure undergraduates and graduates are attracted to the many benefits of CIBSE membership.

The region, which has 540 members, offers a programme of technical meetings, running from September to April each year. It has been working hard to increase the attendance at these and has been publicising them on social media (Twitter @CIBSE_NE). The diverse range of the events – from core building-services subjects to wider built-environment and engineering issues – should help to broaden the appeal of these meetings.

The region, which has invited fellow professional institutions – such as RIBA and RICS – to its events, believes 2015/16 will bring another interesting, informative and entertaining programme, open to both CIBSE members and non-members.

In 2014, CIBSE North East welcomed a new chair, Gerard Hosford, who is principal mechanical engineer at Patrick Parsons, in Newcastle upon Tyne.

Hosford has been involved with CIBSE in the region for the past five years, establishing its Young Engineers Network (YEN) in 2009, before becoming chair of the YEN North East Region. He was nominated vice-chair of the main CIBSE

committee in 2013, and has been chair of the region since April 2014.

The North East region's committee is continuing to form links with other institutions and professional bodies in the area. In January, it held a technical event, with a presentation from the BIM Academy. This included an overview of the latest developments in BIM technology, and the approach to integrating the skills we require into the way we work today.

The presentation included an interactive 45-minute demonstration, with a discussion on Revit MEP and the challenges that mechanical, electrical and plumbing engineers face when working with BIM to achieve the government's requirement for Level 2 compliance by 2016.

For more information, visit www.cibse.org/networks/regions/north-east



New CIBSE North East chair Gerard Hosford

Key projects

- Northumberland Specialist Emergency Care Hospital in Cramlington
- Science Central in Newcastle
- Durham Police HQ
- Stephenson Quarter, Newcastle
- Bede College, Holmside building, Sunderland

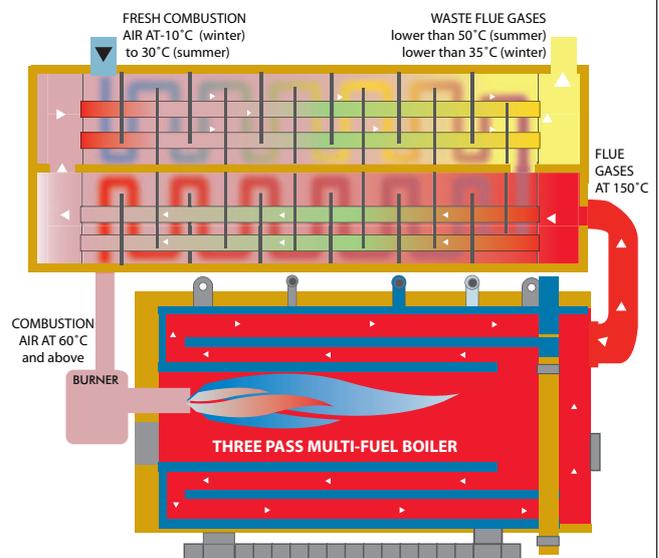


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CIBSE Building Performance Awards 2015 winners

ENGINEERS TOLD: JUST GO FOR IT!

Ken Shuttleworth made an impassioned plea to engineers to shout louder about their work, as CIBSE recognised the cream of the industry at its annual awards. **Liza Young** reports



Carbon Champion M&G Real Estate



Beca with the International Project of the Year Award

M&G Real Estate was crowned Carbon Champion at the CIBSE Building Performance Awards 2015 for slicing energy use across 500,000m² of its shopping centre portfolio. The firm also picked up the Energy Management Award after cutting energy by 23% at ten shopping centres – including a 24% reduction at Manchester Arndale – which equates to a total saving of 21,152 MWh and £985,000.

The awards presentation followed a rousing speech by leading architect Ken Shuttleworth, who urged building services engineers to take more credit for their skills.

He told the 700-strong audience that they could make a difference. ‘Never has there been a more exciting time to be an engineer. The timing is perfect for you to come out of the shadows and make your voices heard. The planet needs you – just go for it.’

Mitch Layng, portfolio energy manager at M&G Real Estate, said to come away as the carbon champion was ‘beyond our dreams’.

He went on: ‘Being an engineer from a very young age, it’s something I’ve always aimed for, and to achieve the award is almost the pinnacle of my career. It’s also very important for the company because our investors quite often ask for green credentials now, and this demonstrates how green we are.’

Layng said some quick and easy wins were made with the portfolio through improved management and metering, installing inverter controls on pumps, and LED lighting.

‘The main lessons learned are [you have] to get under the skin of the buildings to actually understand how they operate, to make sure you collect enough data to understand the performance of the building, analyse that data and then benchmark and set targets.’

He added that teamwork had achieved the award. ‘It’s important that we have collaboration between all the parties involved, from the investment and asset managers within M&G Real Estate to our partners who do the facilities management.’



CIBSE President
Peter Kinsella



Aecom was crowned Building Services
Consultancy of the Year (over 100 employees)



More than 700 people
attended the awards

But it was Aecom that stole the show at the Grosvenor House ceremony, in central London, winning three awards, including Collaborative Working Partnership, Building Services Consultancy of the Year (over 100 employees) and New Build Project of the Year (value up to £10m).

URS (now Aecom) also took the New Build Project of the Year (value over £10m) crown for The Quadrant:MK – home of Network Rail.

Mike Starbuck, technical director at URS, said: 'We should be encouraged to strive to achieve better standards. With each year we see the bar being raised and – as consultants – it's important that people view us at the cutting-edge of excellence as we look at new ways of trying to achieve better things, better standards and more efficient buildings.'

He said the main challenge during the project was dealing with such a large client with many stakeholders, who all had their own particular requirements. 'We represented the M&E services – an area that can be regarded as

a little unglamorous, so it was a case of getting the point across successfully so they could understand exactly what they were getting in the building.'

Starbuck said the handover process posed many potential problems; for instance, the client was moving into a naturally ventilated building from one that was air-conditioned. 'It was important that we spent time educating the occupiers about the environment into which they would be moving. That process was very well-thought out and we were pleased to see conditions being achieved that were exactly as [outlined in] the design intent.'

Ant Wilson, director at Aecom, added: 'It's fantastic to be highlighted in so many categories and – because of our link with URS – to get four awards in one evening at such a great event is amazing.'

Wilson said engineers could really make a difference to combating climate change at the low energy side of the industry. 'Engineers have an important part to play to come up with buildings that use substantially less energy and are better for the environment. To be acknowledged for that by your peers – and the calibre of the judging panel – is fantastic.'

He added that the Collaborative Working Partnership Award for Aecom's work with the BBC was a 'real accolade'. 'The future of the industry comes down to working together, understanding what the client wants and trying to get in their shoes to deliver something that's of excellence to them.'

This year, 15 trophies were presented at the ceremony hosted by BBC business reporter Steph McGovern, including two new awards – Lighting for Building Performance and Building Control Systems.

The judges found it so hard to split the lighting entries that – for the first time in the awards' history – the category had joint winners: Sainsbury's Project Graphite and Cundall Birmingham.

Craig Winter, building services partner at Cundall, said: 'I think the CIBSE awards are critical to celebrating our successes, and it's very important that we highlight that and get the message across to other parts of the industry – not just the engineering elements – in terms of the value we can add to projects.'

He added: 'Lighting has gone in leaps and bounds in recent years, partly driven by energy, partly by rules and requirements for Part L, and that's inspired the industry to be more creative and put pressure on itself to satisfy that demand.'

Other notable winners included BCM (Beverley Clifton Morris), which retained its Building Consultancy of the Year (up to 100



WINNERS AT A GLANCE

- **Carbon Champion**, sponsored by Remeha Commercial
M&G Real Estate Shopping Centre Portfolio – M&G Real Estate
- **Energy Saving Product of the Year**, sponsored by Spirotech
TurboChill chiller with low GWP refrigerant R1234ze (200–1360kW)
– Airedale International Air Conditioning
- **Building Control System Award**, sponsored by Spie
Barclays Operational Control Centre (BOCC) – Barclays Bank
- **Lighting for Building Performance Award (joint winners)**
Cundall Birmingham – Cundall Light4
Sainsbury's ProjectGraphite, LED lighting programme – Sainsbury's Supermarkets
- **Building Performance Training Programme Award**, sponsored by Vaillant Commercial Systems
Data centre risk and energy reduction programme and data centre client requirements workshops
– Operational Intelligence/Entel Chile
- **Collaborative Working Partnership Award**
The team behind Broadcasting House, London – Aecom
- **Building Services Consultancy of the Year (up to 100 employees)**, sponsored by beebby anderson recruitment
BCM (Beverley Clifton Morris)
- **Building Services Consultancy of the Year (over 100 employees)**, sponsored by Andrews Water Heaters – Aecom
- **Refurbishment Project of the Year (value up to £5m)**, sponsored by CIBSE Patrons
Westborough Academy zero carbon masterplan refurbishment project, Westcliff-on-Sea – OR Consulting Engineers
- **Refurbishment Project of the Year (value over £5m)**
Premier House, Twickenham
– Flatt Consulting
- **New Build Project of the Year (value up to £10m)**
Stratford Library, University of East London, London – Aecom
- **New Build Project of the Year (value over £10m)**, sponsored by Daikin
The Quadrant:MK, Milton Keynes – URS
- **International Project of the Year**, sponsored by cooltherm
Christchurch Airport artesian heating and cooling, Christchurch, New Zealand – Beca
- **Facilities Management Operations Award**, sponsored by Gratte Brothers
International Commerce Centre (ICC), Hong Kong – Kai Shing Management Services
- **Energy Management Award**, sponsored by Imtech
M&G Real Estate Shopping Centre Portfolio – M&G Real Estate



Shuttleworth told engineers to stand up to architects



WATCH NOW

Watch the awards highlights video at www.cibsejournal.com

employees) title, and Beca's artesian heating and cooling system at Christchurch Airport, which won International Project of the Year.

Brian Morris, managing director at BCM, said that ongoing collaboration and teamwork were going to take the firm from a regional business to a national one. 'We're making inroads into London at present and we expect to have a serious London office in the next 12 months, so we're not finished yet – we're all about growth,' he said.

Justin Hill, technical director at Beca, said the CIBSE accolade was the 'primo award' in the building services industry.

'We need to celebrate success as an industry, and we need to use these awards and these projects to inspire the younger generation and fire up some passion in them to become building services engineers. I always say – although I get shot down on occasions – that building services is the only engineering discipline that can save the world.'

Hill said that despite 11,000 earthquakes in New Zealand, the project was completed almost on time and within 1% of the budget.

Its artesian heating and cooling system, which uses aquifer water that runs beneath Canterbury, as a heat sink or heat source, was

so successful that Beca is retrofitting it to the airport's existing international terminal.

Another star of the show was guest speaker Ken Shuttleworth, of Make Architects, who delighted the crowd by telling them to stand up to 'pain-in-the-arse' architects who had been 'kings of the castle for far too long'.

He said: 'I am a rebel architect and I know that you do all the work and make the architects look good. It's unfair, and it's time for that to change. Tell the architects – when they try to call the shots – to sod off.'

He said the mission to put Man on the moon, and the engineers behind Concorde, were inspirational in his youth, and called for the building industry to be as innovative as its aerospace counterpart. 'The massive reality of climate change is our catalyst,' he said.

'There was a time when engineers were world-renowned. Who's today's equivalent? Dyson? Celebrity architects – or starchitects – have taken over with their dazzling shirts and big watches and big, pointy, shiny buildings,' he said. 'You should stand up to them and tell them what they do not want to hear. What's the worst that can happen? At least you get to save the planet.'

For more from the speech, see page 11. [CJ](#)

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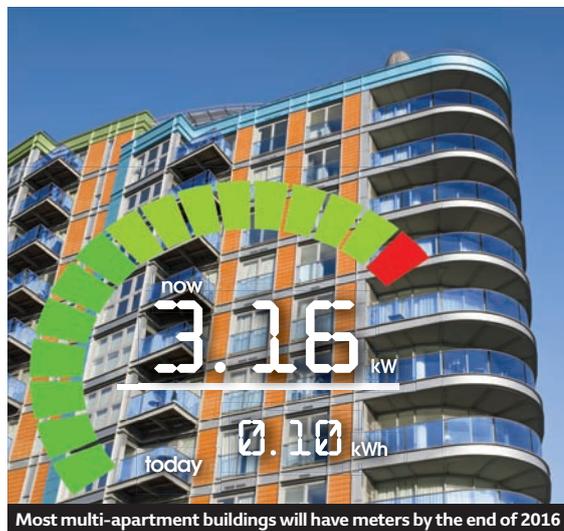
New regulations covering metering and billing for distributed heating, cooling, hot and chilled water will be enforced from April. Hywel Davies explains what needs to be done in a short time

New regulations that make it mandatory for meters to be installed in a large number of building types have been introduced. The Heat Network (Metering and Billing) Regulations 2014 were made in December 2014 to implement various requirements of Articles 9 to 12 of the Energy Efficiency Directive. These cover the supply of distributed heat, cooling, hot and chilled water from most district heat networks and communal heating systems throughout the UK. The regulations apply to most networks, in the residential, commercial, industrial and public sectors (see panel).

The Energy Efficiency Directive (EED), which is also the reason for the introduction of the Energy Savings Opportunity Scheme (ESOS) in the UK, was adopted to promote energy efficiency in the EU further, and to contribute to the achievement of the EU 20:20:20 targets for energy savings and carbon emissions reduction.

In the introductory sections of the EED, the recitals, it is noted that provisions for metering and billing in several earlier directives on energy saving have had limited impact. It suggests that in many parts of the EU these provisions have not led to customers receiving up-to-date information about their energy consumption, or regular billing based on actual consumption, to enable customers to regulate their energy use. For space heating and hot water in multi-apartment buildings the lack of clarity of these provisions has led to numerous complaints.

Under the Metering and Billing Regulations, from 18 December 2014, any person supplying and charging for the supply of heating, cooling or hot or chilled water (a heat supplier) to a final customer has had to comply with the regulations, if they are supplying through a central source, in



RNAGY / SHUTTERSTOCK

Measurement Office, which has responsibility for enforcing the regulations, will not take enforcement action before April 2015.

The initial requirements compel anyone operating a DHN to notify its location, the buildings supplied and the number of final customers supplied.

Where only one final customer occupies a building served by a DHN, meters must be installed to measure the consumption of heating, cooling or hot water by that customer, unless it is not cost-effective or technically feasible to do so.

The regulation states that where existing meters that are part of a DHN or communal heating system are replaced, they must be exchanged for a meter that accurately measures, records and displays consumption by the final customer, unless it is technically impossible to do so, or the cost is unreasonable.

If a newly constructed building is connected to a DHN, or a building on such a system, undergoes major renovations that include the building services equipment, then a sufficient number of meters must be installed to measure the consumption of heat, cooling or hot and chilled water by each final customer.

From 31 December 2014, operators of DHNs have had to provide accurate bills and billing information based on actual consumption, and be compliant with the requirements in Schedule 2 of the regulations.

Annually, at least, customers must be issued with a bill based on a meter reading – not an estimate – and, if opting to receive electronic billing information, this must be provided quarterly. Where the estimated reasonable cost of issuing such information exceeds £70 per final customer, per calendar year, the heat supplier is relieved of this obligation.

WHAT IS IN THE SCOPE OF THE REGULATIONS?

Guidance from the National Measurement Office (NMO) suggests that the regulations will apply to a wide range of buildings, including:

- Rented accommodation with a single heat source supplying multiple dwellings
- Houses converted into flats/bed-sits relying on the original heating system
- Shopping centres
- Sub-let space such as fitness centres or restaurants in hotels or third-party vendors in supermarkets
- Industrial sites where a contract exists for the supply of heat, for example to an adjoining plant.

The NMO also suggest that the regulations apply to:

- University halls of residence
- Sheltered and social housing
- Residential care homes
- Shared offices.

It is not yet entirely clear whether these are only in scope where there is an explicit charge for heating or cooling, or whether the existence of a 'service charge' that includes heating and cooling falls in scope.

a building occupied by more than one final customer (known as communal heating), or through a district heat network (DHN) to multiple buildings or sites.

The obligations come into force in stages until 2016, and the Department for Business, Innovation & Skills (BIS) has indicated that the National



From 31 December 2016, DHN operators must install meters in buildings where they supply more than one final customer, unless this is not technically or economically feasible. In this case, they must install a hot water meter, as well as heat-cost allocators and thermostatic valves at each room-heating radiator, in order to determine and enable each final customer to control their consumption of heating.

Once again, the heat supplier does not have to do this if it not cost-effective and technically feasible. In this case 'alternative methods' may be used to determine charges for the supply.

It is perhaps unfortunate that when developing the implementation of this aspect of the directive, government did not emulate the Department of Energy and Climate Change in its engagement and consultation with industry over Article 8 and the ESOS regulations. The consequence is that industry has just discovered the requirements under the metering and billing regulations, with implementation deadlines that will be applied almost immediately.

So, in summary, most multi-apartment and multi-purpose buildings with central heating or cooling, which are supplied from a district heating network or a central source serving multiple buildings, will be affected.

They will have to have individual meters installed by 31 December 2016, to measure the consumption of heat or cooling, or hot water, for each unit where technically feasible and cost-efficient.

It is perhaps very timely that CIBSE is revising its guidance on sub-metering for buildings; it may well be in demand over the next two years.

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

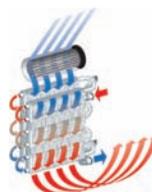


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FANNING THE FLAMES



Failure to manage fire-damper testing and maintenance can have serious consequences for those responsible for property management, says **Dermott Quinn** of Ductbusters

Fire dampers have been installed in ventilation ductwork systems in their thousands over the years.

However, neither installers nor dampers were subject to inspection or a handover process, and consultants, architects and/or caretakers may not have been conversant with their installation or repair. They may have known they were there for fire purposes, but not how they functioned.

It was – and still is – common for dampers to be installed the wrong way round and upside down. In addition, during installation and maintenance, linkages and/or dampers frequently collapse in a jammed-open position. If a problem occurs – typically, loss of airflow – the fitter or maintenance man will ‘cure the problem’.

The correct procedure would be to inspect the damper, discover the fault and, usually, replace the fusible link or cassette. However, the easy way is to jam open the blade with a bit of wood or electrician’s wire, which – obviously – defeats the use as a fire damper.

Regular inspection and ‘drop’ testing of fire dampers is, therefore, essential.

Regulations

Fire Damper Regulations BS9999 state that fire dampers should be tested by a competent person at regular intervals not exceeding two years.

Spring-operated fire dampers should be tested annually, and fire dampers situated in dust-laden or similar atmospheres should be tested much more frequently.

In addition, periodic maintenance of any smoke-detector system used to operate fire dampers is required, to determine whether detection occurs at the appropriate design smoke density. For healthcare establishments, *HTM 03-01 Part B* stipulates annual maintenance of all ventilation plant.



Jammed fire damper

However, Channel 4 News recently reported that between March and June 2010, 418 fire dampers at Birmingham’s Queen Elizabeth Hospital were inspected – and only 218 passed. Three were damaged and 197 could not be accessed. In 2011, 31 dampers were tested and only one passed.

The biggest obstacle to fire-damper maintenance is lack of access, with many other services competing for space in ceiling voids, and small access doors that only offer access for inspection, not testing.

To check and inspect a fire damper, we require the biggest access the ductwork will allow. We also require the area adjacent to the damper to be free from restrictions or other services. Lastly, we expect to see an access door adjacent to the fire damper – it is not unusual to find a damper that has obviously never been inspected or tested because there is no access door installed!

The Channel 4 programme revealed that a technical report – issued shortly before the hospital opened – included pictures of a damper sealed with tape, one propped open with a piece of metal and others built into the wall so they couldn’t be accessed for testing.

These problems are all too common. We have seen numerous instances of:

damaged/jammed fire dampers; collapsed blades; corroded or jammed springs; dampers held open with wood; and dampers incorrectly installed upside down. We have also seen the damage caused by a lack of inspection and maintenance.

At a leisure centre in the south of England – where the smoke and fire dampers had been isolated and jammed, leaving them inoperable – some discarded towels in a changing room combusted, producing a small fire with localised heat and extreme smoke.

The smoke was drawn through the ductwork into the main plantroom and was then picked up by the recirculation ductwork system and distributed through the whole of the leisure centre. The cost to repair and cleanse all the smoke-affected areas ran into millions.

Another blaze occurred in a large hospital where the dampers were installed in firewalls to allow compartmentation. Had the dampers been inspected, the fire would have been localised and contained very quickly. However, the dampers – on both sides of the fire walls – had been jammed open with bits of wood, hammer stales, electricians’ wire and electrical small-bore pipe. The hospital department and adjacent areas cost millions to be rebuilt.

Developers and contractors need to be mindful of the need to install sufficient dampers with access for testing.

As part of an ongoing maintenance contract, a qualified specialist contractor should provide comprehensive reports, detailing the performance of each fire damper and recommending any remedial work. However, not all contractors can carry this out.

We are not aware of any procedures within BIM that cover the design, installation, inspection and maintenance of these critical, lifesaving fire dampers. We are hopeful, however, that this will come as awareness increases.

It is not unusual to find a damper that has obviously never been inspected or tested because there is no access door installed!

DERMOTT QUINN is managing director of Ductbusters.



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at

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ENERGY DRIVE

Aviva Stadium, the home of Irish rugby, has kicked energy waste into touch since adopting the ISO 50001 Energy Management system. **Aidan Byrne** and **Eamonn Williams** explain how the tool helped uncover 14 megawatts of energy savings in the first three years of operation

As the focus on energy continues to sharpen worldwide due to political, financial or environmental factors, many organisations are adopting energy management systems (EnMS) to ensure the secure and cost-effective operation of their building estate. The company running the Aviva Stadium in Dublin is one, and its impact on reducing energy use has been dramatic.

Over the three-year period following the implementation of the ISO 50001 Energy Management System, the stadium saved an impressive 7,758 MWh of electricity and 6,317 MWh of gas.

Only a year after the stadium opened in 2010, the operator New Stadium Ltd (NSL) found that it was using much more gas and electricity than the designers had predicted. The firm realised that, while environmental design had been optimised for match days, little consideration had been given to the



IAN WATSON / GETTY IMAGES

A full version of this paper first appeared in the *SDAR Journal* (www.arrow.dit.ie/sdar) Vol 2 Issue 1. The *SDAR Journal* is the journal for Sustainable Design and Applied Research in Engineering and the Built Environment, published by CIBSE Ireland and the Dublin Institute of Technology. It is a peer-reviewed journal for first-time publishers of evidence-based research papers, but authors are engineers or a collaboration of working engineers and academics about building services applications. Details about submissions are available on the website, or by contacting the editor, Dr Kevin Kelly, directly at kevin.kelly@dit.ie



OPERATORS BEHIND THE NATIONAL STADIUM

Aviva Stadium, which replaced the Lansdowne Road stadium, was completed in May 2010. It was handed over to a management firm, New Stadium Limited (NSL), which was set-up by the two host organisations: The Irish Rugby Football Union and the Football Association of Ireland. NSL is responsible for all stadium operations.

energy consumption at meetings, conferences and events held at the ground.

In a bid to identify and reduce energy use, NSL implemented ISO 50001 in 2011. The standard outlines how an organisation can establish, maintain and improve energy management. (See panel 'What is ISO 50001'). It can be used to comply with the Energy Savings Opportunity Scheme, which requires large companies to carry out an energy audit of their buildings, processes and transport (see 'The treasure hunt' feature, February *Journal*).

Many businesses have already begun to adopt ISO 50001, but the sports stadia industry has been slow to adapt to this trend. We hope its implementation at the Aviva Stadium will encourage more operators to adopt it.

Commitment to the cause

For ISO 50001 to be effective, senior management must show a commitment to the standard at an early stage, ideally

by creating an energy policy that states an ambition to improve energy performance continually. At the Aviva Stadium the electrical engineer, now facilities manager, was chosen to be the management

representative, alongside the stadium's maintenance officer, who is also responsible for the operation of the EnMS.

The standard requires that an energy review is undertaken to identify: current



What is ISO 50001 Energy Management System?

ISO 50001 outlines rules for its implementation, but does not impose any definitive quantitative requirements for energy performance. It says an organisation should strive to achieve commitments outlined in its energy policy. It does not enforce the obligations with which an organisation must comply in order to meet its legal and other requirements.

The ISO 50001 standard uses the Plan-Do-Check-Act (PDCA) methodology to improve energy use continually in an organisation by incorporating energy-management practices into everyday organisational practices.

- Plan: conduct the energy review and establish the baseline, energy performance indicators (EnPIs), objectives, targets and action plans necessary to deliver results in accordance with the organisation's energy policy.
- Do: implement the energy management action plans.
- Check: monitor and measure processes and key characteristics of operations that determine energy performance against the policy and objectives, and report the results.
- Act: continually take actions to improve energy performance and the EnMS.

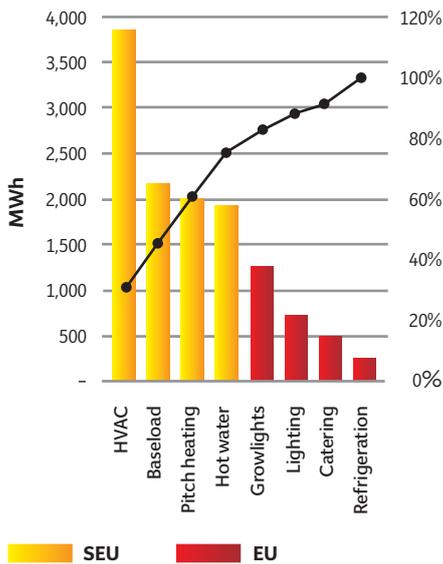


Figure 1: Aviva Stadium's SEU Pareto chart 2013

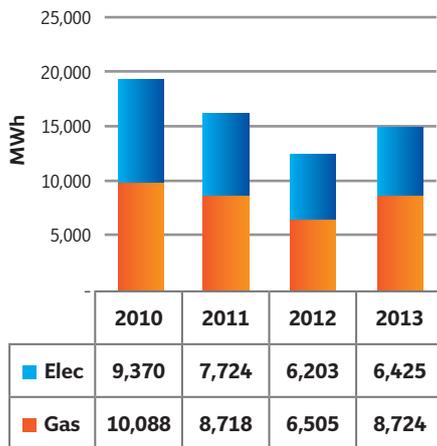


Figure 2: Aviva Stadium's annual energy consumption (2010-2013)

energy sources; consumption; significant energy users (SEUs); and opportunities for improving energy performance.

By analysing the stadium's consumption data, trends were identified and a benchmark for energy use was created.

This SEU identification process was found to be profoundly challenging, primarily because the stadium's original design did not include sub-metering for thermal or electrical loads.

Information was gathered, including plant schedules and equipment nameplates, to quantify the energy consumption relating to each particular process or system. However, the accuracy of this method was not good enough to pinpoint areas of significant energy use with any confidence. The purpose of identifying SEUs is to prioritise the allocation of resources – with incorrect data, Aviva Stadium risked allocating resources to the wrong areas.

To improve accuracy, Aviva Stadium installed a sub-metering system, which consists of more than 150 electrical meters, three gas sub-meters, six thermal heat meters, and a web-based monitoring system. The initial cost of this installation was about

5-10% of the stadium's average annual energy spend. This system has accurately and quickly identified the most significant energy users, which has resulted in a more efficient allocation of resources.

The Pareto 80/20 rule was used to identify SEUs. This states that for many events, roughly 80% of the effects come from 20% of the causes. By identifying 80% of the energy consumed as significant, the systems, plant, or equipment responsible for this energy use, can be identified as the site's SEUs (see Aviva Stadium's SEU Pareto chart in Figure 3).

The Pareto chart was created using a mixture of metered and tabulated data, so its accuracy is not absolute. This is being corrected by staff; recent installation of heat meters will yield more specific data over the coming heating session.

Aviva Stadium's current SEUs are the HVAC, pitch-heating and domestic hot water systems and the electrical baseload. Relevant variables were identified for each. This proved to be almost impossible during initial stages at the stadium because the lack of sub-metering meant operators were unable to differentiate between the separate loads.

Energy Performance Indicators (EnPIs) are



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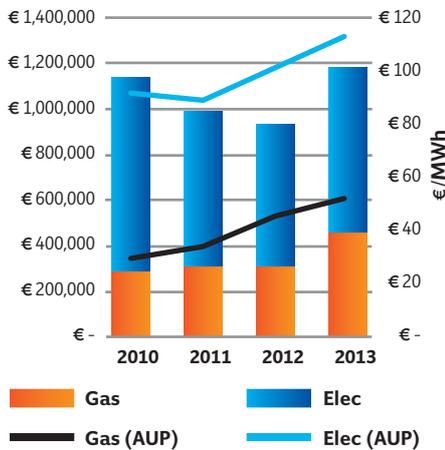
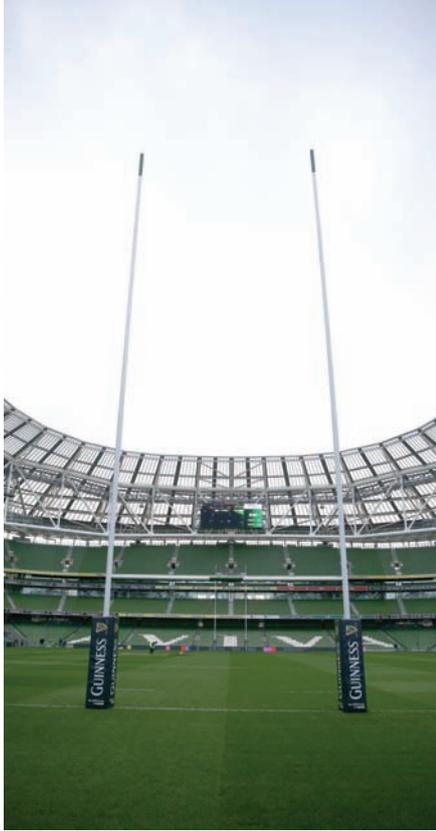


Figure 3: Annual energy costs



crucial in the monitoring and measurement of the energy performance of each SEU, and they should be used as a means of identifying significant deviations in performance. One example of an EnPI used by Aviva Stadium, is the measure of external temperature versus the amount of energy consumed by the heating system, where kWh is the energy consumption (for instance, gas) and the heating degree days (HDD), using 15°C as the base temperature.

For example, in November 2013, 1,336,298 kWh of gas was consumed with 270 HDD. This equates to a ratio of 4,949 kWh/HDD. During the previous November, only 879,712 kWh of gas was consumed, despite having 272 HDD, and therefore a lower ratio of 3,232 kWh/HDD. This then identified a significant deviation in gas consumption for that month.

The similar EnPI was used for the under-pitch heating. In this case, the HDD base temperature used is around 10°C. This is because grass is expected to grow at, and above, 10°C.

One of the most significant opportunities for improvement was the reprogramming of the Building Management System (BMS). This allowed us to control the operation of HVAC in different areas and times, and only cost Aviva €2,000.

As the designers' primary design brief was for large pitch events, this resulted in far too much plant being called to run by the BMS when each space was in use. In some cases, it was found that air-handling units and fans were running despite having no impact on event spaces.

After making this change to the BMS, a regression analysis was completed the following year; it showed an R² (coefficient of determination) of 0.9 for the heating system. This indicated a strong relationship between gas consumption and external temperature (the HDDs versus the gas consumed). Before this change in 2011 this was not the case, as the R² value was 0.7 – meaning the heating system could be out of control.

Tactics

The planning stage begins when an organisation establishes, implements, and maintains documented energy objectives and targets. It is important that these objectives and targets be approved by top management and communicated to those who may have an impact on them. They must also be looked at on a regular basis and during the annual management review.

One objective was to improve the energy performance of the kiosk areas by shutting/



PAMELL PHOTO AND VIDEO / SHUTTERSTOCK

powering them down in between events. This was verified by the use of electrical meters, and was also externally verified by an external energy consultant who conducted a separate measurement and verification plan on behalf of the stadium's electricity supplier. The objective was achieved, and 306,124kWh was saved in 2013.

It is critical that sports stadia management bears in mind its obligations in governing sporting bodies when reviewing requirements. For example, the Aviva Stadium has to provide 2,500 lux of illuminance on the pitch for broadcasting purposes, so floodlights may sometimes be needed during daylight hours.

Putting plans into play

Energy awareness plays a huge role in the success of any energy management system. During the implementation at the Aviva Stadium, a training needs-analysis was undertaken for all people who have an effect on the stadium's significant energy users. A list of the required training and competencies was compiled and a training register created. This identified the training needs of each person, and which standard operating procedure (SOP) to be followed.

Documents relating to EnMS must be legible, available and up-to-date. The energy team at Aviva found that the vast amounts of documentation required (caused in part by third-party certification) often hampered any 'actual' energy management progress during the initial implementation phase. In particular, keeping the document control register and the legal requirement register up to date resulted in a significant investment of staff time.

The implementation of ISO 50001 requires that improvements in energy efficiency and performance be considered during the building's operation and design, as well as on the procurement of energy services, products, equipment and energy. For example, when Aviva Stadium was

replacing the filters in its AHU, it told the supplier that energy performance/efficiency was of critical importance. As a result, the supplier proposed replacing the existing synthetic bag and panel filters with the installation of alternative fibre-glass bag filters, which were significantly more expensive but much more efficient. They also eliminated the need for the panel filter, which reduced the pressure drop across the AHUs; this allowed the frequency of the variable speed drives (VSD) to be reduced, thus saving a considerable amount of electrical energy.

As part of the stadium's EnMS, SEUs are reviewed on a monthly basis by inputting metered data for each energy user into a Pareto chart. This process gives both the monthly SEU breakdown and the year-to-date status. Any deviation – either 20% above or below expected levels – is recorded in its deviation log book, resulting in further investigation, corrective and preventative action.

Benefits

The stadium's annual energy consumption has steadily declined since ISO 50001 implementation began back in early 2011. It was calculated that more than 7,758 MWh of electricity and 6,317 MWh of gas was saved over this three-year period. (See Figure 2).

Despite this steady decrease in consumption, the constant upward trend in the market price, or Average Unit Price (AUP) of energy over this period, which can be seen in Figure 3, has offset much of the potential financial savings.

Even though some savings were curbed by the energy price hike, had consumption at the stadium stayed at 2010 levels, the potential energy costs encountered would have been significantly higher.

Therefore the potential savings (or costs avoided) as a result of implementing the standard can be calculated by multiplying the average unit price of both gas and electricity for each year (2011-2013) by the energy consumption in 2010.

As a result, the energy costs avoided by Aviva over the course of its ISO 50001 implementation were calculated to be €1,088,244.

Other economic benefits were operational efficiencies achieved through the elimination of costs associated with the assistance of an external auditor, which was required for the existing Sustainable Management System BS 8901 (now ISO

20121 Sustainable Events Management).

Additionally this correlation between both systems meant that the training required for the staff conducting internal audits could be packaged together by the chosen service provider, so cutting costs.

This is the first stadium in the world to achieve third-party certification to ISO 150001. The sporting sector is slowly shifting towards these certifications, and will have to do so if it wants to secure lucrative sports events.

Certification has already helped Aviva Stadium establish a 'win' against rival European stadia. It was awarded a package of games at the Euro 2020 Football Championship, where Uefa has stringent environmental requirements.

References:

International Organization for Standardization, 2011. ISO 50001:2011

AIDAN BYRNE is the stadium maintenance officer and **EAMONN WILLIAMS** the facilities manager. They were responsible for implementing ISO 50001 at the Aviva Stadium

LATEST SCORE

Since this article was written, Aviva Stadium revealed that in 2014 the gas consumed was 7,026,982 kWh and the electricity 5,481,586 kWh. When normalising the gas consumption against the external temperature (or heating degree days), much of this reduction from 2013 figures is caused by the drop from 2,312 HDD in 2013 to 2069 HDD in 2014.

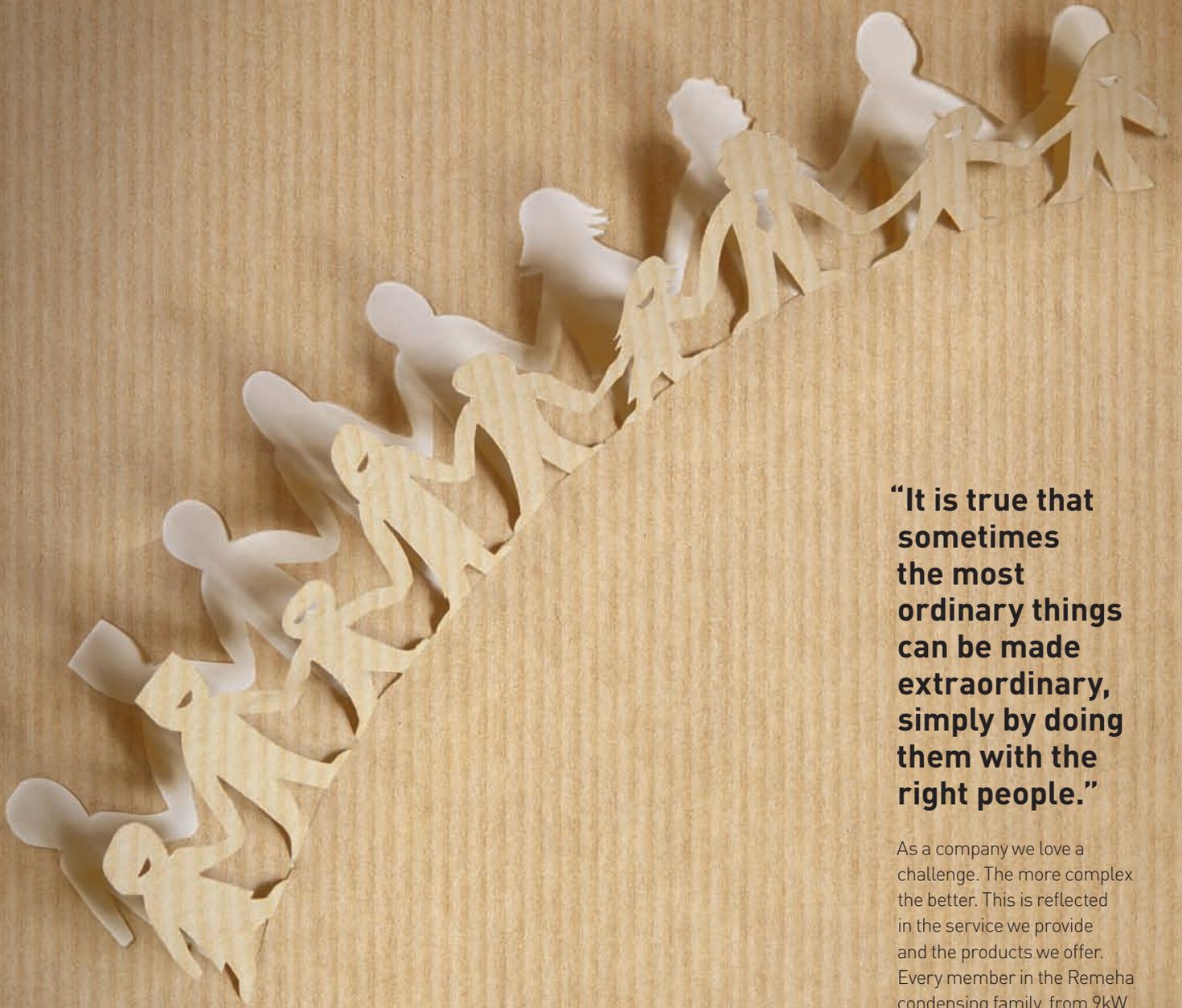
Estimated savings/cost avoided					
		2011	2012	2013	Sub-total
€	Elec	146,679	320,826	332,888	€800,393
	Gas	48,136	168,322	71,393	€287,851
					Total €1,088,244

Figure 4



PANEL PHOTO AND VIDEO / SHUTTERSTOCK

Over the course of its ISO 50001 implementation Aviva saved €1,088,244



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Noise control in drainage systems – especially in high-rise buildings – is a challenge for engineers. **Steve Vaughan** reports from the Building Drainage Conference to hear experts discussing this topic and others, including fire breakout prevention and ventilation and airflow in complex drainage systems



FLUSHHH...

Pressure transient propagation

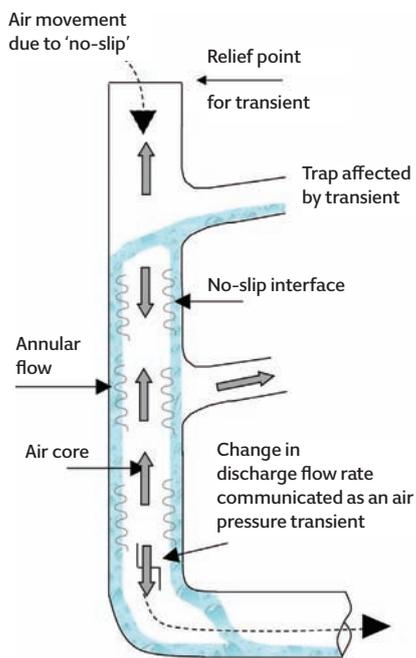


Figure 1

6 The taller the building, the further the fresh air has to travel, generating resistances that result in increasing negative pressure

Airflow and noise prevention were dominant themes at the CIBSE Society of Public Health Engineers (SoPHE) Building Drainage Conference on 15 January.

Noise, fire breakout, pathogens and hygienic drainage design, as well as airflow in drainage systems – particularly in high-rise buildings – were all covered by specialists at the event, held for the first time at the Kohn Centre, at The Royal Society in London.

The first session – on noise breakout in above-ground drainage systems – opened with manufacturers of cast iron, stainless steel and plastic drainage pipework presenting on the characteristics for each material, and the acoustic control methods that can be adopted.

For all materials, airborne and structure-borne noise requires careful consideration. Quite often, manufacturers' claims are based on selective information – such as differing flow rates – so comparisons may be difficult to evaluate. BS EN 14366:2004 aims to provide comparable data, so that an informed choice can be made between pipework materials.

However, specifiers often demand more comprehensive tests that relate to drainage offsets and horizontal runs, as well as more applicable installation scenarios, including concealed pipework, turbulent flow (standard tests with laminar flow), water fill, and systems with appliance branch connections. These are more appropriate to specific site constraints, which BS EN 14366:2004 does not consider.

Comparisons were made between the

Building Regulations Approved Document E (Resistance to the passage of sound), BS 8233:1999 (Guidance on sound insulation and noise reduction for buildings) and European DIN 4109 (Sound insulation in buildings), with manufacturers explaining how they carried out independent testing to evaluate their systems against these standards.

Whichever drainage pipework material is chosen, the fixing and support methods – together with the installation quality, room layouts and riser or ceiling-void construction – play an important part in limiting the acoustic impact of the building drainage system on the internal environment.

Walter van der Schee, who represents the TVVL – an association for building service technology in Holland – explained that many factors influence the level of noise production and noise reduction in drainage systems. He said TVVL carries out independent testing using purpose-made test rigs and apparatus that mimics real-life installations.

Van der Schee went on to discuss how ceiling construction, light fittings and other ceiling penetrations can all influence the acoustic performance, while pipework bends and offsets can impact on noise generated by waste-water flow.

Dynamic models

Session two, on airflow in above-ground drainage, started with Professor Lynne Jack – deputy head of the School of the Built Environment at Heriot-Watt University – who discussed the research that the university has carried out in relation to the simulation of air



SERGEY VECHNIKOV / SHUTTERSTOCK



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The drainage venting design for the 48-storey Pan Peninsula in London was based on BS12056 and ASPE guidance

Tall-building drainage design principles

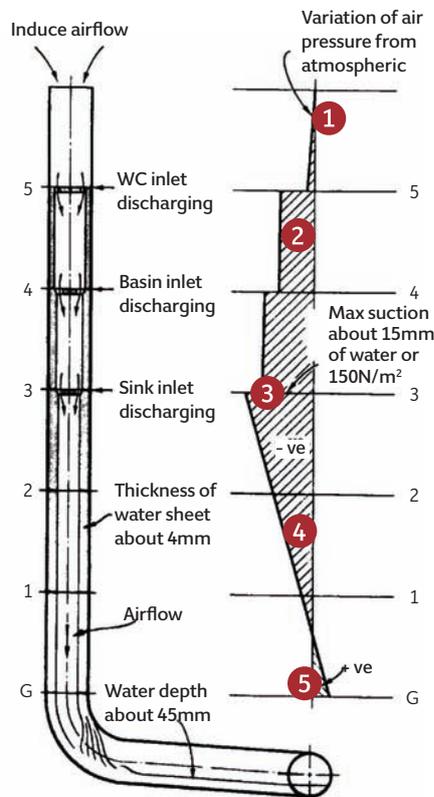


Figure 2

- 1 Pressure falls below atmospheric immediately below top of stack
- 2 Friction increases negative pressure down stack
- 3 Pressure drops further where stack is restricted by branch flows
- 4 Below the lowest discharging branch, pressure gradually increases
- 5 Pressure increases above atmospheric at base and can 'blow out' water seals

appropriate point of pressure relief (see Figure 1, page 30). Although the amplitude of the transients is small, these can affect water-based trap seals of up to around 50mm.

Entrained airflow has been found to be 8-15 times the annular applied water flow in a vertical stack, with drainage-stack water flows above 2 l/s having the potential to generate transients in excess of 50mm water gauge, thus introducing the potential to deplete the water-trap seal within a sanitary appliance.

The work of Nikolai Jegorowitsch Schukowski relating to pressure transient propagation – as well as the various stack base-flow conditions and criticality of venting – were also discussed. AIRNET computer simulation software has been developed and is used by Heriot-Watt University to design, predict response, undertake forensic analysis, and test active devices, such as air admittance valves (AAV) and positive air pressure attenuation device (PAPA) for drainage ventilation systems.

Jack ended the presentation by explaining how the new technology of reflected-wave technique can be used to identify defective trap seals (see Figure 3, page 32).

Call for high-rise regulations

Peter White, of Hoare Lea, continued with a presentation on tall-building drainage.

He highlighted the importance of controlling air pressure but not water velocity within a drainage system, as well as how foul air is kept within systems via water-seal traps, which are very sensitive to pressure changes.

The taller the building, the further the fresh air ➤

pressure transient propagation in building drainage ventilation systems.

Jack explained that many codes and guidelines are based on the 'steady state' model. However, all systems are inherently dynamic as a result of changes in system conditions introduced after natural variations in water or entrained airflow.

This means that propagated pressure waves are subsequently communicated to the rest of the drainage network, until they reach an

Reflected-wave technique

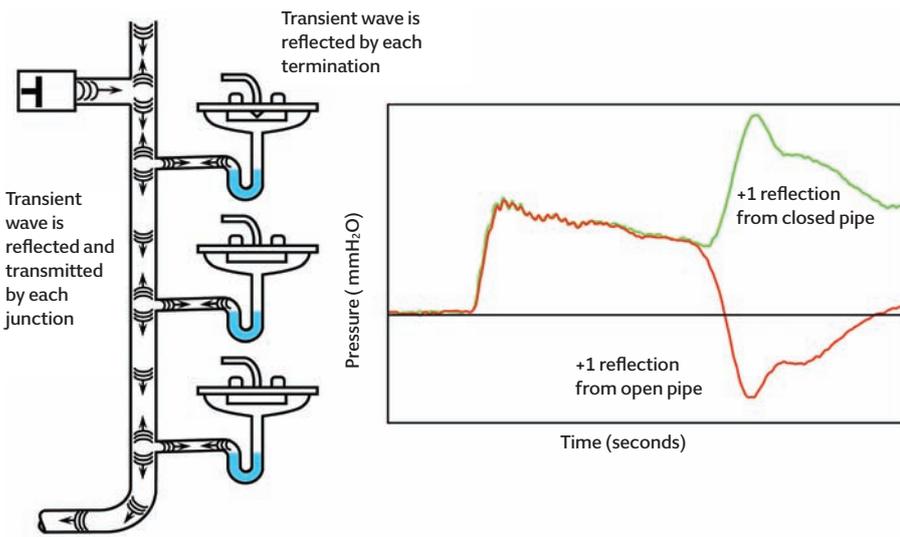


Figure 3: The new reflected wave technique can be used for identification of defective trap seals

Comparison of pressure alleviation configurations

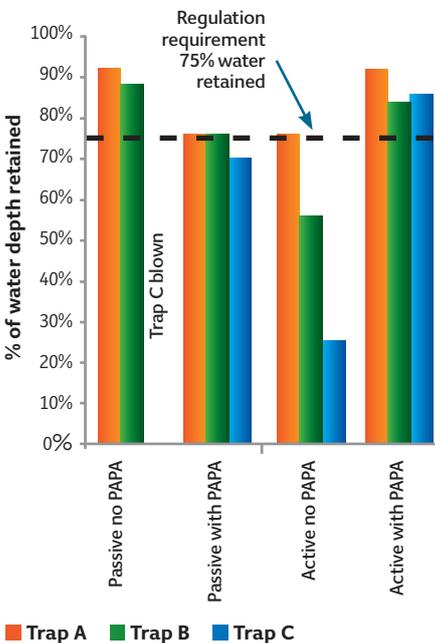


Figure 4: Active air pressure transient control using PAPA

has to travel, generating resistances that result in increasing negative pressure (see Figure 2, page 31).

White said the traditional method of controlling pressure fluctuation in large buildings is through a secondary ventilation stack; however, there is no reference to building height or maximum length of vent pipework in the current British Standards. Although American guidance, such as ASPE, addresses vent length, it is very conservative.

White added that the AIRNET software was used to verify the drainage venting design for London's 48-storey Pan Peninsula building, which was based on a hybrid design using BS12056 and ASPE guidance. He highlighted the need for a UK guidance document relating to high-rise drainage design.

System ventilation

Steven White, from Studor, discussed the principles of active drainage ventilation. He introduced the history of automatic air admittance valves (AAVs) and how the trap seal – a barrier between the drainage system and the living space – can be depleted by many events, such as induced siphonage, self-siphonage, thermal depletion and wind effect.

White showed various applications of AAVs, and explained how these can reduce roof penetrations and the amount of vent piping required. He also discussed their ability to balance the pressures in the drainage system.

He explained active air pressure transient control using PAPA in conjunction with AAVs, and presented case studies of various drainage system arrangements. This, he said, could result in a system responding faster to air pressure changes, and be helpful over traditionally-designed systems (see Figure 4).

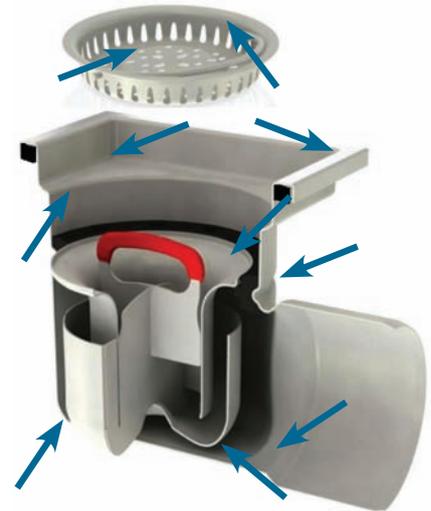


Figure 5: This floor gully has rounded component features, generated using advanced, deep-drawn metal cold-forming techniques

For the third session, the pipeline makers returned to discuss prevention of fire with details on the characteristics and construction requirements for each material. Part B of the Building Regulations (2007) (B1 dwellings, B2 other than dwellings), was referenced, as well as HTM 05-02 (2013) and BB100 (2007), with examples of providing compliance noted by each presenter.

The closing presentation of the day, by Peter Jennings, of ACO Building Drainage, provided a detailed insight into hygienic drainage design and pathogen avoidance. A brief overview of regulations, terminology and drainage functions for commercial kitchens and food preparation areas was provided, as well as an explanation of the principal bacteria and pathogens found in food production areas.

Good drainage design plays an important part in minimising bacteria and pathogen traps, and Jennings gave examples of both good and bad manufacture and design (see Figure 5).

Statistical data on foodborne disease was also reviewed, indicating that Campylobacter (3µm long, or 33 times smaller than the width of a human hair) is by far the most common pathogen source of food contamination in the UK. In view of its size, it is obvious how poor drainage design and installation can have a significant impact on the ability to maintain a hygienic environment.

Chris Northey, SoPHE chair, thanked the speakers, event manager James Ziebarth and sponsors Studor, Saint-Gobain, ACO Drainage, Blücher, Geberit, and Polypipe. CJ

● STEVE VAUGHAN is public health engineering regional director at Aecom, and sits on the CIBSE SoPHE technical committee.

PLUMBING FOR HEALTH

A one-day conference by the Royal Society for Public Health will be held on 11 March at its Portland Place HQ, in London, followed by the Worshipful Company of Plumbers' annual lecture



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TAKING THE TEMPERATURE

There is a move in the property industry to score building success according to the productivity and health of occupants, but does industry know what influences wellbeing in the workplace? **Alex Smith** hosts a roundtable debate in an attempt to uncover the evidence



ROUNDTABLE PANEL

- **Ashley Bateson MCIBSE**, partner, Hoare Lea
- **Ann Bodkin**, head of design, Education Funding Agency
- **Roderic Bunn**, BSRIA principal consultant
- **Craig Robertson**, sustainability specialist at architect AHMM
- **Ron German**, director at Stanhope
- **Andy Highton**, development director at Stanhope
- **Sara Kassam**, head of sustainability at CIBSE
- **Adrian Leaman**, managing director at Building Use Studies
- **Guy Nevill**, senior partner, Max Fordham
- **Gary Raw**, visiting professor, UCL

It's outrageous that we design buildings without measuring building performance



Bodkin: One needs vanguards who can manage the risk



Raw: Allow users to work with building systems



Health and wellbeing in buildings is a hot topic right now. There have been a number of reports^{1,2} and discussions around the area, looking at the factors affecting occupant productivity and how the industry might feed research into new metrics and certification schemes, aimed at creating healthier, more productive spaces. In the US a Well Building Standard³ has already been launched to certificate such buildings.

In response, *CIBSE Journal* assembled a high-level panel of academics, practitioners and clients to look at the evidence, and to see whether the right research was feeding into reports being made available to the property industry. Academic heavy-hitters included Adrian Leaman and Gary Raw and Roderic Bunn who, between them, had undertaken pioneering research into productivity, sick building syndrome and Soft Landings.

The roundtable also heard from experienced designers and architects from Max Fordham, Hoare Lea and AHMM, and Ann Bodkin formerly of Bennetts Associates and now head of design at the Education Funding Agency. From the client side, there were representatives from Stanhope – one of the most enlightened property firms in the industry – including Ron German, who worked on the original launch of the Breeam certification scheme.

The debate kicked-off with a rather gloomy analysis from one of the founding fathers of post-occupancy evaluations (POEs), Adrian Leaman. Alongside Bill Bordass, he has been surveying occupants hundreds of properties to understand the links between buildings and productivity, and conducted the Probe studies that appeared in the forerunner of the *Journal*.

'There is a deep level of frustration that underpins what I do,' said Leaman. 'It's about understanding occupant needs, and getting

people to listen, but 80% of findings have not reached the public domain. We're in danger of not learning from the worst that's happened.'

Ashley Bateson agreed that research needed to focus on occupant needs, and said too many professionals focused on design but not operation. 'People aren't always designing buildings as though people matter – it is crazy that operational outcomes are not a key objective in architecture or engineering.'

While working on a student residential project, Bateson said he struggled to communicate the importance of daylight. 'People just looked at the client brief, which had no metrics for lighting or wellbeing. They were happy with the design because it was compliant. They didn't want to rock the boat. We must not forget that students have to live in these buildings for 50 years, so it's important to consider the wellbeing aspects of design.'

Gold dust

'One ambition of mine is to make designers go into buildings a year after they've been completed and ask people how they feel, as part of building performance evaluation. It's outrageous that we design buildings without measuring performance outcomes,' he said.

Bateson said the standard appointments of design teams are an issue, as professional engagement normally ends at practical completion (PC) and the client often isn't prepared to pay for building evaluations. 'How can you procure a £30m building and not want an evaluation report,' he asked.

Raw likened it to a new car being delivered on time, for the agreed price, but then finding out that the alternator had not been connected to the battery.

Bunn said designers must study their buildings. 'We need to focus on performance outcomes – that is a new way of thinking, >



German: Certification could move us forward



Bateson: Designers must go into buildings



Highton: More flexibility needed in the BCO Guide

“If you put too many people in a space, there will be a nasty impact. No important work has been done on it.”
 – Adrian Leaman



KILLER VARIABLES

The variables affecting productivity identified by Bill Bordass and Adrian Leaman are:

- Comfort including personal control: People are more forgiving of discomfort if they have some effective means of control over alleviating it
- Responsiveness to need: Ability to anticipate or quickly fix building issues
- Ventilation type: Closely related to depth of building
- Workgroups: Smaller groups are more productive
- Design intent: How this is communicated to users and occupants

more a philosophy. Designers have to look upon information on building operation as gold dust not just as interference to their habits and preconceptions.’

Robertson said that indemnity insurers discouraged architects from going into buildings. ‘They think it will expose them to extra liability for their design services,’ he said.

Guy Nevill agreed more research needed to filter through to practitioners, in part to back up designers’ instincts. ‘You know it works, but you don’t always know why,’ said Nevill, who has worked on pioneering Max Fordham projects such as the Hive, and the Woodland and National Trust HQs. ‘We have carried out POEs, so design teams have learned what works. We have anecdotal evidence we share, but we want to look further at the science behind it, so we can understand what people want and how we can influence behaviour.’

Leaman wrote a paper on productivity⁴ with Bordass 10 years ago that resonates today. They devised a series of questions for occupants that aimed to identify links between productivity and the actions of building designers and managers, and found five ‘killer variables’ which influence productivity. (See panel, left).

‘The focus now needs to turn away from

classical building science areas,’ said Leaman. ‘The research here is robust, especially on indoor air quality and temperature. There are several areas that need more attention’, he said. ‘One that has cropped up recently is occupant density. If you put too many people in a space, there will be a nasty impact. No important work has been done on it.’

Leaman said there needed to be more research on how the time of day impacted occupants, such as schools when children move to different lessons, and the effect of glare on screens. ‘How well the building is resourced is another factor,’ said Leaman. ‘If it’s relatively complicated and not well resourced, it will cascade down to occupants.’

Challenging the rules

German agreed that the industry knew about the ‘hygiene factors’ – heating, cooling, lighting, ventilation and noise – and that other variables needed exploring. At Stanhope’s Chiswick Park, he says the firm looked at what made people happy and, as a result, there are amenities such as fitness centres and cafes.

To gain an understanding of occupant wellbeing, German said Stanhope carried out short questionnaires to measure how occupants felt about workplaces. ‘It’s not scientific, but the results enable us to understand why there are variables, and to work out whether it’s because the building isn’t working properly or because it’s not being managed in the right way.’

German said research knowledge had not yet worked itself into guidance. ‘Research reflecting the way we work is not finding its way into the *BCO Guide to Specification*,’ said German. ‘It’s become a victim of its own success; it’s become something of a bible, which people think is some kind of rulebook.’

Bateson said property agents often refer to strict BCO compliance when faced with unfamiliar designs. He cited the example of a new office, where Hoare Lea suggested exposing the concrete ceiling to provide passive cooling and give tenants generous floor-to-ceiling heights, but it was perceived to be too unfamiliar for the market, so the agent insisted on false ceilings, which are the norm for the office market. ‘Parts of the BCO Guide discuss opportunities to be flexible, but because they’re not in the summary of metrics, it’s challenging to have that discussions with agents,’ he said.

Craig Robertson also recalls a ‘rude challenge to the standard market suspended ceiling’. He said AHMM’s design for the White Collar Factory in London, ‘really pushed the way that BCO standards can be delivered’ with its exposed concrete incorporating

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► embedded cooling coils, exposed suspended services, natural ventilation and minimal air conditioning. Robertson said Arup used extensive modelling to try to prove it was a viable commercial space but, to convince the market, a prototype had to be built.

Andy Highton said ideally there should be more flexibility in the BCO Guide. Agents will reject a design from a long list if it doesn't follow BCO guidelines, said Highton. 'Otherwise they see it as a risk, even though the design might work really well.

'When you put a lot of effort into a document like the BCO Guide, there's a tendency not to want to change it, and it remains static,' said Raw.

'Rules are for the guidance of the wise, and the obedience of the foolish,' said Bunn. 'There is a tendency to try and distil health and wellbeing factors into a number that you just can't apply. I'm having this problem with Soft Landings, where some people just want a number to be told what to do rather than think more deeply about things.'

Bunn said more should be done to manage the expectations of clients about the way their buildings work, and to engage regularly with occupants after PC to help them understand what they have got.

'People are forgotten,' said Sara Kassam, who was previously sustainability and energy manager at the University of East London before joining CIBSE. 'There's a lack of engagement with stakeholders. They'll be more likely to respond if they have some ownership. If they understand the building, they are more likely to adapt.'

The panel agreed that occupants had a more positive view of a building if they were given more control. 'My ambition is to permit occupants to create an environment that works for them,' said Raw. 'You don't all necessarily want to be at the same temperature at the same time. Allow the users to work with the building systems and envelope.'

The trouble with metrics

Robertson said his firm had trouble in defining wellbeing and productivity as a metric to base design decisions on, despite doing a lot of work comparing BUS survey 'perceived productivity' against issues such as absenteeism and profitability. 'My concern is that certification schemes could be another tick-box exercise,' he said. 'It's about defining a meaningful and concise way of integrating it into our processes without spawning a bureaucratic exercise.'

Bunn agreed: 'It can't be easily certified. Not everything that matters can be measured, and

not all that can be measured matters. Some things just need to be better understood.'

But Bodkin believed that it might be worth at least testing a standard, in the same way Bennetts Associates piloted Breeam 95 on Wessex Water's headquarters in Bath. 'One needs vanguards who can manage the risk, and test the standards,' said Bodkin.

German sounded as though Stanhope might be willing to take up the baton. 'I agree, even if it's less than perfect it might move us forward. The way to get under the skin of these things is to give it a go.'

Bunn urged caution. He insisted there needed to be evidence that outcomes showed a return on investment while Robertson said: 'The underlying indicators are key, if they are to be the basis for design decisions or changes.'

Robertson's point brought the discussion back to where it started – the industry has to make sure that the right type of academic research is being undertaken, and that it is translated into meaningful guidance and metrics that can be adopted and understood by practitioners and clients, alike.

As Paddy Conaghan wrote in last month's *CIBSE Journal*: the industry has to find a way of bringing key research to the fore, to ensure designers aren't administering the wrong medicine to building occupants. [CJ](#)

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Nevill: We need to look at the science



Robertson: Defining wellbeing as a metric is difficult



Kassam: People are forgotten



Bunn: Can't tick-box our way to health and wellbeing



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WARM *Reception*

The 2015 ASHRAE Winter Conference avoided the Super Bowl blizzard and delivered a packed schedule to more than 3,000 delegates. **Tim Dwyer** reports on the highlights and speaks to ASHRAE president Tom Phoenix



ASHRAE executive vice-president Jeff Littleton delivers upbeat ASHRAE messages

The timing of the 2015 ASHRAE Winter Conference was impeccable. Delegates enjoyed unseasonably warm weather at the Palmer House Hilton in Chicago but, within days of the show closing, the district experienced its fifth worst snowstorm on record, with almost 20in of snow falling in what was dubbed the 'Super Bowl Blizzard'.

While more than 42,000 attendees and 3,000 delegates enjoyed spring-like conditions at the annual North American showcase for building services engineering, the ensuing icier environment would have been perfect for one award winner – a penguin and ride attraction in Orlando, Florida, one of 60 recipients of honours and awards.

Among those feted this year was the chief engineer of the Vatican, Stefano Marino, as well as a mix of students, building designers and operators.

The awards were made during the opening plenary session, where there was standing-room only as delegates peered through doorways to catch this biannual state of society 'parade', complete with rousing video warm-up extolling the positive impact that ASHRAE members have in the community (See panel 'Winners in Chicago').

Evangelist

ASHRAE President Tom Phoenix handed the final award to CIBSE member, and ASHRAE past president, Kent Peterson. He received the John F James International Award, which recognises those who have done the most to enhance ASHRAE's international presence.

Kent is widely recognised as an evangelist of interdisciplinary working and continues in his volunteer and professional work to further the practical comprehension and application of benchmarks. He was instrumental



Some of the 3,000-plus delegates who took part in more than 100 sessions



CIBSE President Peter Kinsella (right) presents ASHRAE president Tom Phoenix with a special certificate recognising his successful application to become a CIBSE Fellow

in linking CIBSE's expertise on energy benchmarking with ASHRAE's development of performance-metrics protocols.

The conference recognises past members of ASHRAE who have made significant contributions in the field. It was notable that Rolla Carpenter (1852–1919) was remembered. His citation included a quote from when he worked at Michigan Agricultural College, where he oversaw the delivery of teaching buildings. He said these spaces were designed so that 'students might learn by actual practice more than from demonstration' – a maxim that many of today's colleges could keep in mind as they pitch towards an increasingly virtual culture.

6 The volunteers at the Women in ASHRAE breakfast event truly exemplify what I love most about ASHRAE – people, passion and performance



Davies. More than 120 delegates attended their presentation on 'Building energy prediction and measurement: Avoiding fantasy and heading toward fact'. This considered the tools and systems used to predict and report on building energy use, explored why forecasts were often incorrect, and what measures could be taken to close the performance gap.

Hinge shared work he had led on at the International Partnership for Energy Efficiency Cooperation. The report – *Building Energy Rating Schemes Around the World: Assessing Issues and Impacts* – concludes that building energy rating programmes should not be viewed by policymakers as the ultimate goal, but integrated into wider policies. These could be energy efficiency requirements, code enforcement, financial incentives and communication strategy.

ASHRAE and BIM

When I managed to catch up briefly with ASHRAE president Tom Phoenix, I asked him why ASHRAE had apparently not made any strong movement in BIM – was it an area where ASHRAE had decided to bide its time?

Phoenix asserted that ASHRAE sees building information modelling as an important tool that can enhance the design and construction process. In the area of education, ASHRAE Learning Institute offers two courses related to BIM. Following the recently updated course 'Introduction to BIM'*, the second course, planned for a summer 2015 release, 'BIM: Process, procedure and workflow' will provide more detail, as well as information on how to use the modelling tool.

Phoenix said ASHRAE's interest in BIM was long-held, and he cited the 2009 ASHRAE free, online publication: *An Introduction to Building Information Modeling*, which has exceeded 4,300 downloads, and the regular autumn energy modelling conference 'Tools for Designing High Performance Buildings' that continues to push forward the applications of BIM.

He pointed out that ASHRAE had strengthened its influence in the international BIM arena by taking over as administrator of the US Technical Advisory Group to ISO/TC 59/SC 13 *Organization of information about construction works*.

Phoenix has been a principal player in ASHRAE's development of a building certification scheme (the BeQ). There has been little take-up of the scheme so far, so I asked him what ASHRAE is doing to encourage building certification and labelling.



ASHRAE past president and CIBSE member Kent Peterson received the John F James International Award

'Unlike Europe there are no federal statutory requirements in the US for buildings to have an energy assessment,' says Phoenix. 'We see that this has been critical to the success of the European asset and operational ratings.' As a result, Phoenix said ASHRAE had invested in two technology staff members to serve as project leads on the ANSI Energy Efficiency Standardization Coordination Collaborative (EESCC). This group has issued *Standardization Roadmap: Energy Efficiency in the Built Environment*, which sets a strategic path for a more energy- and water-efficient built environment.

Importantly, the roadmap establishes a national framework to which US industry, government, standards-developing organisations, and others can look to enable greater energy and water efficiency capabilities for the nation's buildings.

Before Tom was whisked off to his next event, I asked about the desire of ASHRAE to broaden its active membership.

He said there were meetings of special interest groups, which were keen to transfer ASHRAE skills into developing countries. These have rapidly expanding economies, but often a shortage in the skills and knowledge required for sustainable development.

Phoenix said he was pleased to see the interest shown in the inaugural Women in ASHRAE breakfast event. 'The volunteers that I saw there truly exemplify what I love most about ASHRAE – people, passion and performance. They have made outstanding contributions to our industry, and I'm pleased to see us recognise the growing diversity in our membership and industry.'

* Disclosure – **Tim Dwyer** is the co-ordinating author of this course.

● **TIM DWYER** FCIBSE is chair of CIBSE ASHRAE Group and CIBSE Journal technical editor



Fun and games at the ASHRAE Winter Conference

ASHRAE executive vice-president Jeff Littleton reported that the organisation was on track to achieve its best-ever financial performance. He also announced that ASHRAE's HQ had been awarded four Green Globes in the Green Building Initiative – a notable achievement given that only 3% of projects achieve this level of certification.

Over the following four days, the 3,018 delegates, from more than 60 countries, took part in more than 100 sessions.

One of the seminars featured CIBSE president Peter Kinsella, together with CIBSE member and managing director of Sustainable Energy Partnerships Adam Hinge, and CIBSE technical director Hywel

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This month: Air conditioning in desert climates, heat pumps in Milan's Bosco Verticale, and the 'father of air conditioning' Willis Carrier

PROTECTING THE GULF FROM DESERT STORMS

Air conditioning in the Middle East is a fact of life so, in desert climates where sandstorms regularly whip up toxic clouds of dust, it is vital plant is well maintained to ensure good indoor air quality. **William Whistler** explains

6 Sandstorms carrying large amounts of bacteria, fungi and pollen allergens typically hit the United Arab Emirates eight to 10 times a year

As climatologists tell us in no uncertain terms – we are on course to expanding the areas of the planet soon to be labelled 'extreme climates'.

The petroleum-based wealth of several countries in the Gulf Cooperation Council (GCC) – including Saudi Arabia, United Arab Emirates, Qatar, Bahrain, Kuwait and Oman – has fuelled a tenfold increase in their built environment since the turn of the Millennium, creating cities where people live, work and shop in 24/7 air-conditioned environments.

These places use vast amounts of energy – estimates of domestic and commercial building electrical use, devoted to air conditioning alone, routinely range from 60 to 75%.¹

The average temperature in the UAE is above 35°C, with more than 350 days of

unbroken sunshine. So, to maintain a typical home in Abu Dhabi at 21°C, the heat energy that needed to be displaced would have equalled 2,971°C in 2012.²

In Dubai alone, there is approximately £765million m³ of air-conditioned indoor space³, constantly threatened by frequent sandstorms that clog up air filters. This presents a huge environmental challenge for building services engineers operating in extreme climates.

How to solve it

It is 10 times more efficient to improve our building envelopes than to direct resources towards improving the efficiency of the air conditioning equipment that cools them.⁴

The envelope must maintain a certain level of insulation and a weather barrier to keep the outside out, and the inside in. The amount of air leakage in an envelope has a huge effect on energy use, building comfort and health issues, especially in extreme climates. This is because the infiltrating air has elevated levels of water vapour and humidity, unhealthy particulates and microbiological toxins.



2015 TECHNICAL SYMPOSIUM

William Whistler presented a paper on this topic at the 2014 Technical Symposium. The 2015 event takes place at UCL, London on 16-17 April. For more details visit www.cibse.org/symposium

➤ Ambient air in extreme climates is rarely salubrious or ‘fresh’; therefore it must be effectively treated so it can restore the oxygen supply and thermal comfort.

The vital role of HVAC hygiene

As the ‘lungs’ of a building, heating, ventilation and air conditioning systems recycle air, maintaining temperature and indoor air quality (IAQ). Design basics, such as keeping a minimum distance between exhaust air and fresh air intakes, and ensuring the building is under positive pressurisation, are typical steps in reducing unwanted infiltration that might cause condensation and bacterial growth.

However, these can be – and often are – over-relied on; simply over-pressurising a building by 6-10% will not guarantee the indoor air will remain infiltration-free.

Some of the real-time conditions that will affect the thermal comfort and health of a building – if the envelope fails to be an integral thermal and weather barrier – are: hygiene, positive pressurisation, system de-pressurisation, wind pressurisation, and air conditioning system imbalance.

Air contaminants may settle within the HVAC system, challenging the filters. Consequently, the lifespan of these air filters is shortened, requiring more frequent cleaning or replacement.⁵ Routine cleaning of air ducts and treatment of cooling coils will also help improve the effectiveness of an HVAC system and recirculation of air pollutants. HVAC maintenance companies should also review the application of antimicrobial products specifically designed for use in air conditioning systems to inhibit fungal growth.

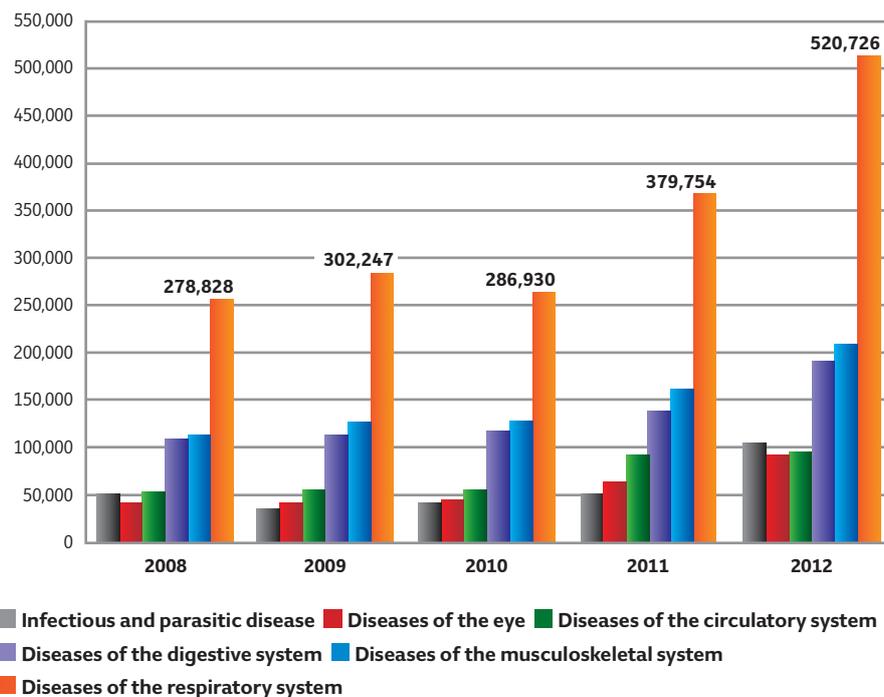
If not properly cleaned, HVAC systems may contain mould, allergen, bacteria, viral and dust contaminants, construction dust, mould spores, fiber glass, pollen, bacteria (including legionella), hair and human skin.

Artificial climates and IAQ

Both unplanned building envelope infiltration – or exfiltration – and planned rates of fresh air ventilation are forms of outdoor/indoor air exchange. In the GCC countries, the outdoor air gathers dust, salt and biological spores as it travels the trade wind currents from distant subtropical landmasses and across vast deserts and high-salinity bodies of water.

Sandstorms carrying large amounts of bacteria, fungi and pollen allergens typically hit the UAE eight to 10 times a year.⁶ Once this particulate- and spore-laden air is inside our buildings, it builds up in the air conditioning system. Without proper system maintenance, the accumulation of these airborne irritants

Clinic visits for diseases in Dubai



In 2012, the Dubai Statistical Centre recorded 520,726 visits to medical clinics with respiratory conditions

can lead to respiratory problems, especially in the young and elderly.

For example, in the first six months of the year, the Environment Agency-Abu Dhabi reported that the amount of dust in the air in the UAE was higher than considered safe for those suffering respiratory conditions on a third of the days.⁷

This unhealthy IAQ can be even more serious when the airborne exterior water vapour condenses to liquid water, creating an ideal environment for the mould propagation.

The extent of the problem of air quality in Dubai can be seen in statistics released by the Dubai Statistical Centre (DSC), which recorded 520,726 visits to clinics for respiratory system diseases (see graph above). In 2012, respiratory disease stood out as the single largest category of treated patients by a factor of more than 200%, and it has consistently done it since the DSC began indexing medical conditions by the same system as the World Health Organization in 2007.⁸

Picking the low hanging fruit

A feasible way forward to sustainability is already before us; we simply have to act on the knowledge we have. No one sets out to design, construct or commission a building that fails to keep the outside out and the inside in.

Historic lessons learned from threats to human health and safety have taught us to think of the building envelope as a system with many possible points of failure, because of the different trades that impact it.

In extreme climates today – and in future – the integrity of our building’s thermal and weather barriers have become integral to our health and safety, as well as to energy conservation and sustainability. And we all need to pay increasing attention. **CJ**

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Garden CITY

The drama of Bosco Verticale's forested façade may be gaining international attention, but it is the innovative use of heat-pump technology that is helping to slash heating and cooling costs at these seminal Milanese apartment blocks. **Alex Smith** reports



© LUCIANO MORTULLA / ALAMY

The 19- and 27-storey towers of Milan's Bosco Verticale apartment block came into full bloom for the first time last summer. Hundreds of varieties of trees and shrubs spilled over the balconies of the 111 apartments to ensure the scheme lived up to the promise in its name – Bosco Verticale, Italian for 'vertical forest'.

The external appearance of the towers follows the seasons, and when you approach in mid-winter – after the deciduous trees have shed their leaves – the *verticale* is not so *verde*. Indeed, it's difficult to distinguish the outline of the branches against the building's dark façade.

While the towers may lose their 'herb appeal' during the colder months, the choice of deciduous trees is an important part of the environmental strategy. In the winter, the bare branches allow the sun to warm apartment interiors through the large floor-to-ceiling windows, so reducing the heating requirements. In the summer, trees in full leaf provide shading, which minimises solar gain and reduces cooling needs.

It's an elegant and simple concept, which cuts the buildings' energy use, while providing Milanese with a green vertical oasis in the city's built-up centre. (See panel, 'Branching out', for more details on the planting). However, the trees are only one part of the innovative environmental strategy for the project.

Designed by architect Stefano Boeri, the project is one of a number of new schemes



in the Porta Nuova district of Milan that take advantage of a large aquifer under the city for heating and cooling. These include the Unicredit skyscraper, the tallest building in Italy. (See panel, 'Milan's hidden power source', page 48.).

Using ground source heat pumps to access the aquifer, the building services engineer, Planning – known in the UK as Rethinking Energy – is balancing the cooling and heating demands to minimise energy use at Bosco Verticale.

Hilson Moran, the original building services engineer on the project, specified two Climaveneta Integra units, which can each provide 556 kW of cooling and

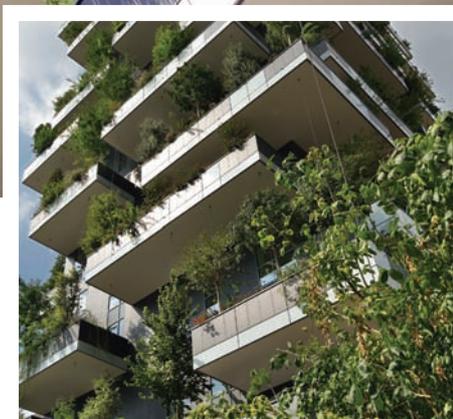


PROJECT TEAM

- **Building services engineer:** Planning (operating in UK as Rethink Energy)
- **Original services specification:** Hilson Moran
- **Architect:** Boeri Studio (Stefano Boeri, Gianandrea Barreca, Giovanni Lavarra)
- **Landscape architect:** Laura Gatti
- **Structural engineer:** Arup
- **Project and property manager:** Coima
- **Porta Nuova developer:** Hines Italy



VALESTOCK / SHUTTERSTOCK



BRANCHING OUT

The balconies of Bosco Verticale are planted with 800 trees – between three metres and nine metres tall – 5,000 shrubs and 11,000 perennials. The trees, chosen by landscape architect Laura Gatti, are mainly deciduous, which means the external appearance of the two towers alters as the leaves change colour over the seasons. The trees will grow to 9m in height and then stabilise. The plants are watered automatically through a centralised system that reuses water extracted from the aquifer. The greenery is maintained from balconies and external platforms, which are used for pruning hard-to-reach branches. Plant maintenance costs are covered in the service charge.

589 kW of heating. They have the ability simultaneously to provide heat and cooling – so, for example, hot water for underfloor heating can be provided to heat north-facing rooms, at the same time as apartments in south-facing rooms are cooled via ducted fan coil units. The radiant floor is also cooled through a heat exchanger connected to the aquifer loop, which helps lower the overall cooling load. Air handling units are positioned at the top and bottom of the larger tower to balance air flows.

The heat pumps work most efficiently during the spring and autumn, when different rooms in the tower need to be cooled and heated simultaneously. When

CREATING A FOREST

The trees and shrubs adorning Milan's Bosco Verticale were chosen by landscape architect Laura Gatti



11,000
PERENNIALS



800
TREES



5,000
SHRUBS

6 In the winter, bare branches allow the sun to warm apartment interiors; in the summer, trees in full leaf provide shading. It's an elegant and simple concept



The heat pump similar to those used at Bosco Verticale and (below) live data from Palazzo Aporti via the internet



the unit provides cooling for overheating rooms, the heat rejected from the condenser can be used to bring room temperatures in other parts of the towers up to the desired setpoint.

By recovering heat and coolth simultaneously, the units can balance the cooling and heating loads, and can improve the COP of the heat pump. To measure the efficiency of the units, Climaveneta uses the total efficiency ratio (TER), which is the ratio of the sum of the heating and cooling power, and electrical output. The coefficient of performance is usually used to measure the efficiency of heat pumps, but this is a ratio for either heating or cooling, not for both.

Two small gas boilers in a basement plantroom, rather than the heat pumps, provide domestic hot water, because – when the building was designed – it was felt that maintaining the gas boilers’ ability to keep water temperatures above 60°C was the best way to prevent the growth of legionella bacteria.

Planning building services engineer Giuseppe Medeghini says he would consider using a heat pump to supply domestic hot water if the building was being designed today, even though they can only provide water up to 45°C. ‘There are now ways to prevent legionella using chemicals, and they are cheaper and more effective,’ he says. ‘Using a heat pump works particularly well during the summer months, where all the excess heat coming from the cooling process, can be captured and used to provide domestic hot water.’

Medeghini says he would also consider using a second heat pump to produce domestic hot water up to 65°C, thereby doing away with the need for a storage vessel. ‘We now have much more flexibility in choosing a system for domestic hot water,’ he says’. (See ‘Balancing act’ panel to find out how Planning is balancing loads using sprinkler tanks in its latest scheme).

Heat pumps still have a part to play in providing domestic hot water at Bosco Verticale. They pre-heat water to 45°C, so the gas boiler doesn’t have to work so hard to boost the temperature to the required 65°C.

Planning is currently finishing the commissioning phase of Bosco Verticale, and is hoping to secure an ongoing contract with the developer, Hines.

Milan’s hidden energy source

Bosco Verticale is part of Milan’s Porta Nuova regeneration zone, which comprises a mix of retail, commercial and housing units, including the Cesar Pelli-designed Unicredit Tower, which – at 231m – is the tallest building in Italy. All the buildings on the estate use the same geothermal system as Bosco Verticale.

There are three geothermal water loops on Porta Nuova. On the ‘Garibaldi’ loop serving Bosco Verticale the water is extracted from 12 underground wells, and transported via a 350mm distribution ring. The apartment blocks use the same loop as the nearby offices occupied by Google. On the other side of the railway, another geothermal loop caters for the Unicredit Tower, plus a mix of other offices, and retail and residential units.

Water is filtered, before passing through heat exchangers under Bosco Verticale and the office. Secondary circuits in the heat exchangers take the chilled and hot water from a basement plantroom into the buildings.



CREDIT: MARCO CAROFALO

The combined peak heating loads for Bosco Verticale and the Google office is expected to be 2,200kW, and the cooling load 1,400kW.

Water from the Garibaldi loop is discharged into the Martesana canal, unless its levels are too high, in which case the water is deviated to six wells that lead back to the aquifer.

Permission for using the aquifer is lodged with the Milan province. It can take a year to receive a final licence, so these are lodged early in the construction process.

The applicants have to state the amount of water they want to use in a year, and ensure that the return temperature of the water is within acceptable parameters – at Bosco Verticale the upper temperature limit is 25°C.



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‘Continuous monitoring is very important, especially on complex systems,’ says Medeghini. ‘Modern HVAC systems can bring important reductions in energy use, but they must be monitored and tweaked to guarantee these savings.’

The energy company is currently keeping tabs on a Climaveneta air source heat pump system at Palazzo Aporti, a Hines office refurbishment in central Milan. Using the heat pump manufacturers’ Clima Pro online monitoring system, the facilities managers can constantly access the performance of the heat pumps and the temperatures in the tenanted spaces, which are all metered.

If Bosco Verticale has the same technology, Medeghini says that the HVAC system can be continuously optimised, reducing energy use and cutting tenants’ bills. These savings will at least help

the residents pay for the pruning of the thousands of trees and plants that have helped create Milan’s showstopper.

While the foliage is fabulous, the intelligent design of the HVAC cannot be overestimated when considering the impact on carbon reduction at Bosco Verticale. Medeghini estimates the system offers at least 35% savings over a traditional building. **CJ**



Balancing act

Planning is working on another scheme in Milan that uses a 150m³ sprinkler tank to store and recover heat – and cool it from water in the system – before returning it to the aquifer. This reduces the amount of water that needs to be pumped from the aquifer. ‘If the pool is between 10°C and 20°C, we do not use the aquifer. If it’s above or below, then we use the

aquifer to rebalance,’ says Planning building services engineer Giuseppe Medeghini. ‘In the early part of the day, when heat is required in the rooms, the system cools the sprinkler tank water from 15°C to perhaps 11°C. The heat pump then doesn’t have to work so hard when cool air is required later in the day, when outdoor temperatures rise.’

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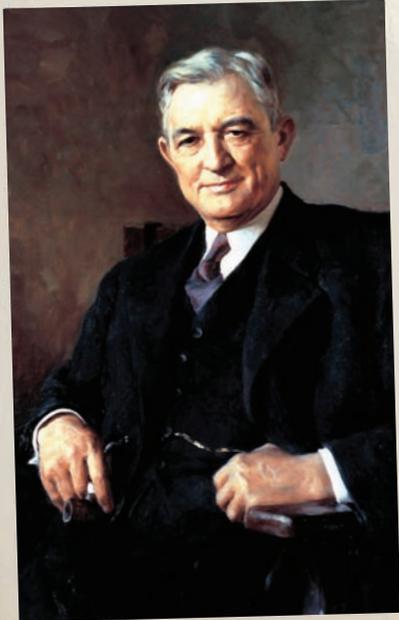


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DADDY COOL

In 1902, Willis Carrier developed the first modern system for controlling a building's temperature, humidity, ventilation and indoor air. **Brian Roberts**, of CIBSE Heritage Group, profiles the 'father of air conditioning'



Willis Carrier was neither the inventor of air conditioning nor the first to take a scientific approach to it, but he is still regarded as the 'father of air conditioning'.

His achievements are many, in particular his vision of a new industry – air conditioning. Carrier's foresight resulted in one of the first scientifically designed air conditioning systems in 1902, and later led to the invention of dew-point control.

More than a century on, Carrier Air Conditioning still proudly bears the name of the visionary engineer.

Humble beginnings

Willis Carrier was born on 26 November 1876, near Angola, in New York. His parents were farmers, and life was often difficult. However, in 1897, he won a four-year state scholarship to Cornell University, from where he graduated in 1901 with a degree in electrical engineering. Shortly afterwards, he was invited to attend a job interview at the Buffalo Forge Company.

Carrier had intended to specialise in electricity – while his prospective employer was 'engaged in the manufacture of blowers, exhausters and heaters' – but, in July 1901, he went to work for Buffalo Forge.

He soon realised that rule-of-thumb practices were being used to design and install equipment, leading to excessive margins of safety and cost. So Carrier set himself the task of researching existing data, and produced a formula for selecting boiler fans for maximum efficiency and minimum power.

This impressed his employers to such a degree that he was allowed to set up what later became an industrial laboratory. In turn,

this led to the young Carrier being asked to solve printing problems caused by atmospheric humidity variations at the Sackett-Willhelms Lithographing Company, in Brooklyn, New York.

He conducted tests using his own ideas for dehumidifying air and keeping its moisture content constant. These included circulating cold water through heating coils, and Carrier produced a scheme for what was then believed to be the world's first scientifically designed air conditioning system. Unfortunately, for reasons of cost, the dehumidifying coils were retrofitted to the existing heating plant and Carrier never considered the 1902 installation a success, though the advertising department chose to ignore this (*Heat & Cold*, ASHRAE, 1997, p332). The installation was removed after a few years.

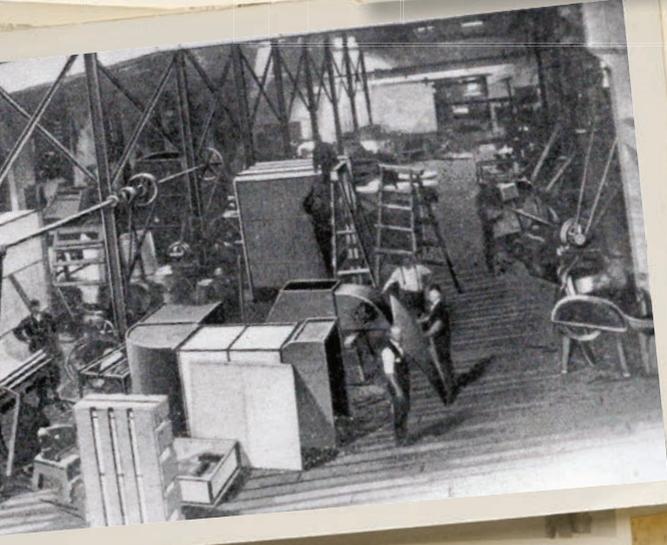
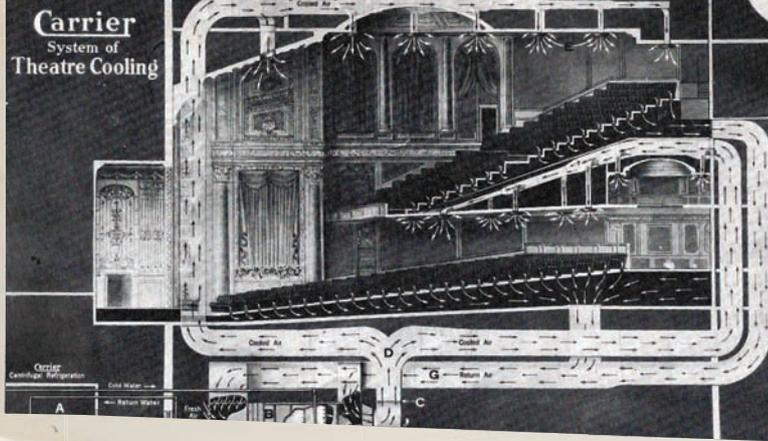
In late 1902, while waiting for a train on a foggy day in Pittsburgh, Carrier is said to have had 'the flash of genius' that eventually led to dew-point control. He developed the spray-type washer, for which he obtained a patent in 1906.

While his use of spray water was readily accepted for humidifying, the idea of dehumidifying air using cold water was ridiculed by many – but, still, Carrier went on to revolutionise the textile industry.

In 1907, Buffalo Forge set up a subsidiary – the Carrier Air Conditioning Company of America – so their employee could continue his work. Carrier went on to develop a constant-friction method for duct sizing, to invent automatic dew-point controls, and to present his rational psychrometric formulae in a 1911 paper.

While waiting for a train on a foggy day in Pittsburgh, Carrier had 'the flash of genius' that eventually led to dew-point control





However, many consider Carrier's greatest technical achievement to be the system he designed for the Cleveland wind tunnel of the National Advisory Committee for Aeronautics (Naca) – started in 1940 and opened in April 1944 – which was required to simulate freezing, high-altitude conditions in which to test prototype aircraft.

The completed installations used an air-flow rate of 10 million ft³/min, cooled to -67°F by 14 refrigerating machines requiring a total of 21,000hp. This helped Naca's contribution to the war effort, but, afterwards, Carrier semi retired and suffered ill health. He died in New York on 7 October 1950, after a long and distinguished career.

Carrier was president of the American Society of Refrigerating Engineers in 1927, of the American Society of Heating and Ventilating Engineers in 1931 and, in 1941, received the Franklin Institute Medal.

He was inducted into the ASHRAE Hall of Fame in 1994, in recognition of his significant contributions to establishing air conditioning as an industry, and psychrometrics as a science. **CJ**

May 1922, and – by the end of 1924 – nine machines had been sold.

Carrier's big break came with the opening of the 'comfort' market, when centrifugal systems were introduced into movie theatres. CEC went on to develop a downwards supply air distribution method and a return air bypass system of control. Further centrifugal installations included a deep gold mine in Brazil, and the warship *USS Wyoming*.

In 1930, CEC provided air conditioning for the railway dining car *Martha Washington*, operating

between New York and Washington, and – in the same year – Carrier Corporation was formed by the merger of CEC with Brunswick-Kroeschell and York Heating & Ventilation.

The new company now had to survive the Great Depression and found it was able to serve all types of buildings except one – the skyscraper. Carrier solved this problem with his invention, in 1939, of the Conduit Weathermaster System using high-velocity induction units with ejector nozzles entraining recirculation room air.

In 1914, the first edition of the Buffalo Forge manual *Fan Engineering* was published, having taken Carrier eight years to compile. However, later that year – with a world war pending – the owners decided to close down its subsidiary.

Making his own way

On 26 June 1915, Carrier and six young colleagues pooled their resources to start Carrier Engineering Corporation (CEC), in New York. Carrier was president and, by the end of the year, 40 contracts had been secured. Unlike its rivals, CEC did not guarantee its installations by horsepower capacity or air volumes, but by providing specified space conditions.

About this time, Carrier recognised the inadequacy of existing refrigerating machines and, over the next few years, visualised a centrifugal compressor with direct drive and compact heat exchangers. However, he lacked either a suitable refrigerant or a compressor manufacturer.

In 1921, on a visit to Germany, he found a compressor manufacturer and a possible refrigerant – dielene. A prototype machine was unveiled at the CEC Newark factory on 22

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● **BRIAN ROBERTS** FCIBSE is a member of the CIBSE Heritage Group, and was chairman from 1984 to 2011



Early air conditioning

The earliest installation that made provision for both cooling and humidification was Dr David Boswell Reid's system, in the temporary House of Commons, in 1835. However, this had been quickly erected inside the shell of the former House of Lords after the fire of 1834. The earliest building designed to incorporate what we would now call air conditioning was St George's Hall, in Liverpool. The system there – again designed by Reid – first came into use in 1851.

In 1893, German professor Hermann Rietschel

published the basis of an engineered approach to comfort cooling. In 1901, the consulting engineer Alfred Wolff applied these principles to his design of the cooling systems for the New York Stock Exchange, which featured 2,100kW of absorption refrigeration using electric generator exhaust steam. This installation recognised humidity control as a design objective. A pioneer in discovering psychrometric relationships was Stuart Cramer, of North Carolina, who coined the term 'air conditioning' in 1906.

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Direct-fired storage water heaters for hot water generation

This CPD article considers the application of direct-fired storage water heaters for supplying domestic, sanitary, potable hot water

The performance of building envelopes improves incrementally as the demands for low energy – and low carbon – building operation become more stringently defined in national and international codes, standards and guidelines. As the absolute carbon impact of a building's fabric is reduced, the proportion of total energy consumed in a building by the generation of domestic (potable) hot water (DHW) becomes ever greater. It is estimated that providing DHW consumes about 3% of the total EU gross energy consumption (which, to provide context, is roughly the annual energy consumption of Sweden)¹ and approximately 24% of global residential – and 12% of global commercial – buildings' energy consumption.²

The energy consumed in generating hot water is tied to the simple relationship that: heat energy to water = $m \times C_p \times \Delta \theta$, where m = mass water (kg), C_p = water specific heat capacity ($\text{kJ} \cdot \text{kg}^{-1} \cdot \text{K}^{-1}$), and $\Delta \theta$ = water temperature increase (K). However, the gross amount of energy required to deliver that heat to the water will depend on the system configuration, as well as operational conditions and maintenance procedures.

In the UK, the 'tradition' has been to

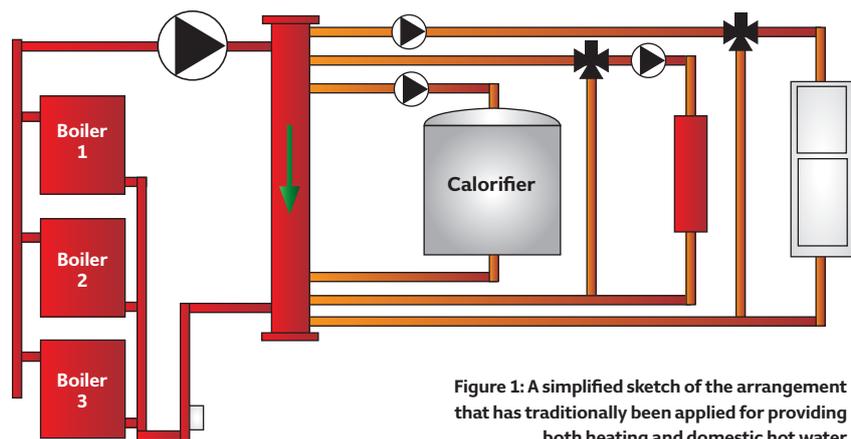


Figure 1: A simplified sketch of the arrangement that has traditionally been applied for providing both heating and domestic hot water

install a boiler that indirectly supplies heat through a separate, indirectly heated 'calorifier' (a domestic hot water storage vessel with internal heat exchanger) for the production of DHW, as shown in Figure 1. Irrespective of the boiler type that supplies the primary heating, this system will experience losses from the boiler, the primary circuit pipework (the pipework that carries water that passes through the boiler) and the storage calorifier. Potentially, when there is little demand for DHW – and no demand on the heating circuits – the boiler can experience short cycling periods that will increase the proportion of 'standing'

losses, reduce firing efficiencies and increase nitrogen oxide (NO_x) and carbon monoxide (CO) emissions.³

More recently, installed indirect systems would have a condensing boiler as the heat source. This relies on return primary water temperatures below 55°C to ensure condensing (and, so, high-efficiency operation), but during periods of low DHW consumption – and particularly when there is no space-heating load – this may not be possible. A direct gas-fired storage water heater can replace the calorifier from the system in Figure 1 and remove the need for that part of the primary pipe loop.

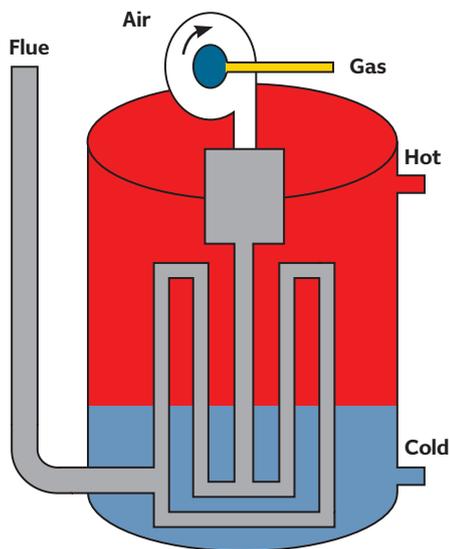


Figure 2: A representation of the heat exchange path in a single-burner, direct-fired condensing water heater

▶ The principle of direct-fired storage water heaters

High-efficiency, gas-fired storage water heaters are designed to heat water by using energy directly from the combustion process, and from latent heat collected by condensing water vapour in the combustion gases. The heat exchanger is located directly within the storage cylinder and, therefore, heat is transferred directly to the stored potable domestic water.

There are various high-efficiency, condensing, direct-fired storage water heaters available. For example, single-burner models are commonly available that deliver a high rate of heat exchange to the water – this is known as the ‘recovery’ rate, since it relates to how swiftly the hot water is replaced, or ‘recovered’, after a period of hot-water use. Single-burner models have a long internal flue, with heat baffles within the flue that provide an extended surface area for the water vapour in the flue gases to condense, as shown in Figure 2.

Hot-water heaters with multiple burners are typically equipped with two or four modulating modular burners – as shown in Figure 3 – with external stainless-steel heat exchangers located outside of the storage cylinder. This storage cylinder would usually have a capacity of 200 to 300 litres. Because of thermal stratification, the lowest-temperature water is drawn into the heat exchangers from the base of the vessel, allowing the unit to act in condensing mode for longer periods. This low-temperature feed water ensures the burners remain at full output for longer periods, producing short recovery times. The multiple heat exchangers can work independently, providing built-in system redundancy and greater opportunity for modulating control.

Sizing direct-fired storage water heaters

It is important to size the direct-fired water heater properly, to suit the specific application within the building. Most manufacturers have sizing calculation tools – such as that shown in Figure 4 – readily available to aid selection. These should be based on hot-water requirements as enumerated by CIBSE *Guide G Public health and plumbing engineering*.⁴

It is important to consider the profile of hot-water use across a whole day and, in many cases, different daily profiles, depending on the assumed building use. Once the daily usage is determined, the more critical peak demand can be assessed.

Traditionally, hot water peak storage has been based on a two-hour recovery period. When calculating hot water storage volumes, an availability factor should be applied, assuming stratification of 80% unless otherwise stated or known. This implies that 80% of the storage capacity will provide usable hot water.⁴ It is important to consider extraordinary circumstances. For example, a health club offering an open day that encourages more people than usual to turn up and use the showers could – if not properly considered – result in the building running out of hot water. Sizing packages would normally allow such diversity to be included.

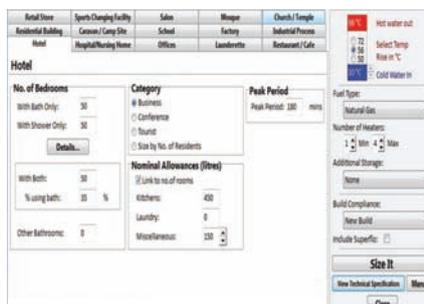


Figure 4: Example of manufacturer's sizing tool (Source: Andrews Water Heaters)

(Source: Andrews Water Heaters)

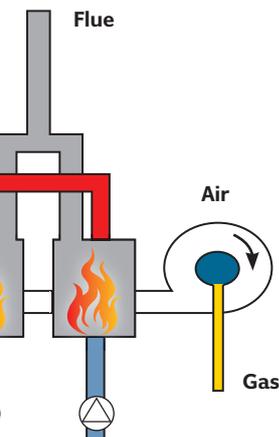


Figure 3: A representation of heat exchange in a multiple-burner, direct-fired condensing water heater

Typically, water heaters will be selected to provide the building's peak demand. For example, a particular four-burner, 300-litre storage, high-efficiency, gas-fired storage water heater can readily supply hot water (at a 50K temperature rise) at a rate of up to 1,920 litres per hour. So, considering a typical CIBSE Guide G recommendation of a two-hour storage recovery period, such a direct-fired, gas-fired water heater is able to produce 3,840 litres of hot water over the two hours. Many installations specify multiple water heaters to be installed to allow for maintenance or breakdown. Those models that have multiple burners may effectively have built-in redundancy that is controlled by the unit's software, allowing water to be provided by remaining burners when one fails.

Take, for example, an annexe to a business hotel, with 45-person occupancy, equipped with showers and wash-hand basins in each room. Assume each person has an hourly hot-water allowance of 25 litres for a shower and 2.5 litres for hand washing (reasonably generous hot-water allowances, based on the mixed water allowances in Table 2.12 from CIBSE Guide G).

45 people at 27.5 litres of water per person = 1,238 litres per hour.

$$\begin{aligned} \text{So power required} &= \text{energy/time} = m \times C_p \times \Delta\theta / (3,600 \text{ seconds}) \\ &= \frac{1,238 \times 4.18 \times 50}{3,600} = 72 \text{ kW} \end{aligned}$$

This is rather simple, and takes no account of diversity of use or occupation – this requires some detailed knowledge of the particular application. So, in the above, simplified example, the consultant would select a direct-fired storage water heater with a water heating power of 72kW to serve the annexe building.

Installation of direct-fired storage water heaters

Direct-fired storage water heaters can be installed in many different locations within

commercial premises. Manufacturers supply many different models that offer the designer of the hot-water services flexibility of installation. Models that are equipped with room-sealed flues and that have long flue runs can be installed within smaller, dedicated plantrooms – often close to the point of use. This lowers the amount of energy required to supply domestic hot water over a long pipe run, and reduces heat losses from distribution pipework. This also helps lessen the length of any dead legs in the system, and more readily allows for compliance with the Health and Safety Executive’s *Legionnaires’ disease – Technical guidance*⁵, which suggests the distribution pipework should be designed to enable the water to reach all outlets at 50°C within one minute of opening an outlet. The direct-fired storage water heater has been shown to have a low incidence of colonisation by legionella bacteria.⁵

When considering the installation of gas-fired storage water heaters, careful thought should be given to:

- Flue location
- Provision of gas pipework
- Space requirements for maintenance
- Type of cold water supply – tank-fed system or unvented system (direct from a mains supply).

Water treatment

Water treatment for the cold water supply is an important consideration, especially in areas of hard water. Water quality is variable according to geographical location – for example, in England, water is typically harder towards the south and east, and softer towards the north and west. But there are local variations, depending on the physical source of the water. Hard water contains dissolved minerals – mainly calcium, magnesium and associated anions bicarbonate, sulphate and chloride. When hard water is heated, bicarbonate decomposes and calcium carbonate is deposited into the water-heater tank and associated pipework. Mineral deposits can dramatically reduce the efficiency of appliances and, eventually, cause the unit to fail. For example, a water-heater tank with a limescale coating of one-millimetre thick can equate to approximately 7% loss in efficiency.⁶

Water treatment should, of course, be properly considered with all types of hot water services, including continuous-flow water heaters and water heated indirectly using calorifiers.

Required storage water heater efficiencies

Legislative requirements will often set minimum performance requirements for DHW systems. For example, the *England Non-Domestic Building Services Compliance Guide 2013*⁷ requires a minimal thermal efficiency of

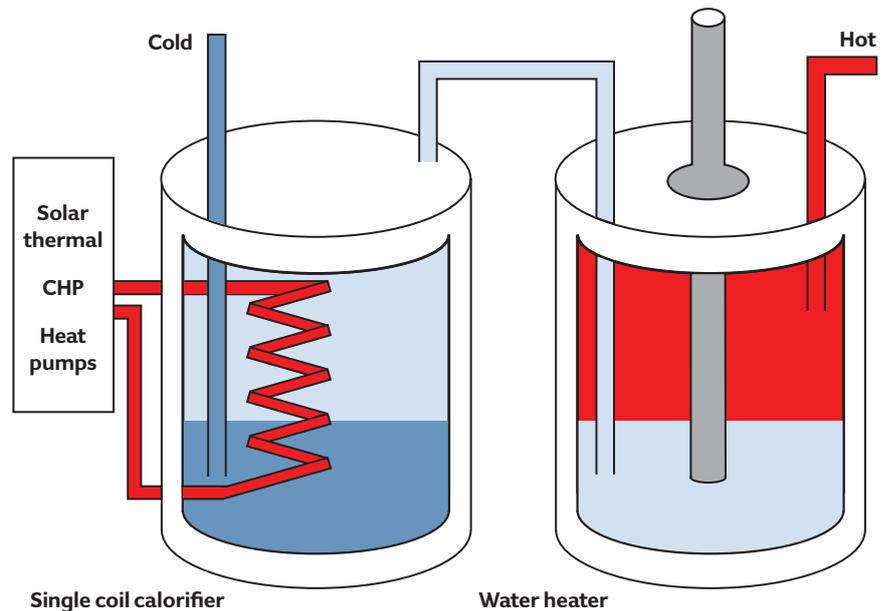


Figure 5: Integration of domestic hot water pre-heating from a low carbon energy source

90% for natural gas-fired storage water heaters larger than 30kW, and 73% for smaller units (LPG system efficiencies are 92% and 74%, respectively).

In England and Wales, when assessing the expected performance for compliance purposes, an additional 2% heat efficiency credit is given for decentralisation of the heating and hot water services (not for new buildings); 1% for the use of direct-fired water heaters with integral combustion circuit shut-off devices; 0.5% for fully automatic ignition controls; and 2% for the use of manufacturers’ water-heater sizing guides and/or technical helplines.

To test compliance with the Energy Performance of Buildings Directive (EPBD) by employing the SBEM National Calculation Method (NCM) software, these credits are used in conjunction with the manufacturer’s heat generator seasonal-efficiency figure – or, in the case of direct-fired water heaters, the manufacturer’s thermal-efficiency figures.

For example, if a direct-fired, multiple-burner, gas-fired condensing water heater is equipped with fully automatic ignition controls (installed as standard) with a gross thermal efficiency of 98%, selected by the use of the manufacturer’s selection tool:

Water heater thermal efficiency	98%
Fully automatic ignition heating efficiency credit	0.5%
Sized in accordance with manufacturer’s selection-tool heating efficiency credit	2%
Total to be entered into NCM software	100.5%

Direct-fired storage water heaters and low carbon technologies

Renewable or low carbon technologies can be readily integrated into a scheme using direct-fired storage water heaters to provide pre-heat

feed water, as shown in Figure 5. The additional pre-heat cylinder will be sized to maximise the use of the low carbon heat source economically. This cylinder should be located as close as practicably possible to the gas-fired storage water heater to reduce losses in transmission.

As an example of the benefit of application, a well-designed and applied solar thermal system in the UK may well be able to satisfy around 30% to 40% of the annual hot water load – this is known as the ‘solar fraction’. It is important that the solar cylinder is sized correctly to maximise the amount of pre-heated water, meeting the needs of the water system and so reducing the building energy usage and carbon emissions. It is equally important to size the solar collector array to match the size of the solar cylinder, mitigating the risk of stagnation at times of low hot-water demand.

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Turn over page to complete module ➤

Module 74

March 2015



1. How much of the EU's gross energy is thought to be consumed by providing DHW?

- A 3%
- B 6%
- C 12%
- D 18%
- E 24%

2. What capacity availability factor is typically applied to take account of thermal stratification in hot water storage?

- A 24%
- B 50%
- C 55%
- D 80%
- E 100% (it is assumed that the storage is fully mixed)

3. In the business hotel example, what would be the basic power required if the occupancy was based on 30 people?

- A 16kW
- B 32kW
- C 48kW
- D 64kW
- E 72kW

4. At what temperature should water reach all outlets within one minute of opening an outlet?

- A 45°C
- B 50°C
- C 55°C
- D 60°C
- E 65°C

5. What solar fraction does the article propose would be potentially available for a commercial application in the UK?

- A 10-20%
- B 20-30%
- C 30-40%
- D 40-50%
- E 50-60%

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New X-Glass LED media façades by AET Flexible Space

AET Flexible Space, provider of underfloor air conditioning systems, has secured the exclusive distribution rights for the X-Glass LED product range in the UK and Europe. AET works with leading architects and developers, and this product adds another dimension to the Flexible Space offering. With X-Glass technology, users can create stunning visual media displays for digital signage, advertising and promotion in store-front displays, restaurants, exhibitions, concerts and all branding opportunities.

● Call 01342 310400, email lucy@flexiblespace.com or visit www.flexiblespace.com



New electric boiler range launched

Atlantic Boilers, of Lancashire, has added a comprehensive selection of electric boilers – from 1kW to 980kW – and water heaters of 445l/hr to 7,520l/hr to its range. Models include the HBI-S20 Electric combi boiler and the Multi-Elec Compact floor-standing boiler, which has a small footprint, is economic to install and run, and has no flue requirements. The Compact has a maximum working pressure of 4 bars, and models range from 36kW to 72kW.

● Email info@atlanticboilers.com or visit www.atlanticboilers.com/electric.html

Aquatech Pressmain launches new energy-efficient Aquamatic EMV range

The Aquamatic EMV range of water-pressure booster sets is designed to increase the pressure of the cold/hot water services within a domestic or commercial building where the existing incoming mains or feed tank are not capable of supplying sufficient system pressure. Aquatech Pressmain's range incorporates efficient, inverter-driven variable speed pumps, which continually vary the motor speed to match the changing flow-demand pattern, while maintaining pressure and reducing power consumption dramatically.

● Call 01206 215121, email sales@aquatechpressmain.co.uk or visit www.aquatechpressmain.co.uk



Alumasc's Harmer SML is now BIM Level 2 compliant

Alumasc's Harmer SML range of cast iron soil and waste pipework systems now complies with BIM Level 2, with 3D BIM data objects available via the Harmer Drainage website or from the BIM store.

In addition, Harmer's floor- and roof-drainage products offer BIM Level 1 compliance, with full BIM compatibility when the 2D and 3D images and support documentation are combined. These will be upgraded to Level 2 compliance by 2016.

SML has also secured British Standard Kitemark certification. The British Standards Institute, which issues the award, carries out rigorous checks to ensure that products are worthy of the BS Kitemark stamp. This further confirms that the products are manufactured in accordance with EN877:1999 and A1:2006, and quality controlled under ISO9001:2008.

● Visit www.harmerdrainage.co.uk/downloads/bim



Aston Group builds on success of apprentice scheme with new appointment

Aston Group, a building services and facilities management company, is supporting the success of its electrical division with the appointment of Harry Tomkins as electrical apprentice. Tomkins, aged 17, from Chingford, is one of 11 apprentices within Aston working towards a professional qualification. He is under the guidance and supervision of an experienced team of electrical engineers, and will spend most of his training period at Ascham Homes, which serves the residents of Waltham Forest, north-east London.

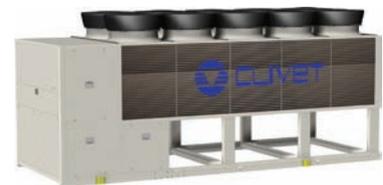
● Visit www.astongroupuk.com



Meir is the man for Andrews Water Heaters

Andrews Water Heaters has appointed a new sales director. Chris Meir has worked in the industry since 2002, spending three years at Lochinvar and, most recently, five years as national sales manager at Remeha Commercial. Meir said: 'My aim is to apply my industry experience and drive the business forward. Andrews is a well-recognised and respected brand, with a comprehensive range of products, so I'm excited to improve the brand awareness and success that the company already enjoys.'

● Visit www.baxiccommercial.co.uk/andrews-water-heaters.htm



Clivet top of the class

Manufacturer of air conditioning systems, Clivet, has launched the Spinchiller range of chillers using the latest in modular scroll technology. The range provides 'A class' performance under full-load conditions. 'Typically, HVAC systems operate at full load for less than 5% of the time,' said Julian Brunnock, sales and marketing director. 'This is the reason why Clivet – for more than 10 years – has been producing liquid chillers capable of delivering maximum efficiency under part-load conditions, thanks to the reliable, modular Scroll technology.'

● Call 01489 572238 or email j.brunnock@clivet-uk.co.uk



Safeguard's super-fast Dryrod gets BBA approval

Safeguard Europe – a UK damp, waterproofing and masonry repair solutions specialist – has received British Board of Agrément (BBA) certification for its Dryrod damp-proofing rods. Designed to be the fastest, cleanest, easiest and most effective rising-damp treatment on the market, the Dryrod damp-

proofing product is a synthetic rod made from advanced polymers. It is impregnated with a silane/siloxane material that forms a DPC in brick, coursed stone, rubble infill, and cavity walls.

● Email info@safeguardeurope.com

Fläkt Woods ReCooler HP is centre stage at Royal Northern College of Music

As part of the recent transformation of the Royal Northern College of Music Concert Hall, Fläkt Woods supplied a range of highly efficient air comfort equipment, including three eQ



air handling units, as well as two revolutionary ReCooler Heat Pumps. The Manchester venue's refurbishment took place between January and November 2014, increasing its capacity to 750. Fläkt Woods' ReCooler HP units were specified to provide the required supplementary heating and cooling, in conjunction with the air handling system.

● Call 01206 222686 or email Rachel.willmott@flaktwoods.com

Prognosis for new Alder Hey is excellent

Alder Hey children's hospital is the busiest in Europe, caring for 270,000 young people. It celebrated its centenary last year and, this year, will mark the dawning of a new era with the opening of a state-of-the-art hospital next to the existing site. Throughout its history, it has spearheaded and pioneered many medical firsts, to put itself at the forefront of medical innovation.

Grundfos Pumps is delighted to have played its part in the new chapter of the Alder Hey's story, working with consultants and contractors to secure the best pump solution for the hospital.

Hospitals are complex sites that need to operate 'on demand' 24/7. Grundfos assisted with the specification 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.

● Call 01525 850000, email grundfosuk@grundfos.com or visit www.grundfos.co.uk



Construction: the undiscovered goldmine of greenhouse gas savings

A report from the Construction Industry Council says 68% of construction professionals think not enough is being done

to reduce carbon in the industry. This comes as no surprise to David Ball, founder of David Ball Group, which manufactures products for the global construction industry. 'Materials are not often addressed as a potential area to reduce greenhouse gases, as there is an assumption that there are no alternatives,' he says. 'However that is simply not true. We have invented a zero carbon concrete, Cemfree, which provides up to a 95% reduction in CO₂ compared with the industry standard.'

● Call 01954 780 687 or email sales@davidballgroup.co.uk



Danfoss dynamic valve controls and balances heating systems in one

With an innovative two-in-one design, the new dynamic valve from Danfoss delivers optimal temperature control and automatic hydronic balancing of two-pipe heating systems in a single product. Designed for installation at the



radiators, Danfoss's development combines a thermostatic radiator valve (TRV) with a built-in differential pressure controller. The latter eliminates pressure fluctuations, which are the common cause of heating-system complaints, such as noisy radiators, uneven heat distribution and high levels of energy waste.

● Call 0845 1217400 or visit www.heating.danfoss.co.uk

CP controls new training ground for the Seagulls

Versatile lighting-control systems from the UK's leading control specialists, CP Electronics, have been installed in the new American Express Elite Football Performance Centre, in Lancing, West Sussex. CP has supplied its Rapid and Vitesse Plus lighting-control systems, which were chosen for this project because of their flexibility and ease of



configuration to any floor-space layout. Rapid and Vitesse Plus systems were installed throughout the facility for Brighton and Hove Albion, known as 'the Seagulls'.

● Call 0333 9000 671, email enquiry@cpelectronics.co.uk or visit www.cpelectronics.co.uk

Cool-Therm rolls out Cloud-based remote monitoring and diagnosis for Turbomiser chillers

Cool-Therm, a pioneer in the development of the ultra-efficient Turbomiser chiller, can now monitor and diagnose chiller performance via the Cloud and GSM – with major potential benefits for engineers and end users. Turbomiser chillers are equipped with specialist communications hardware and software, enabling them to transmit and receive data remotely. The system can connect to a local cellular GSM network, or be accessed via ethernet.



● Call 0117 9610006 or email enquiries@cooltherm.co.uk

Harrogate Grammar 'lessens' its environmental impact

Harrogate Grammar School has replaced its ageing boiler plant with a Hoval STU biomass boiler, backed by two UltraGas gas-fired condensing boilers.

The new system was specified and installed by G&H Sustainability, which selected Hoval boilers because of their proven quality and reliability. The system comprises a 195kW STU wood-pellet, biomass boiler, two 350kW UltraGas condensing boilers and a silo for storing the locally sourced wood pellets. Hoval supplied the STU boiler in a 'plug and play' skid-mount configuration, to facilitate installation. G&H Sustainability's Andrew Hudson said: 'We expect the biomass boiler to meet around 80% of the space heating and hot-water requirements throughout the year.'

By choosing a biomass-led heating system, Harrogate Grammar School is eligible for additional revenue through the Renewable Heat Incentive.

● Visit www.hoval.co.uk



Mikrofill at Kingsley School

The Kingsley School, in Royal Leamington Spa, Warwickshire, has had an excellent reputation for high academic standards and first-class pastoral care over the past 130 years. In 2013, a mechanical refurbishment of the independent girls' day school's sixth-form block was carried out by Evesham Mechanical Services, incorporating the installation of new LPHW equipment, manufactured by Mikrofill. This included Ethos 70kW & 110kW stainless-steel condensing boilers complete with ancillaries and factory-commissioned pressurisation packages.

● Call 03452 606020 or visit mikrofill.com



Saving energy with Luxonic's LuxLink Wireless control system

Luxonic's LuxLink Wireless control system significantly increases the sustainability of lighting schemes by combining multiple technologies to reduce energy consumption. Sensors detect occupancy, and measure available daylight, to ensure energy is not used for lighting unnecessarily. LuxLink complies with European standby-power directives for stand-alone luminaires and those that relay data as part of a network. It is built into the luminaires, for simple installation, and provides emergency self-testing, energy monitoring and daylight-linking features.

● Call 01256 363090, email info@luxonic.co.uk or visit www.luxonic.co.uk



Jaga radiators, at your service

Nestled in the heart of the New Forest, St Luke's Church, in Sway, Hampshire, is a prime example of the way heritage buildings can be brought into the modern age using energy-conscious and cost-effective heating measures. Jaga's Tempo LST radiators were chosen because they could be installed in unobtrusive, continuous casing along the walls of the aisles and chancel, while concealing distribution pipework and providing a safe, low surface temperature. Because of their powerful heat output, the radiators offset cold down-draughts from the large, stained-glass windows, to ensure everybody is kept warm.

● Call 01531 631533, email jaga@jaga.co.uk or visit www.jaga.co.uk

Kooltherm FM the premier choice

Kingspan Tarec has always focused on providing specifiers, mechanical engineers and contractors with the highest level of technical support, allowing them to get maximum benefit from the premium performance of its Kooltherm FM Complete Pipe Insulation System. Now the company is going one step further, with the introduction of the Kooltherm FM Premier and Premier Plus Services. These will deliver clear advice and guidance at every stage of a project, from the initial specification to site visits and certification.

● Call 01457 890400, email info.uk@kingspantarec.co.uk or visit www.kingspantarec.com



Lumiance brings life to London office

An office building, 25 North Row - in the heart of London's Mayfair - has recently undergone a complete refurbishment, including a new contemporary façade, to modernise its 1980s appearance. Thanks to the installation of several Lumiance InVerto luminaires, the basement space has been transformed into a stylish, modern and vibrant area. Paragon Management carried out the interior fit-out for the project, while Londonguild Electrical Contractors undertook the lighting design and electrical installation for the whole building.

● Visit www.lumiance-lighting.com



Potterton commercial appoints sales director

Potterton Commercial has expanded its team with the addition of Neville Small as sales director. Small has worked in the heating industry for 30 years, spending the past seven with Baxi Commercial, first as business development manager and then as head of business development. His aims for Potterton are to increase the firm's share of the commercial boiler market, and grow confidence in the Potterton Commercial brand by providing reliable products, backed by first-class customer service and technical support.

● www.baxicommercial.co.uk/potterton-commercial.htm



Kingspan Tarec installed at flagship M&S

Kingspan Tarec Kooltherm FM pipe insulation was installed in one of the most sustainable and sophisticated retail spaces in the country – Marks & Spencer, Cheshire Oaks. The 209,068ft² store was designed by Aukett Fitzroy Robinson and features a wide range of energy-saving measures, including hemp and lime wall panels, and an 80,000l rain-water harvesting tank. The building won the RIBA National Award 2013 for Workplace, and New Build of the Year at 2014's CIBSE Building Performance Awards.

● Call 01457 890400, email info.uk@kingspantarec.co.uk or visit www.kingspantarec.com



Martindale's VI1500 takes safe isolation to new level

The VI1500 – part of the industry-standard range of voltage indicators, which is now available from Martindale Electric – extends safe isolation procedures into higher voltage applications. The indicator has a 1000V CATIV safety rating and LED indication for AC/DC voltages from 50V to 690V and above, ensuring compliance with health and safety recommendations for safe working in all BS EN61010 installation categories. The VI1500 is the simplest and most reliable way to ensure circuits have been de-energised and properly isolated.

● Call 01923 441717 or visit www.martindale-electric.co.uk



VT7 from Martindale simplifies safe voltage testing

Martindale Electric, which specialises in voltage detectors and safe isolation, has announced a new high-performance, single-pole voltage indicator. The VT7 enables voltage detection in difficult applications where other single-pole testers do not work – for example, when wearing PPE gloves – saving time, and ensuring full safety procedures can be followed. Detection of AC voltages, from 50-600V, is indicated by a bright LED and a buzzer when contact is made with the probe tip.

● Call 01923 441717, email sales@martindale-electric.co.uk or visit www.martindale-electric.co.uk

Panasonic launches new heat-recovery solution

In the latest example of Panasonic's continued commitment to developing unbeatable, energy-efficient, air conditioning technologies for commercial applications, the company has introduced a new heat-recovery device. The unit features a DX Coil – designed to recover up to 77% of the heat from outgoing air – and a Bioxigen air-purifying system to improve air quality. The counterflow heat exchanger reduces the air conditioning load, enabling customers to reduce their energy consumption and save on costs.

● Visit www.aircon.panasonic.eu or follow @PanasonicHC_UK



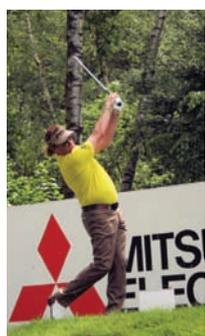
Specflue to debut intelligent heating interface units at Ecobuild

Specflue will be launching its next generation of heating interface units (HIU) at Ecobuild 2015. Manufactured by Thermal Integration, the new, intelligent HIUs have been designed for better performance and ease of use, while delivering all the benefits of a traditional HIU.

Built using embedded electronics, the HIU's full features will be revealed at the show, at London's Excel. However, they include a range of innovative digital controls to improve the management of heating and hot water in properties connected to a communal heating system, using a central boiler.

The tools will enable greater unit efficiency and user management of temperature, pressure and flow rates. Specifiers visiting stand N6140 will be able to talk to the technical team behind Specflue's renewable heating panels, pellet boilers and stoves.

● Call 0800 902 0220 or visit www.heatweb.com



Miguel Ángel Jiménez becomes global brand ambassador for Mitsubishi Electric

Mitsubishi Electric has announced its first global, corporate, player sponsorship, signing the PGA Tour, European Tour and Champions Tour golfer Miguel Ángel

Jiménez as its brand ambassador. As part of the agreement, Jiménez – who is the 45th-ranked player in the Official World Golf Ranking – will wear the Mitsubishi Electric corporate logo on his golf shirt. He donned the logo for the first time at the 2015 Mitsubishi Electric Championship, at Hualalai, in the United States, which he won by one stroke.

● www.MitsubishiElectric.com

Kingston Heights open-water community heating recognised with award

The pioneering Kingston Heights project, where 137 apartments and a hotel get renewable heating and hot water from the River Thames, has received further recognition. It secured the Commercial Project of the Year award at the National ACR Awards 2015. When announcing the success of the project, the judges said that Kingston Heights was a 'clear category winner'. Developer Mike Spenser-Morris collected the award, alongside Russell Jones, of Mitsubishi Electric.

● www.zerocarbonpartnership.com





Toshiba seeks R22 data and offers chance to win Rugby World Cup 2015 tickets

The Toshiba Air Conditioning division of Toshiba Carrier UK is a strong supporter of environmental protection, and is a pioneer in achieving carbon neutral status for its UK business. In keeping with its green credentials, Toshiba is launching an R22 data-collection initiative to assess the number and

type of R22 systems still operational across the UK and Ireland. The company is inviting feedback from contractors, installers, end users and consultants – and, to encourage as much feedback as possible, Toshiba is offering participants the chance to win tickets for the 2015 Rugby World Cup.

● Visit www.toshiba-aircon.co.uk/news/article/rugby-world-cup-competition



Toshiba extends high-efficiency digital inverter air conditioning series

Toshiba Air Conditioning, a division of Toshiba Carrier UK, has extended its high-efficiency, high-

performance Digital Inverter 4 range, with the introduction of two new outdoor units and seven new indoor models. The units – delivering 1hp (2.5kW) and 1.5hp (3.6kW) – complete Toshiba's light commercial line-up, which now spans from 1hp through to 10hp. The new models have a sector-leading operating range, delivering cooling from -15°C to 46°C and providing heating in ambient conditions as low as -15°C.

● Visit www.toshiba-aircon.co.uk

Sentinel Commercial launches 'plug and play' limescale-prevention device for small commercial premises

Leading water-treatment specialist Sentinel Commercial has added a 22mm KaIGUARD system package – which will fit most small commercial buildings – to its successful, scientifically proven, limescale-prevention device range. The new 22mm package includes a zinc anode unit, water meter and controller, with the latter pre-set to a 22mm commissioning mode – making this a true 'plug and play' solution for light commercial premises.

● Visit www.sentinelprotects.com



Kingspan Therma duct performs well at Silverstone UTC

Kingspan Therma Duct Insulation has been used in the construction of the new £10m Silverstone University Technical College, helping it to achieve a BREEAM 'Very Good' rating. Silverstone is one of the government's flagship university technical colleges, and was created through a partnership between Silverstone Circuits, Tresham College and the University of Northampton. Students, aged 14 to 19, will have the opportunity to study a technically oriented curriculum in high-performance engineering or events management.

● Call 01544 387 384, email literature@kingspaninsulation.co.uk or visit www.kingspaninsulation.co.uk



NHS commissions low-carbon biomass heating system from Rural Energy

Lancashire Care NHS Foundation Trust has chosen biomass technology, supplied by Rural Energy, to heat its new £40m mental health facility

in Blackpool. The biomass boiler has helped The Harbour to meet the high standards set by BREEAM, to deliver a sustainable and low carbon building with a long lifespan. In addition, the Herz BioFire 600kW boiler will greatly reduce the facility's energy bills, while providing a significant income from the Renewable Heat Incentive scheme.

● Visit www.ruralenergy.co.uk



Rehau updates CPD on efficient district heating networks

Specifiers and consultants who want to learn more about designing efficient district heating schemes can now benefit from updated continuing professional development (CPD) delivered by pipework experts Rehau. The RIBA- and CIBSE-approved CPD ties in with some of the key messages in the newly published CIBSE/CHPA *Heat Network Code of Practice*. The educational CPD provides an insight into the options available for district heating schemes in terms of heat sources and pipework materials.

● Call 01989 762 600, email Jo.Trotman@rehau.com or visit www.rehau.co.uk

Fitzroy Place chooses Remeha boilers

Remeha boilers is providing energy-saving heating at Fitzroy Place – London's 450,000ft² office, residential and commercial complex for Exemplar, Aviva Investors and Kaupthing. Contractors Dornan Engineering supplied and installed the Remeha boilers, which work alongside a central CHP plant. Two cascades of three Remeha Gas 310 Eco Pro boilers serve the eight-storey offices at 1 and 2 Fitzroy Place, with three Remeha Gas 610 Eco Pro boilers serving the residential area.

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





Turn Key's specialised design removes the need for hotel leak detection

A new air conditioning system in a Buckinghamshire hotel is showing how clever design and specification can remove the need for leak-detection equipment. The Crowne Plaza, Gerrards Cross, is a 147-bedroomed hotel, which has undergone a complete refurbishment. Turn Key Air Conditioning installed a Mitsubishi Electric City Multi heat-recovery system, which the specialist contractor – with Mitsubishi Electric Value Added Reseller PACAIR – designed with the minimum amount of refrigerant in each bedroom, to comply with EN378.

● Visit www.tkac.co.uk or visit www.pacair.co.uk

Wall-to-wall comfort with Zehnder Nestsystems radiant conditioning



Zehnder Nestsystems is a next-generation radiant conditioning system for residential and commercial applications. Offering dual heating and cooling functionality,

exceptional controllability and energy efficiency, Zehnder Nestsystems comprises a network of plasterboard panels that incorporate an innovative radiant heating and cooling element. Installed in place of standard plasterboard, to walls or ceilings, Zehnder Nestsystems enables a building's indoor climate system to be fitted as part of the general construction.

● Call 01276 605800, email sales@zehnder.co.uk or visit www.radiant-conditioning.zehnder.co.uk

Not all fan coil units are made the same!

Diffusion has supplied more than 2,000 of its Eco H270 EC/DC fan coil units to 20 Fenchurch Street, nicknamed the Walkie Talkie because of its distinctive shape.

The joint-development between Land Securities and Canary Wharf Group specified an extremely

low specific fan power (SFP) of 0.19W/l/s, to be achieved at an external system pressure of 30 Pascal, and at NR35 with all units running. Witness testing demonstrated that SFPs of 0.14 to 0.17W/l/s would be achieved, and be accomplished within the NR35 noise requirements on standard model selections, without oversizing.

● Visit www.diffusion-group.com



System UVEX – the natural, sustainable way to stop Legionnaires' disease

A new range of proven, clean, low-energy, cooling-water management products has been launched.

System UVEX produces UV treatment systems that are highly effective in treating water for cooling, water features, and humidifiers, as well as harvesting rainwater without using multiple chemicals. The system is not only effective in helping to prevent waterborne problems, such as Legionnaires' disease, but it is cleaner, greener and cheaper than traditional systems.

System UVEX is cost-effective and highly sustainable, and the latest products offer: improved monitoring, with signal outputs for real-time and historic observations; controls that are self-adjusting in reaction to the demands of the building; and true duplex treatment to guarantee in-built backup. There are options for any size or type of water-cooling system. ACoP L8- and HSG274-compliant, System UVEX helps avoid the hassle and cost of dosing with traditional chemical systems.

● Call 01707 642 358, email enquiries@systemUVEX.co.uk or visit www.systemUVEX.co.uk



New look for Kamstrup

Kamstrup – a world-renowned manufacturer of quality, high-accuracy energy metering and remote-reading solutions – has a fabulous new logo and website. With a range of RHI-compliant heat and energy meters conforming to MID EN1434, Kamstrup can also offer meter-reading solutions – from simple installations to fully automated meter reading. Come and visit us on Stand H26 at NEMEX 21-23 April at the NEC, Birmingham.

● Call 01787 319 081, email info@kamstrup.co.uk or visit www.kamstrup.com

Wieland makes right connection at Adelphi Building

A range of products – including special distribution modules and pluggable distribution boards from Wieland Electric – have been used for the connection of lighting and power in the newly refurbished Adelphi Building, overlooking Victoria Embankment in London. The £30m project to remodel and refurbish the art deco building incorporates 190,000ft² of high-specification, open-plan office accommodation, while maintaining the integrity of the original architecture for the property owner, Blackstone.

● Visit www.wieland.co.uk



Warmafloor installs underfloor heating and integrated cooling system

Warmafloor, a UK surface heating and cooling specialist, is developing a bespoke underfloor heating system for Berkeley Homes' seven-acre, mixed-use Goodman's Field development, in the City of London. The project will feature almost 1,000 apartments, and has been split into four phases, with the first due to open this year. Warmafloor was commissioned to develop bespoke underfloor heating that can integrate a cooling system to deliver comfort to the residents of all 182 apartments of the first phase.

● Visit www.warmafloor.co.uk

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Evinox the perfect fit at Unity Place

Evinox Energy is working with Bowmite Electrical & Mechanical on a new mixed-use development in Walthamstow, which features a communal heating system serving 80 dwellings. Unity Place is located in the Blackhorse Lane regeneration area. Evinox engineers provided design support and liaison with Bowmite and CHP suppliers to devise an energy-efficient and cost-effective solution for the LTHW system at Unity Place.

● Email info@evinoxenergy.co.uk or visit www.evinoxenergy.co.uk



ControlZAPP – smart control with dimming capability

Danlers has announced the release of its ControlZAPP with dimming capability, a groundbreaking link between stand-alone controls and sophisticated, but expensive, managed systems. Featuring Bluetooth smart communication, ControlZAPP can be used to set up, adjust or override settings remotely into a predetermined real-time schedule.

The ControlZAPP app can be downloaded free from Danlers' website for use with mobiles or tablets (Android 4.3 or later).

● Call 01249 443377, email sales@danlers.co.uk or visit www.danlers.co.uk

Heat recovery & AHU high-efficiency/low NOx gas-fired heaters

Thermal Energy Components – the UK division of Klingenburg – manufactures thermal wheels, crossflow and counterflow plate heat exchangers in sea-water-resistant aluminium and plastic, and humidifiers for the HVAC industry.

It also supplies, services and installs a comprehensive range of indirect gas-fired heat exchangers, for inclusion within AHUs or existing ductwork, from standard efficiency models to fully condensing premix high efficiency and low NOx (<30ppm).

● Email service@tecukltd.co.uk



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Senior Electrical Engineer

London, £42 - £48k + benefits

We are working alongside a market leading multi-disciplinary consultancy with a rich history of engineering excellence and an impressive project portfolio both in the UK and across the globe. The practice actively supports its staff, and offer excellent opportunities for progression. The successful candidate will enjoy unrivalled project and client exposure. BAR1759/JA

Senior Mechanical Design Engineer

London, £40p/h

A very enticing opportunity has arisen for an enthusiastic individual to join a very well established and solid building services consultancy based in Central London. There is a steady stream of innovative and cutting edge projects which span the commercial, retail, and hospitality sectors in the UK and Middle East. BAR2417/KB

M&E Design Managers

London & Essex £65 - £75K + benefits

With the Rail sector booming, I have a fantastic opening for experienced Design Managers to oversee multiple Crossrail and Network Rail projects. You will be responsible for the coordination of projects working closely with the design consultancies and in house design teams to ensure delivery of projects. The company specialise in the rail, aviation and power sectors, have an extensive order book of work and an enviable reputation in the market. BAR2439/CB

Senior Public Health Engineer

London, To £42p/h

An excellent opportunity to join a multidisciplinary company based in the UK. This role is a fast moving and exciting opportunity as you will be working on some unique projects across the commercial, retail, and residential sectors. Successful candidates should have experience of above and below ground drainage. BAR1647/KB

Senior Mechanical Design Engineer

Yangon, Myanmar, £3,500 - £4,200 per month

This represents a fantastic opportunity for a degree qualified Senior Mechanical Design Engineer to join a leading multinational design consultancy in Myanmar. We are looking for a candidate that can exploit our client's long standing presence in the region by continuing to develop business and delivering high quality projects across a variety of sectors. BAR2441/PA

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Principal Electrical Design Engineer

Bath

£45,000 Plus Benefits

A top multi-national engineering company want to hear from technically sound electrical engineers. You will be operating at principal level and be looking to join an award winning building services team.

The role gives the opportunity to work on well publicised projects in the UK and Middle East. In addition to project commitments you will run teams and secure future projects. Fast track promotion is available to the right candidate.

Associate Electrical Engineer

Surrey

£60,000-£65,000 Plus Package

A multi award winning engineering consultant is looking for a number of Associate level electrical engineers to work on large internationally recognised projects. Within the role you will oversee project delivery and be responsible for running large electrical teams, managing deadlines and controlling quality and resource within your team.

Project Director (Electrical)

Milton Keynes

£60,000-£65,000 Plus Package

A highly regarded, award winning building services practice is looking for a Project Director to lead their expanding Milton Keynes operation. Their current client base falls within retail, industrial, logistics and residential sectors and experience within these is desirable.

This is a great opportunity for a project director to work within a fully autonomous role with the potential for equity.

M&E Design Manager

Bury St Edmunds

£50,000 Plus Package

One of the largest independently owned design and build companies in the UK are now looking for a strong candidate to head up their M&E operations. You will be from a mechanical bias with experience in both a contracting and consulting environment. The role will be to co-ordinate the design process on projects from £4 to £10 million in value on a range of high profile buildings.

Principal/Lead Electrical Design Engineer

Central London

£43 per hour (contract role)

An instantly recognisable global consultancy has recently won some ground-breaking projects in the Middle-East. If you are a Principal/Lead Electrical Design Engineer looking to work on highly publicised airport and rail projects with above market rates on offer please get in touch. This contract role is likely to last in excess of 12 months.

Find more jobs online at conradconsulting.co.uk

For more information about any of these positions, please contact george@conradconsulting.co.uk or call **0203 1595 387**

For a confidential chat, call us 8am to 8pm on 0203 1595 387

Principal/Associate Electrical Project Design Engineer London/City – To £65k + Bens

Capable of managing projects from inception to completion, supervising staff, overseeing design and overall management.

Current projects include Hotel Developments, Airports and High Rise Towers in the UAE, South East Asia and South America.

Previous experience in leading a design team in the UK and overseas, the ability to manage client/design teams and interpreting/confirming the project brief are essential. Relevant project experience of electrical systems across a variety of sectors also required. Prospect of regular overseas travel, responsibility of building your own team and a structured career path to becoming a Director.

Electrical Building Services Design Engineer London/City – To £52k + Bens

Ideally you will be suitably qualified and have attained or be working towards C.Eng status. Able to demonstrate relevant experience within a similar role, you must have the ability to deliver individual projects, including attendance at meetings, internal programmes, project reviews and working with the design team.

You will understand the client needs and confirm the project brief, assist and support members of the engineering team.

Contact **Chris Murphy** on 0797 959 8524 or cm@sol-rec.com
or **Simon Lee** on 0779 206 2731 or sl@sol-rec.com

We also require professional contract/freelance HVAC, Electrical or P.H. Engineers for a variety of contract across London & the South East.



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University of Essex

Estate Management Section

Exciting opportunities have arisen within the maintenance team for the following posts:

Engineer (Building Services)

The post holder will be responsible for the management of the in-house maintenance teams consisting of an Assistant Engineer and 18 Electrical and Mechanical Craft Persons. This includes liaising with other trades, specialist sub-contract maintenance companies and the University at large to carry out on-site maintenance repairs, inspection/testing and small works installations of Electrical and Mechanical services associated with Commercial and Domestic properties owned or operated by the University of Essex.

The post holder will also be responsible with the assistance of a Contracts Manager for the preparation, tendering and implementation of fixed term maintenance contracts and annual LTM projects.

The ideal candidate will be highly motivated with maintenance experience within a similar role and qualified to degree level.

Salary: £38,511-£45,954 per annum

Ref: SS654

Assistant Engineer (Maintenance Services)

The post holder will work as part of a maintenance team and assist the Engineer (Building Services) in the supervision and management of the electrical and mechanical trades. This includes liaising with other trades, specialist sub-contract maintenance companies and the University at large to carry out on site maintenance repairs, inspection/testing and small works installations of Electrical and Mechanical services associated with Commercial and Domestic properties owned or operated by the University of Essex.

The ideal candidate will be highly motivated with maintenance experience within a similar role and hold a minimum of ONC qualifications.

Salary: £28,695-£31,342 per annum

Ref: SS659

Both posts offer many benefits including generous holiday entitlement, pension scheme and child care facilities/vouchers. Further details can be found in the job pack.

Closing date for both posts: 22 March 2015

Apply online. If you have a disability and would like information in a different format telephone (01206) 873521/874588.



www.essex.ac.uk/vacancies



Senior Mechanical Engineer

Midlands | to £50K + Bens | ref: 6304

An international engineering consultancy who offer design and specialist consultancy services are seeking a Senior Mechanical Engineer. With a renowned project portfolio you will work on innovative pharmaceutical projects. Great opportunity to gain promotion due to continued expansion.

Sustainability Consultant

London | to £55K + Bens | ref: 6811

Our client, with hundreds of offices worldwide, are at the forefront of sustainable and long term solutions on a diverse range of projects. They require a Sustainability Consultant with SBEM and IES qualifications. Excellent opportunity to take the Sustainability reins in a forward thinking company.

Mechanical Associate

Manchester | to £55K + Bens | ref: 7173

A large internationally renowned engineering consultancy are looking for an Associate level Mechanical Engineer to work out of their Manchester office. You will be responsible for strategic development of the mechanical division and managing pioneering building services projects.

Public Health Engineer

London | to £45LTD | ref: 7163

An internationally recognized multidisciplinary consultancy is looking for Public Health Engineers. With innovative projects spanning 12 months + this is an exciting opportunity for an ambitious engineer.

Mechanical Design Engineer

London | to £35LTD | ref: 7231

A leading building services consultancy require a Mechanical Engineer to join their thriving design team on a 6 month+ contract. Recent project wins include major international stadiums.

www.blueprintrecruit.com/vacancies

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cv@blueprintrecruit.com

Oxford University Hospitals NHS

NHS Trust

PFI PERFORMANCE & QUALITY TEAM,
JOHN RADCLIFFE HOSPITAL, OXFORD

PFI Hard FM (M&E) Manager

Job Ref: 321-ML-147

Salary: Band 7 £30,764 - £40,558 pa

Hours: f/t 37.5 pw

We have vacancies within the PFI Performance & Quality team at Oxford University Hospitals NHS Trust for two Hard FM Managers working Monday to Friday, 8.30am to 5.00pm. These roles will be responsible for ensuring the continued achievement of value for money within all three PFI Contracts and that services are being provided in line with statutory regulations and Trust policies.

The successful candidate will be knowledgeable about PFI processes, able to work on their own initiative, a quick learner, flexible, a solid team worker and possess excellent written and oral skills. Successful candidates will also have significant Estates and Facilities management experience, preferably within the NHS or equivalent.

For more information or to arrange an informal visit, contact Antony Hudgell, PFI Hard FM Client Manager on 01865 737636, email: antony.hudgell@ouh.nhs.uk

Closing Date: 11 March 2015

To apply and gain further details of these posts, go to <http://jobs.ouh.nhs.uk> and click on the 'Administration Services' button.

Some posts will be subject to criminal records bureau checks. Equality of opportunity is assured and we are committed to improving your working life. Our no smoking policy advances a healthier environment.



www.ouh.nhs.uk

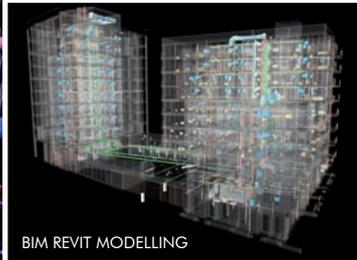
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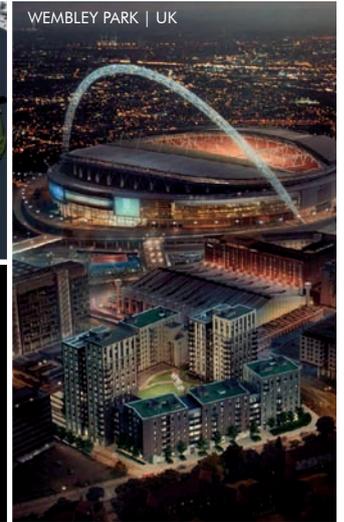
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GREENWICH PENINSULA | UK



BIM REVIT MODELLING



WEMBLEY PARK | UK

Foreman Roberts are International MEP, Energy & Sustainability Consultants. This year we are celebrating 60 years since the founding company was established and are working on exciting projects both in the UK and overseas.

We are currently seeking candidates for a number of key positions in our UK & Dubai offices, including:

Senior, Principal & Associate level Candidates in Electrical & Mechanical, Design Engineering, together with Energy & Sustainability Engineers & BIM/Revit technicians.

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Assistant Mechanical Services Engineer

Oxford
£30,434-£37,394 Plus Benefits

A rare opportunity has arisen to join the highly acclaimed estates department at the University of Oxford. The Estates Services department is responsible for the management and strategic direction of Oxford University's functional and commercial estate. This comprises some 450 buildings including teaching facilities, laboratories, offices, museums, libraries and residential properties. Reporting to the mechanical services section leader, the candidate will assist with the surveying and designing of mechanical systems, briefing external consultants, project management, commissioning and handover of various mechanical projects across the estate. This is a great opportunity to work on some of the most iconic, cutting edge and historic buildings while working within a friendly and energetic team.

For more opportunities at Oxford Universities Estates Department please see: <http://www.conradconsulting.co.uk/job-8630.html>

Project Engineer

Oxford
£38,511-£45,954 Plus Benefits

The Building Services Section of the Estates Office is seeking an experienced Project Engineer to be responsible for receiving building projects from Capital Projects into the maintenance team.

Working in conjunction with other members of the Building Services Section and other sections of the Estates Services, the Project Engineer will contribute significantly to the 'soft landings' process, engaging with projects at an early stage; will ensure that mechanical systems have been suitably installed, tested and commissioned and all other relevant tasks carried out to ensure the smooth running of services.

With £120m of capital projects delivered annually, the Projects Engineer will need to use their initiative to decide which projects to support and have excellent negotiation and influencing skills to ensure project teams deliver to the university's requirements. This is a great opportunity to get involved in wide variety of exciting and technically challenging projects.

For a confidential chat, call us 8am to 8pm on 0203 1595 387

Events & training

NATIONAL EVENTS AND CONFERENCES

EcoBuild

3-5 March, London
Visit CIBSE on stand N3080, where the membership teams will hold briefing sessions offering advice on CIBSE membership applications.
www.ecobuild.co.uk

Turning low energy designs into low energy buildings: TM54

10 March, London
An event, based on TM54, organised in association with the London Universities Environment Group and the Association of University Engineers. With speakers Dave Cheshire and Richard Belfitt from Aecom, and Mark Janko from the University of East London.
www.cibse.org/events

Plumbing for Health: World Plumbing Day

10 March, London
Organised by the Royal Society of Public Health in partnership with SoPHE, this event brings together international experts in health, plumbing design and plumbing manufacturing to explore public health issues.
www.rspg.org.uk/en/courses-conferences-and-events

Big Bang Fair

11-14 March, Birmingham
The annual event bringing science, technology, engineering and maths alive for young people
www.thebigbangfair.co.uk

Technical Symposium

16-17 April, London
Book now for the 2015 Technical Symposium
www.cibse.org/symposium

CPD TRAINING

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

Successful design management

4 March, London

Wiring regulations: 2015 update (applicable 1 July)

5 March, London

Energy building regulations: Part L

5 March, Manchester

Sanitary and rainwater design

5 March, London

Fire safety building regulations: Part B

6 March, London

Energy surveys (ESOS requirement)

11 March, London

Energy system: ISO5001 (ESOS compliant)

12 March, Birmingham

Intro to 11kV (high voltage) distribution

12 March, London

Legionella control: responsible person role

13 March, London

Intro to CHP

13 March, London

Electrical services explained (three days)

17-19 March, London

Preparing FM & maintenance contracts

18 March, London

Rainwater harvesting & greywater recycling

20 March, London

Gas safety regulations: Designing for compliance

20 March, London

Mechanical (HVAC) services explained (three days)

24-26 March, London

Fire safety in blocks of flats

25 March, London

Building services one day overview

26 March, Manchester

Electrical distribution design

26 March, London

Energy monitoring and targeting

27 March, London

ENERGY ASSESSOR TRAINING

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

Energy Savings Opportunity Scheme (ESOS) Training

9 March, London

LCC Operations (DEC) Training

10-12 March, London

ESOS Training

23 March, London

Energy Performance Certificate LCC Design

24-25 March

ESOS Training

31 March, Newcastle

CIBSE GROUPS, REGIONS AND SOCIETIES

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

WiBSE - Dealing with Confrontation

4 March, London

With speaker Sarah Davis

East Midlands Region Annual Dinner

6 March, Nottingham

Home Counties North West Region: The Crystal - The Future of Cities?

7 March, London

An engineer-guided tour of Siemens BREEAM Outstanding 'The Crystal' exhibition.

Fresnel Lecture

10 March, London
An SLL lecture, in celebration of the International Year of Light and the 200th anniversary of Fresnel's Wave theory. Lecture delivered by Peter Phillipson.
www.cibse.org/sll

SoPHE: Hygienic Building Drainage Design - Fats, Oils and Grease Control

10 March, London
www.cibse.org/sophe

YEN East Midlands Region: Breeam and Heat Pumps

10 March, Nottingham
Daikin will give an introduction to the Breeam process and explain how heat pumps

and cooling systems contribute to a Breeam rating.

Merseyside and North Wales Region - Central Library Tour

12 March, Liverpool

Yorkshire Region: Technical Visit - NG Bailey Offsite Manufacture Factory

17 March, Bradford

SoPHE: Thin-walled Stainless Steel Pipe Systems

18 March, Manchester
A free presentation from Mario Finnelli and Peter Jennings from ACO Drainage. To book, email malcolmatherton@hoarelea.com

West Midlands region: BIM in Action

18 March, Birmingham
With speaker Jason Whittall and Tim Willis from One Creative.

Merseyside and North Wales region: Annual Luncheon

20 March, Liverpool

ANZ Region NSW Chapter: Annual Dinner

20 March, Sydney

WiBSE: Leadership, Improving Management Skills

22 March, Manchester
With speaker Imelda O'Keefe.

Ready, Steady, Light

24 March,
Annual Society of Light and Lighting team challenge.

YEN South West Region: BIM Bare Bones

25 March, Bath
Andrew Duncan, BIM manager at Arup, and Charlie Murray, trainee digital engineer at Laing O'Rourke, will discuss Project OVE, an Arup R&D project focussed on replicating the human anatomy using BIM.

SLL Masterclass

26 March, Edinburgh
Continuing the lighting masterclass series.
www.cibse.org/sll

East Midlands Region: Student Evening

26 March, Nottingham

Hong Kong Chapter: Annual Dinner

26 March, Hong Kong

CIBSE Technical Symposium 2015

The fifth annual technical symposium, on 16 and 17 April, will be held at University College London, featuring more than 60 peer-reviewed presentations.

This year sees an unprecedented breadth and depth of presentations. Phil Draper, of Broadgate Estates, will examine how short paybacks and carbon savings can be delivered in a real city centre building with integrated solutions, including heat pumps. Meanwhile Hoare Lea's Doug Baldock will consider how modelling used in large-scale urban energy optimisation can be applied to smaller-scale, local applications.

Sergio Fox, from Denmark, will examine whether building systems designs are truly evolving or - in reality - swapping one overly complex solution for another. He will refer to case studies of projects covering 30 years, and evaluate a current HQ building refurbishment. A study by Conn Yuen, of CO2nsulting, Hong Kong, will probe the misconception that insulation is always desirable. There will also be technical sessions from CIBSE's schools and natural ventilation groups, as well as the International Building Performance Simulation Association.

For an updated list of confirmed papers and more, visit www.cibse.org/symposium





The University of Manchester

Mechanical Engineer – Compliance and Energy

£38,511 to £47,328 per annum

Ref: PSS-05918

You will set, develop and monitor appropriate and acceptable standards of service in respect of mechanical engineering design and maintenance, compliance and energy conservation.

You will assist in the delivery of the University's mechanical strategic objectives associated with all project work including the Long Term Maintenance and Capital Projects, whilst developing outline design briefs to enable the commissioning of internal and external consultants, and set and maintain strict mechanical and low energy design parameters for all development work.

You will lead on ensuring compliance with legislation associated with mechanical services and energy including, but not exclusively, producing of DEC's, EPC's CRC and EUETS, whilst assisting in the delivery of an ongoing programme of mechanical and energy condition surveys.

You will assist in the development and maintenance of the mechanical and energy sections of the Design Team's Code of Practice together with the delivery of an ongoing programme of mechanical and energy condition surveys to assist in the development of a long-term maintenance plan.

You will be able to demonstrate an established track record and experience in construction, engineering, and facilities management. You will hold or be working towards a current full membership of the Chartered Institute of Building Service Engineers Professional and hold, or be working towards, a full Chartered Member of the Engineering Council. You will hold an appropriate professional and academic qualification to degree level (or equivalent) in an engineering related discipline and possess substantial vocational experience.

You will also have experience of managing a multi-disciplinary team together with experience of managing and controlling budgets/resources/funding.

As an equal opportunities employer, we welcome applications from all suitably qualified persons. However, as black and minority ethnic (BME)/female candidates are currently under-represented at this level in this area, we would particularly welcome applications from BME/female applicants. All appointments will be made on merit.

For enquiries about the vacancy, contact Tony Small at antony.small@manchester.ac.uk or call 0161 275 4943.

Closing date: 11 March 2015.

The University of Manchester values a diverse workforce and welcomes applications from all sections of the community.

www.manchester.ac.uk/jobs



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Our experienced recruitment team will help you all the way giving you the best chance to find **your perfect candidate**.

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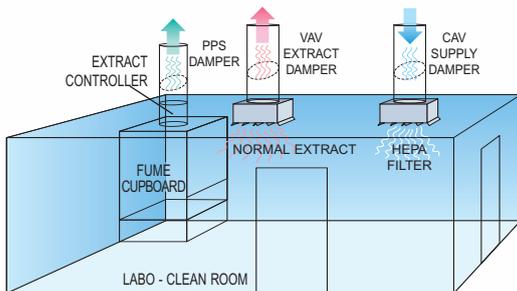


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Accurate air flow measurement with the unique CMR Venturi built into the airtight shut-off damper to control room pressure or constant volume.



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