



JOURNAL

CIBSE

The official magazine of the Chartered Institution of Building Services Engineers

November 2013

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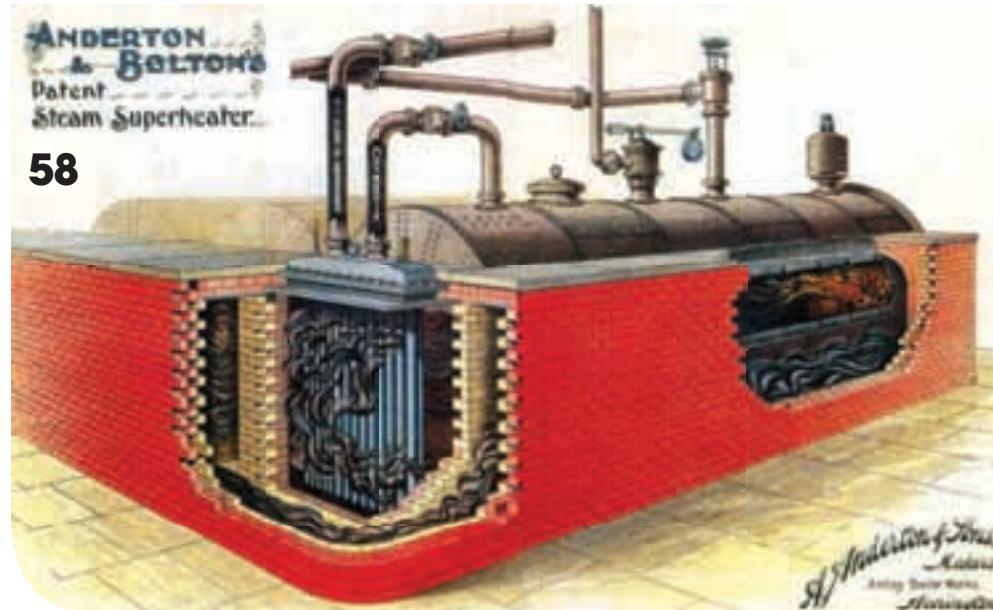
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It's an ill wind

The 10% rises in fuel bills proposed by energy firms mean thousands more people will be slipping into fuel poverty this winter.

The UK may be experiencing a mild autumn, but there's a distinct chill in the air in Whitehall, where the government is signalling a change in policy direction on regulations governing energy use.

In what the Liberal Democrats described as a 'panicky U-turn', David Cameron announced that the Conservatives would be seeking to 'roll back' green levies that help fund energy efficiency programmes and renewable technologies.

Evidence of further backtracking on the Conservative claim that it would be the greenest ever government, has also been revealed in a statement by former housing minister Mark Prisk.

He said taxpayers would have to foot the £5.7m bill for a payment to the Landmark Information Group, the company responsible for managing the air conditioning inspection scheme. Prisk blames the previous government for signing the deal, but a lack of enforcement of regulations since the Coalition came to power has meant Landmark has failed to earn the fees promised in a government contract (page 7).

Any undermining of grants and legislation supporting low carbon buildings would be a disaster for those in fuel poverty.

Nigel Banks sees the consequences of rocketing bills in his role as group sustainability director at housing developer Keepmoat. He knows how warm, well-insulated homes can bring comfort to the vulnerable who could otherwise struggle to heat their homes.

Banks argues that industry needs to drive down the cost of refurbishment to enable huge carbon savings in homes and businesses, and he claims 'deep retrofits', offering 75% reduction in energy bills, can be achieved for £10,000 per home.

Banks was a former winner of the CIBSE/ASHRAE Graduate Engineer of the Year and you can see who has been tipped for future success in this year's awards (page 18). We reveal the 2014 Building Performance Awards shortlist on page 30, as well as those who won awards at the President's Dinner.

Congratulations to everyone who received an accolade and good luck to those in the running for a performance award at the Grosvenor House hotel on 11 February.

Alex Smith, editor

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UK NUCLEAR PLANT GETS THE GREEN LIGHT

The UK's first new nuclear power station in a generation has been given the go-ahead by the government.

France's EDF Energy will head up the project, which includes Chinese investors, to build the £14bn Hinkley Point C nuclear power plant in Somerset.

The two reactors planned for Hinkley, which will provide power for about

60 years, will have a big part to play in the coalition's drive to shift the UK away from fossil fuels towards low-carbon power, and security of supply.

When expansion of the existing power station is completed, probably by 2023, power will be ready for delivery as the existing fleet of AGR reactors will be coming towards the end of operation.

Poor enforcement hits taxpayers with £5.7m bill

Former housing minister blames 'botched' contract for payout

By Liza Young

Taxpayers have been forced to cover a £5.7m payment shortfall caused by the low level of energy certificates and air conditioning inspections.

Under the Energy Performance of Buildings Regulations (EPBR) any air conditioning system with an output of more than 12kW must be inspected every five years, and a report lodged with a national register.

But because of low compliance levels, taxpayers have had to find £5.7m to compensate the Landmark Information Group, which runs the national energy certificate register.

The revenue from fees for submitting documents to the register has not been sufficient to meet the full cost of operating the registers.

In a ministerial statement, former housing minister Mark Prisk blamed the previous Labour government for the 'botched' contract.

He said: 'It is clearly unacceptable that contracts were drawn up and operated, that outsourced a service to the private sector but left taxpayers with unreasonable commercial risks.'

But CIBSE technical director Hywel Davies said the shortfall was also down to 'the failure of the enforcement and penalty regime operated by this government'.

Experts suggest there are at least 300,000 air conditioning systems covered by the EPBR, implying that there should be 60,000 lodgements a year on average. But recorded data shows 1,000 a month, which is 20% of what would be expected.

This represents a revenue shortfall of almost £250,000 a year, just on air conditioning inspections at the old lodgement fee.

'Action to improve compliance with the EPBR is not burdening business,' said Davies.

'It may require those breaking the law to comply and pay the costs, but that is only asking them to pay their fair share just like everyone else.'

Davies said that a lack of compliance would have a knock-on effect on energy assessors, who would find a low return on their training investments.

It would also affect assessor training for the proposed Energy Savings Opportunity Scheme, which is being developed as part of the UK's implementation of the EU Energy Efficiency Directive.

This requires large enterprises to undertake regular energy audits.

● Prime Minister David Cameron has vowed to roll back green levies in the upcoming Autumn Statement on 4 December.

The *Daily Mail* has backed the Prime Minister's call for a cut in support for grants supporting energy efficiency and renewable technology, despite Landmark being a subsidiary of the Daily Mail and General Trust (DMGT).

In brief

TASK GROUP SEEKS ZERO CARBON DEFINITION

The UK Green Building Council is launching a new task group to help define what constitutes 'zero carbon' for non-domestic buildings, amid increasing concern and confusion across the industry.

The group, which will be chaired by British Land's Sarah Cary, will report in February 2014.

'The implementation date for zero carbon is not very far away, and the earlier we can get clarity on the definition, the better for industry,' she said. 'This group offers a chance for industry to set out what it thinks should happen next, and to help build a strong business case for action.'

HUNDREDS DOWNLOAD APP

The new *CIBSE Journal* app has been downloaded hundreds of times since its launch last month.

It contains rich interactive content, including video interviews, animations, and building fly-throughs.

To view the app visit cibsejournal.com/app, or for Android or the web version access it from the homepage at cibsejournal.com.

TSB links performance to simpler design

An £8m post-occupancy evaluation project has highlighted that complex buildings lead to poorer energy performance.

Over the last four years, the Technology Strategy Board (TSB) financed 100 post-occupancy evaluation (POE) projects, including M&S' green Cheshire Oaks store.

'Simplification and continuous management are key,' said Ian Meikle, head of the TSB low impact buildings programme. 'There is a tendency for poorer performance, the more complex the building.'

Meikle said that up to £80,000 was spent on each project, providing protocols, monitoring equipment and expertise.

'By measuring performance, you know how well your building's been built. It shows attention to detail through the design, construction, and commissioning process. The result can be a high-quality user-focused building,' he said.

'Some of the best-performing buildings can save 30-40% on their energy bills. So not only does it make environmental sense, it also makes business sense,' he said.

The programme has received a further £60m funding over the next five years to focus mainly on BIM-led projects.

Watch Ian Meikle on building performance at [cibsejournal.com](#)



DuPont wins counterfeit case

DuPont Refrigerants has completed 'an enforcement action involving counterfeit refrigerants', which resulted in a seizure of cylinders and packaging in China.

Following a tip-off from a fellow manufacturer, DuPont took legal action against Hangzhou Sporlan Heating and Refrigeration Company. A raid of Hangzhou Sporlan facilities by local law enforcement authorities led to the seizure of counterfeit cylinders and packaging.

This led to the confiscation of 300 units of counterfeit DuPont Suva 134a refrigerant.

Hangzhou Sporlan was required to pay damages to DuPont and has been forbidden from using and advertising DuPont's trademarks. It has also had to reveal its suppliers for follow up investigation.

'We continue to aggressively pursue full legal action against counterfeiters who illegally use our trademarks,' said Greg Rubin, global business manager for DuPont. 'Counterfeit refrigerants present a danger to the marketplace, in terms of potential safety and environmental issues, as well as the possibility of equipment failure.'

Soft landings key to M&S store savings

A living green wall helps with insulation and attracts biodiversity



● Collaboration in supply chain leads to 40% CO₂ savings over six years

A flagship M&S green store reduced its carbon footprint by 40% in six years after incorporating soft landings into its contracts.

A post-occupancy evaluation of Cheshire Oaks revealed that the building achieved a 42% reduction in energy use compared to a benchmark store. It also had 40% fewer carbon emissions, with rainwater harvesting providing a third of the store's water.

The hemp wall insulation, combined with 70% better airtightness than required by building regulations, also meant that the building lost less than 1°C of heat overnight.

The site currently houses 88 individual plant species, encouraging biodiversity.

Head of property Plan A Munish Datta said soft landings and seasonal commissioning brought together all stakeholders involved in the design, commission, building, and occupancy stages.

This meant that every supplier was tied to the project for 12 months after completion.

'I think contractors are as passionate about the buildings that they build or design, as they are about them running correctly. I don't think that's come naturally – or immediately – to the property industry, but it's becoming easier,' said Datta.

'And this collaborative approach, which is very much the ethos of soft landings, is enabling us to have better performing buildings at the end of the first year of their occupation, when most of the issues that would have happened are eradicated because we're working together on them.'

Datta said that the findings from all the 'learning stores' will now be rolled out into four existing Simply Food stores in Epping, Slough, Oswestry, and Heswall – before retrofitting the entire M&S estate.

Every learning store has a dedicated store maintenance engineer and regional facilities manager, and will be remotely monitored every 15 minutes.

Learning stores are also helping to cut down on construction waste by using modular buildings and sharing unwanted resources with the local community via Freecycle and Gumtree websites.

Datta said that M&S saved £70m by becoming 31% more energy efficient and 27% more water efficient across its UK estate.

He added: 'The whole point of doing this is to improve our specifications for new stores, but more significantly for our existing estate.'

● **The CIBSE green roof guide will be published in 2014.**

Watch Munish Datta on M&S energy savings at [cibsejournal.com](#)



Argent to use TM54 on King's Cross development

Property giant Argent has revealed that it is using post-occupancy evaluations on its estate with the help of CIBSE's new design tool *TM54: Evaluating operational energy performance of buildings at the design stage*.

It is using the data to create benchmarks to feed into TM54 for the King's Cross development, where 50 new buildings are planned for the 67-acre site.

Argent project director Morwenna Wilson revealed, at the launch of TM54, that data from surveys and pre- and post-occupations was being fed into the beginning of the design process.

'It's very important that the information



Morwenna Wilson

we give to them is relevant and correct because some of them rely on information like this to do their financial planning and make sure their businesses survive,' said Wilson.

TM54 co-authors David Cheshire and Anna Menezes said that the new model aimed to facilitate a dialogue between designers and clients.

Cheshire said that TM54 identified a range of possible outcomes for designers, who often rely on models based on the National Calculation Methodology, which only show 'part of the picture'.

Watch Morwenna Wilson at the launch of TM54 at [cibsejournal.com](#)



Government risks breaking EU rules over Allowable Solutions

● Carbon offsetting won't be acceptable under EU law

The government may be in conflict with EU rules if it allows carbon offsetting under Allowable Solutions.

CIBSE has questioned whether an Allowable Solutions approach, which allows housing developers to offset carbon emissions by paying for low energy infrastructure a long distance from their projects, is compatible with revised EU law.

Allowable Solutions are designed to enable housebuilders to deliver zero carbon homes from 2016, by allowing them to offset their buildings' carbon emissions through renewable programmes elsewhere.

In its response to the DCLG Allowable Solutions Consultation, which closed last month, CIBSE said the nearly zero carbon definition in the Energy Performance of Buildings Directive (EPBD) may not be compatible with carbon offsetting. The EPBD definition states: 'The nearly zero or very low amount of energy required should be covered, to a significant extent, by energy from renewable sources, including energy from renewable sources produced on-site or nearby.'

CIBSE says that investing in far-away renewables such as off-shore wind turbines could fall foul of the definition.



It believes that the directive may limit Allowable Solutions to the nearby built environment and energy infrastructure, such as the refurbishment of local estates or investment in low energy district heating schemes.

The EPBD definition of nearly zero energy buildings must be met from 2020, but the UK intends to require developers to deliver zero carbon homes from 2016.

In its consultant response, CIBSE said: 'It would be unfortunate, to say the very least, for the UK to set off on a path of Allowable Solutions in 2016, only to be hauled back in 2020/1 because the policy was deemed not to be compatible with EU law.'

See CIBSE's response to the consultation at www.cibse.org/technicalresources

DCLG still committed to zero carbon buildings through Part L

The Department for Communities and Local Government (DCLG) has restated the government's commitment to zero carbon buildings.

In a presentation to the BRE, the department's head of technical policy, Anthony Burd, said it remained a clear priority, and reminded his audience that these targets had been reiterated by the Chancellor in this year's Budget. He said the new Part L energy efficiency targets were 'not a move away from zero carbon commitments' despite what some people might claim.

Burd added that the changes to Part L due to come into force in 2014 were an 'important technical

step' that struck a balance between the zero carbon buildings target and the need for economic growth.

'Part L strikes a balance between zero carbon target and growth' – Burd

DCLG remains committed to achieving zero carbon new homes by 2016, and new non-domestic buildings by 2019, with Building Regulations seen as the main mechanism for achieving this.

Two related consultations were completed in October, looking at the way ahead for 2016 targets and Allowable Solutions as well as a review of Housing Standards.

Burd said the proposals on Allowable Solutions were linked to the government's preference for developers to have flexibility 'if they are going to have to meet regulatory costs'.

From 6 April 2014 new homes will have to reduce their carbon emissions by a further 6%, but this will have to be achieved within the Spending Review commitment to reduce regulatory burdens on housebuilders, so as not to hinder housing growth, according to DCLG.

Non-domestic new builds also face a '9% strengthening' of carbon emissions standards.

● See regulations review on page 4 of Products and Services Special.

Europe set for F-Gas compromise

A proposed ban on pre-charging split air conditioning systems with refrigerant gas could be dropped from the final version of the reviewed F-Gas Regulation due to come into force early next year.

Manufacturers said a pre-charging ban would be impractical and would disrupt production processes. However, the European body that represents contractors is still hoping for a compromise that would 'protect the principle of improving professional installation'.

The Air Conditioning and Refrigeration European Association (AREA) says the use of pre-charged units encourages DIY installation and so increases the danger of harmful refrigerant gas leaking into the environment. It, along with officials at Defra, offered to work with the European Parliament to restrict the supply of pre-charged systems to only those individuals able to demonstrate proof of professional qualifications.

Further boost planned for PV

Solar PV remains central to the UK's renewables policy, according to Energy and Climate Change Minister Greg Barker.

Installed solar PV capacity has increased by a factor of 25 since 2010 and the Government said it wants to work with industry 'to build on this unprecedented growth'. However, it acknowledged that more work needed to be done on siting and financial factors.

'The Coalition is committed to delivering the clean and reliable energy supplies that the country needs but new solar installations must be sensitive to public opinion and mindful of wider environmental and visual impacts.'

A Roadmap to a Brighter Future produced by the Department of Energy and Climate Change (DECC) sets out the vision for the future of PV ahead of the planned Solar PV strategy, due next spring.

In brief

KING'S COLLEGE CUTS ENERGY BILL BY £390,000

More than 100,000 sensors and devices have been used to help King's College London identify energy savings worth £390,000 per year, and annual carbon savings of 2,500 tonnes over three campuses: Guy's, Denmark Hill and the Strand.

The initiative covers almost 100 buildings and more than 1,500 plant items including, boilers, pumps and air-conditioning units.

The online Demand Logic platform was used to pinpoint energy-saving opportunities in the heating, cooling and ventilation systems, which can be hard to spot in large and complex buildings.

CUTTING THE MUSTARD

A Colman's Mustard factory has reduced its energy consumption by 39% and saved more than 260 tonnes of carbon after upgrading its lighting.

Colman's also saved £3,795 on energy bills each month - £45,540 a year - after replacing fluorescent lighting at its Norwich plant.

Engineers installed 3,892 T5 converters from Energys, which enabled energy-efficient lamps to be slotted into existing light fittings.

£400m BOOST FOR ENGINEERING DEGREES

The government has announced a £400m funding boost for science and engineering at English universities.

Universities and Science Minister David Willetts said the government was putting up half the money with the rest to be raised in match-funding by the universities themselves.

It is hoped the move will increase the number of women taking science and engineering degrees because the universities will need to provide evidence of 'a commitment to equality and diversity' when applying for the money.

The National Centre for Universities and Business wants to double the proportion of engineering degrees taken by women to 30% by 2030.



Cameron intervenes in Prompt Payment Code row

● Late payment driving small businesses to the wall

Building engineering firms are suffering particularly badly from the failure of the government's voluntary Prompt Payment Code, it has emerged.

The code, which was launched in 2008, is to be the subject of a consultation announced by David Cameron following new YouGov research, which reveals that 85% of small firms have experienced late payment in the past two years. SMEs are owed a total of £30.2bn.

'It's not right that suppliers are not getting paid on time for the work they do, and the services they provide,' said Cameron. 'I know that late payment can have devastating effects on our small and medium-sized businesses.'

The code is supported by the European Directive on late payment, which stipulates that all public sector bills should be paid in 30 days, and business-to-



'It's not right that suppliers are not getting paid on time for work they do, and services they provide'

business payments within 60 days. However, many sub-contractors in construction are forced to wait up to 120 days for payment.

About 1,500 firms have signed up to the code, but former trade minister Lord Digby Jones said it was nothing more than a 'nice statement of intent'. He said many large corporations used late

payment as a business tactic and that no company had ever been shamed into mending its ways.

'Late payment is theft,' said Roderick Pettigrew, chief executive of the Building & Engineering Services Association (B&ES). 'I can't see any other way of describing taking something – be it specialist services; goods or products – from your supplier and refusing to pay for it. At best it is a sneaky way of 'borrowing' money from suppliers, rather than from a bank – and paying no interest.'

'The government needs to wake up quickly to what is going on here. Without proper action, late payment could derail the fragile economic recovery. Perfectly well-run companies are being driven to the wall by cash-flow problems for which they are not responsible.'

Pettigrew described late payment and unfair cash retention as a scandal. 'B&ES will continue to lobby hard for a binding code of fair payment that would bar main contractors from public-sector projects if they fail to pay on time.'

Part L challenge for new Crystal Palace

Plans to recreate Prince Albert's Crystal Palace are set to pose a enormous challenge for designers attempting to comply with Part L of the Building Regulations, according to a CIBSE historian.

'If we are talking about a replica, which is to be used all year round, I don't see how such a building could possibly comply with Part L of the Building Regulations,' said Neil Sturrock, CIBSE Heritage Group chairman.

Arup was selected by investors ZhongRong Group to develop a concept for the new structure, but an architect is yet to be appointed. The Greater London Authority (GLA) is due to appoint an advisory panel that will announce a design competition.

Sturrock suggested creating a large thermal store to heat and cool the building (see box right).

The original Victorian building, which was built for the Great Exhibition held in the summer of 1851, had no heating.

Sturrock said: 'There was no fixed shading incorporated into it either, but there were external canvas blinds which could be drawn across between the ridges of the roof.'

For more on this story log on to:
www.cibsejournal.com



HOW DO YOU COOL A GLASS PALACE?

CIBSE Heritage Group chairman Neil Sturrock suggests a huge thermal store could help heat and cool a rebuilt Crystal Palace. 'My suggestion for an energy efficient solution would be to build a vast inter-seasonal thermal store underneath the building. This would be heated up over the summer by taking heat from the air inside the building, and this

heat would then be released into the building over winter. The most economical method of doing this would be by means of reversible heat pumps.'

'The emphasis here is on vast because a rough rule of thumb tells us that an inter-seasonal heat store (using water and anti-freeze) needs to be about twice the volume of the building.'



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Green Deal under fire from all sides

● Parliamentary group calls for urgent review

The government's flagship energy efficiency initiative is in danger of collapse.

Just a handful of Green Deal projects have been completed, despite more than 85,000 assessments having been carried out, prompting shadow energy minister Caroline Flint to announce that a future Labour government would scrap the scheme.

Criticism of the interest rates attached to the loan repayments; early repayment penalties;

complexity; and poor awareness of the benefits among the general public, have led to calls for a complete overhaul.

The government had hoped more than 10,000 homes would have benefited from overhauls by Christmas, but this target is now unrealistic with fewer than 20 projects completed when CIBSE Journal went to press.

In its report, *Re-energising the green agenda*, the Commission of Inquiry of the all-party parliamentary group for excellence in the built environment is generally supportive of the Green Deal, but says it needs to be reviewed urgently.

CIBSE's role in the debate

Dr Dorte Rich Jørgensen MCIBSE provided evidence to the all-party group:

'We need to fix what is not working to create greater momentum to kickstart the Green Deal and reach out to the nation's 26m households and 4.5m businesses. It was encouraging to see the panel adopt many ideas from Atkins' work at London 2012 and Faithful and Gould's input on Marks & Spencer's Cheshire Oaks store.'

'As CIBSE members we have an unique opportunity to demonstrate leadership in re-energising the green agenda by sharing best practice and supporting our clients in retrofitting their buildings.'

Read more on CIBSE's Green Deal Assessment at cibseblog.co.uk

Indoor air quality left out in the cold

● ASHRAE president calls for healthier buildings

A renewed focus on both the environment and energy efficiency has left good indoor air quality out in the cold, claims ASHRAE President Bill Bahnfleth.

In his address at the CIBSE Young Engineers Awards, Bahnfleth said basic needs and quality of life meant putting people's health, safety, productivity and comfort first.

'There's been a tendency in the last few years to focus more on energy and environmental protection than what actually is going on inside the building.'

'I think we're not putting enough effort on any level – research or in practice – into taking care of the quality of the indoor environment.'

Bahnfleth said ASHRAE had

been a pioneering organisation in recognising the importance of the indoor environment more than 30 years ago.

'But I think we've lost that leadership to some extent, and I'm trying to bring it back,' he said.

He stressed the importance of changing standards and strategies during the design stage to maximise productivity inside buildings.

'We're really not paying attention to research showing that the way we are treating air quality in buildings is not reaching optimum levels of either health or productivity,' said Bahnfleth.

'So, we need to change our standards and also we need to start valuing indoor air quality, and the impact that it has.'

See *Feedback* on page 22 for response to Bahnfleth's speech.



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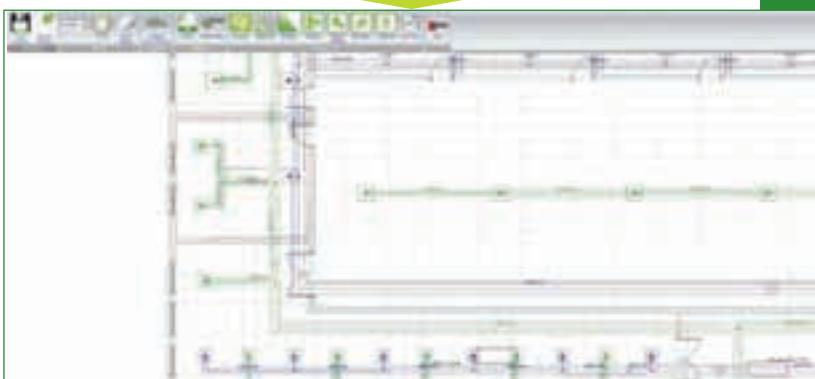
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Renew your membership

Members will soon be able to renew their CIBSE subscriptions for 2014.

A statement of fees and how to pay will be sent to members shortly, with renewal due on 1 January 2014.

For quicker, more convenient membership subscription renewal, CIBSE offers those with UK bank accounts the option to pay their membership subscription by direct debit. International members can pay by continuous credit card authority (CCA). To register for either, call +44(0)20 8772 3655 and provide your bank account number and sort code, or credit card number. Payment will be collected annually and you will receive a discount on your standard membership fee.

Alternatively, renewal can be completed online at www.cibse.org/members, by phone with a debit/credit card, or by sending a cheque. Members should check at www.cibse.org/members that the Institution has their correct address details.

If you have retired from full time employment, are currently out of work, on maternity or paternity leave, or earning less than £7,500, you can apply for a reduced membership subscription fee of £46. Visit www.cibse.org/fees for details.

Region honours volunteers

CIBSE Home Counties North West (HCNW) region presented gifts to Mike Goodwin MCIBSE and Allison Meaney in recognition of their stellar voluntary efforts.

Goodwin served as secretary and chair from 1995-97 and chair from 2001-03 with Meaney providing dedicated organisational support.

CIBSE regions function through a volunteer network, providing local support and networking opportunities to CIBSE members across the UK and internationally. Visit www.cibse.org/regions for more.

Winners of Employer of the Year Award revealed

Max Fordham has been confirmed as winner of the Employer of the Year Award 2013. The award recognises employers who have shown excellence and innovation in developing the engineers of the future.

The event, which ran alongside the Young Engineers Awards, which also include the Graduate of the Year Award, was held at the Institution of Mechanical Engineers and was sponsored by Lochinvar, Daikin and Ruskin Air Management.

Each of the winning companies showed particular commitment to championing newly qualified engineers in the building services industry, and supporting them in employment and education. Avoca won the award for the small company category, with Max Fordham winning the medium company category, and Hoare Lea taking the large company award.

Max Fordham was named overall winner for its well-structured programme for developing and encouraging young engineers, showing how it had made young engineers the heart of its strategy for recovering from tough economic times. It was clear that young engineers play a crucial role in the future growth of the firm, and are given responsibility and opportunities to match.

The winners received a trophy and £1,000 of CIBSE training vouchers, presented by CIBSE President George Adams and ASHRAE President Bill Bahnfleth.



Max Fordham won the Employer of the Year award, with Bill Bahnfleth, left, and George Adams



Hoare Lea, winner of the large company award



Avoca, winner of the small company category

Record number of abstracts received for CIBSE Technical Symposium

CIBSE has received the largest-ever number of abstracts for submissions to the annual CIBSE ASHRAE Technical Symposium, which will be held on 3-4 April 2014, at the Dublin Institute of Technology.

The abstracts were received from all over the world and included a mix of academic and industry submissions, reflecting the aim of the symposium to facilitate information-sharing and networking across the built environment sector.

The symposium will commission about 50 authors to submit papers, all of which will need to be peer-reviewed. As such we are seeking volunteers to act as referees. Any CIBSE Member willing to review papers should contact us, providing a few sentences, by way of overview of your practical areas of technical expertise. As well as helping to ensure that the papers

presented are of a high standard, it will give referees a chance to find out about some of the developments to be presented at the event. If you are interested in helping with refereeing, email groups@cibse.org.

The symposium is titled 'Moving to a New World of Building Systems Performance' and will give a platform to the latest practice and research from around the world, into active and passive building systems that will shape an effective future for the built environment with minimum resource impact.

A joint enterprise with ASHRAE, CIBSE's American counterpart, the symposium is also supported by the Future Cities Catapult, a newly established global centre of excellence on urban innovation.

For more information visit
www.cibse.org/symposium2014



The Happold Brilliant Award

The Happold Brilliant Award 2012-13 was presented to Liverpool John Moores University and accepted by Derek King MCIBSE on behalf of the university. The annual accolade recognises excellence in the teaching of building services engineering.



Rewarding excellence

● The President's Dinner highlighted some of the talent within CIBSE membership. A range of awards were given, and CIBSE congratulates all who received them

Ken Dale Travel Bursary

There were three winners of the Ken Dale Travel Bursary: Kayley Lockhead, Angela Reid and Katie Wallace. Lockhead studied renewable technologies in Africa to alleviate poverty and protect the environment, visiting Kenya, Uganda and Tanzania. Reid examined sustainability, focusing on energy reduction and supply, visiting mixed-use developments in China, Australia and Canada. Wallace researched CO₂ heat reclaim, focusing on refrigeration in supermarkets, visiting the USA, Denmark, Switzerland and Sweden.

The Ken Dale Travel Bursary, now in its sixth year, is made possible by the kind donation of the family of the late Ken Dale, a past president of the Institution of Heating and Ventilation and an Honorary Fellow of CIBSE. This year, additional funding was provided by the Society of Public Health Engineers and the Richard Tully Fund. The bursary provides the opportunity to experience technical, economic, environmental, social and political conditions in another country, in order to examine how these impact on building services engineering.

Hays Building Services President's prize

Sophie Naylor, from the University of Nottingham, won the 2013 CIBSE Undergraduate Award. Naylor, who studied Architectural Environment Engineering at the University of Nottingham, won with a



project entitled: *Application of Biomimetics to Improve Capillary Transport in Heat Pipes*. Sophie was presented with a £500 prize and a trophy.

The CIBSE Undergraduate Award, sponsored by Hays Building Services, is designed to encourage students to develop their potential and aim for excellence. It is awarded to students in their final year of a building services course accredited by CIBSE, recognising their academic achievements at the end of their course of study.

A trophy was also presented to Dr Ed Cooper, representing the University of Nottingham, as acknowledgment of its achievement.

Richard Seaman from Dublin Institute of Technology, and Matthew Taylor from Leeds Metropolitan University, were both runners-up.

Technical awards

Two prizes for technical papers published in the Building Services Engineering Research & Technology (BSERT) were presented on the night.

The Napier Shaw Bronze Medal for best paper on a research topic was awarded to Michael Barclay, Steve Sharples MCIBSE, Jian Kang and Richard Watkins MCIBSE for their paper: *The natural ventilation performance of buildings under alternative future weather projections*.

The Carter Bronze Medal for best paper relating to application and development went to YH Yau for his paper: *Climate change implications for HVAC&R systems for a large library building in Malaysia*.

CIBSE medal winners

The nominations panel gave medals to Graham Manly FCIBSE (Gold), John Michael Barber FCIBSE(Silver) and Patrick Bellve FCIBSE(Silver) for their contributions to industry.



CIBSE seals five-year BSERT deal

Sage Publications has signed an agreement with CIBSE to extend their publication arrangement for a further five years for both Building Services Engineering Research & Technology (BSERT) and Lighting Research & Technology (LR&T).

This coincides with a fast-changing marketplace and ensures that all CIBSE members continue to have assured quality, peer-reviewed journals publishing material of direct relevance to members.

BSERT is the peer-reviewed journal of CIBSE that covers all areas (aside from lighting technology) of energy and environmental services in buildings.

In recent years, the winners of the Napier Shaw Bronze Medal and Carter Bronze Medal have been selected from those published in BSERT (See page 41 for more details).

Young Lighter of the Year finalists revealed

● Winner will be revealed by Society of Light and Lighting at the Lux Awards

The Society of Light and Lighting (SLL) is pleased to announce the Young Lighter of the Year 2013 finalists. These entrants will present their papers at the LuxLive exhibition and have the chance to win the prestigious award of Young Lighter of the Year at the Lux Awards in London on 21 November 2013.

The awards – now in their 19th year – provide a unique platform for young lighters and are open to those under 30. They give the young lighters an opportunity to write a paper on a lighting subject, hone their presentation skills in front of an

invited panel of judges, and raise their profile within the industry.

The finalists were chosen from the quality and talent shown in both their 3,000-word papers on any lighting subject of their choice, and their video presentations. The finalists, who will be presenting their papers at LuxLive, are: (below L to R) Ben Leslie, David Kretzer, Philip Avery and Rachael Nicholls.

All finalists receive a cash prize along with a year's membership to SLL, and the chance to present their papers at the LuxLive event. To attend the event, visit www.luxlive.co.uk

Watch the finalists on the app and Android/PC
cibsejournal.com/app, cibsejournal.com 



Nominations for CIBSE Board and Council

The Board is the governing body of CIBSE. It is made up of the seven Officers of the Institution (president, president-elect, three vice-presidents, honorary treasurer and immediate past president) and five elected members. Vacancies arise at each AGM, and the board is required under Regulation 36 to nominate candidates for all the forthcoming vacancies.

The board has also agreed that elections should be held for membership of the council of the Institution, a much larger consultative body that exists to advise the board on Institution policy, and which is composed mainly of representatives of the regions, societies, groups and standing committees.

The board has accordingly made the following nominations to fill vacancies arising at the next AGM in May 2014:

President-elect Nick Mead CEng FCIBSE

Vice-presidents John Field CEng MCIBSE, Tadj Oreszczyn CEng FCIBSE, Cathie Simpson CEng FCIBSE

Honorary treasurer Stuart MacPherson CEng FCIBSE

Members of the board Stephen Lisk FSLL, David Pepper, Andrew Saville CEng FCIBSE MSLL

Members of council Peter Raynham CEng MCIBSE FSLL

Short biographical notes for candidates will be found in the members' section of the CIBSE website at www.cibse.org

Members of the Institution are entitled to nominate additional candidates for election, according to the rules set out below:

● Fellows, Members, Associates and Licentiates may submit nominations for the offices of president-elect, vice-president and

honorary treasurer, and for members of the board. Only duly qualified individuals who have been supported by 10 nominations from Fellows, Members, Associates and Licentiates will be added to the lists.

● Fellows, Members, Associates and Licentiates may also nominate individuals from those grades for membership of council. Graduates, Companions and Affiliates (including students) may nominate individuals from those grades for membership of council. Only duly qualified individuals who have been supported by five nominations from members in the appropriate grades will be added to the lists.

● Any such nominations must be made in writing to the chief executive/secretary, and must be received at CIBSE headquarters by **1 February 2014**. These nominations must be accompanied by the nominee's written consent to accept office if elected. The names of those making nominations will follow the name of the candidate on the ballot paper.

The qualifications for each position are as follows: **President-elect**: Fellows of the Institution who hold or have held the office of vice-president. **Vice-president**: Fellows, Members, Associates or Licentiates of the Institution who are or have been members of council.

Honorary treasurer: Fellows, Members, Associates or Licentiates of the Institution who are or have been members of council.

Members of the board: Members of all grades may be nominated (at least three of those elected must be or have been members of council, and at least three must hold membership in the grades of Fellow, Member, Associate or Licentiate).

Members of council: Must hold the appropriate membership grade for the category in which nominated, ie Fellow/Member/Associate/Licentiate or Graduate/Companion/Affiliate (including students).

YEN ball comes to Nottingham

Nottingham played host to the 2013 CIBSE YEN (Young Engineers Network) national ball. The black tie event saw members attend an evening of entertainment and food, courtesy of celebrity chef Marco Pierre White.



Nottingham was selected to mark the developing East and West Midlands YEN centres, chaired by Tanvir Saini and Lee Tabis LCIBSE. West Midlands chair Tabis said: 'This proved to be a great opportunity for our young engineers to meet, share and inspire; and help our industry to truly blossom.'

Fundraising took place during the evening, with a charity raffle raising more than £600 for local charities Rainbow Children's Hospice and My Sight

Nottinghamshire.

As well as enjoying an evening of celebration, YEN chairs and vice-chairs held a meeting to discuss a number of issues including: building the profile of young engineers; attracting talent to the industry; diversity; and collaborative working.

YEN would like to extend thanks to all the network volunteers for their continued efforts, and to sponsors Mitsubishi Electric, Herz Valves, Remeha and Reflex for supporting the 2013 YEN ball.

New members, fellows and associates

FELLOWS

- Betts, Peter Andrew
Iver, UK

Hayhurst, David
Bury, UK

Khan, Muhammad Ijaz
Rushden, UK

Lau, Kwok Kwong Edwin
Homantin, Hong Kong

Leone Gamado, Timothy
London, UK

MEMBER

- Bakare, Ezekiel Adeoye
Lagos, Nigeria

Cameron, Mark William
North Point, Hong Kong

Chan, Ka Ho
Quarry Bay, Hong Kong

Chan, Kam Tong
Chai Wan, Hong Kong

Chan, Ming Yin
Kowloon, Hong Kong

Cheung, Chi Tai
Hong Kong Central,
Hong Kong

Cho, Chui Ching
Wanchai, Hong Kong

Ciciani, Stefano
Auckland, New Zealand

Davies, David
Cardiff, UK

Doohan, Eoin
Celbridge, Republic of
Ireland

Fisher, Clare

London, UK

Grigorieva, Elena
Havant, UK

Hung, Chun Leung
Hong Kong, Hong Kong

Jones, Hywyn Edern
Cardiff, UK

Lau, Kai Pak Desmond
Ontario, Canada

Laville, James
Edinburgh, UK

Lee, Chi Yu John
Chaiwan, Hong Kong

Lee, Tat Hung
Kowloon, Hong Kong

Lee, Yuk Leung
Sham Shui Po, Hong
Kong

Lim, Ming Hung
Kowloon Bay, Hong
Kong

LiuShiu Kei Homantin
Hong Kong

Man, Wing Chung
Lai Chi Kok, Kowloon,
Hong Kong

Mellor, Christopher Brian
Huddersfield, UK

Morrow, Ian David
Coleraine, UK

Ng, Wai Chung
N.T., Hong Kong

Ng, Diana Beng Choo
Bristol, UK

Ng, Tat Man
Kowloon, Hong Kong

Ng, Chi Shing

Tai Po, Hong Kong

O'Callaghan, Gerald
Dublin 6, Republic of
Ireland

Page, Barry
Dubai, United Arab
Emirates

Skalkowski, Maciej
Sunbury-on-Thames, UK

Smith, Rory
El Cajon, USA

Sonogova, Martina
Poole, UK

Tam, Tak Yeung
Ma On Shan, Hong
Kong

Yeboah, Siegfried
Kwame
Ningbo, People's
Republic of China

Yip, Wai Tong
Sheung Shui, Hong Kong

LICENTIATE

- Hutchings, Stuart
Biggleswade, UK

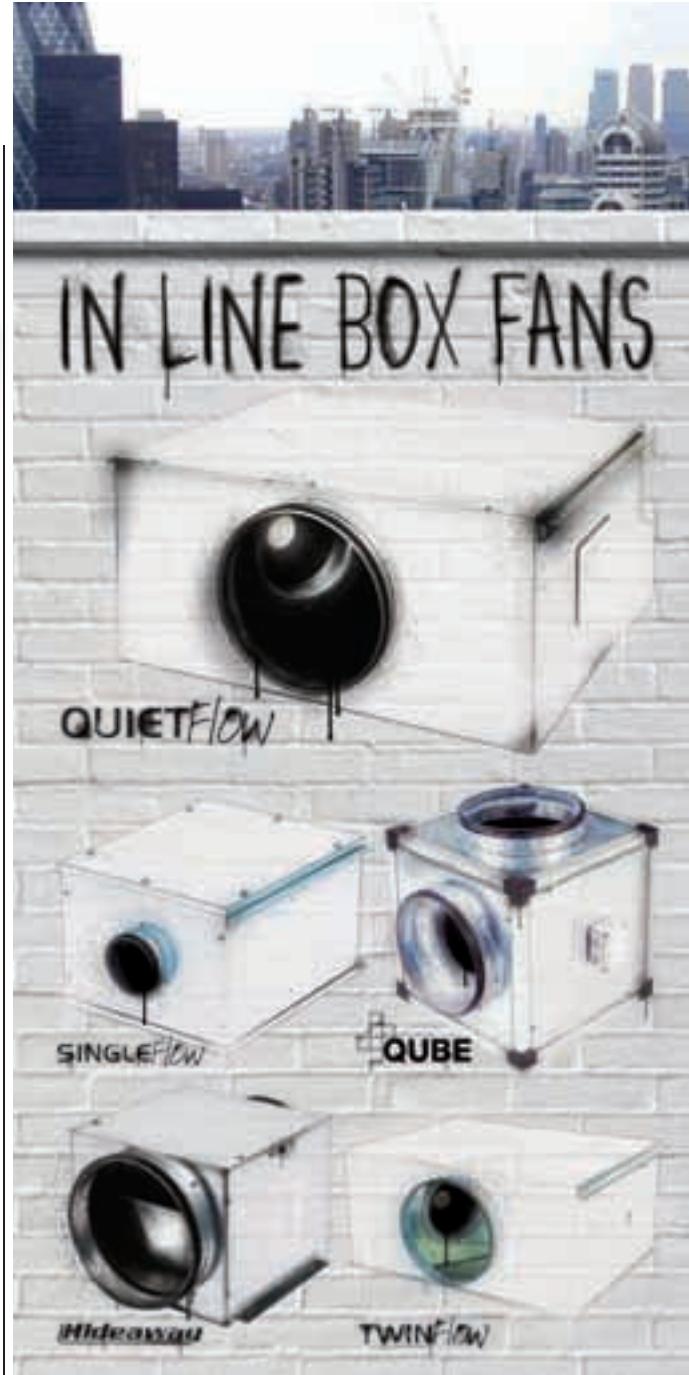
Lynch, Paul
Dublin 12, Republic of
Ireland

McDermott, John
Stalybridge, UK

Pugh, James
Worcester, UK

Spragg, Jon
Surrey, UK

Standing, Danny
Hoddesdon, UK



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STEPPING INTO THE SPOTLIGHT

The next generation of young engineers blazing a trail in the industry, and striving to push the boundaries of building design, was celebrated at the CIBSE Young Engineers Awards 2013. **Liza Young** reports

I hope to create projects that stimulate environmental sustainability and make a measurable difference to people's lives



Winner of the CIBSE ASHRAE graduate of the year award, William Holley

Ten finalists were challenged to demonstrate their presenting and communication skills as they battled it out for the prestigious title of CIBSE Graduate of the Year 2013 and the chance to participate in the New York ASHRAE conference next year.

William Holley, graduate building services engineer at Buro Happold, took the top award after impressing the judges with a personal account of his experiences working on a nursery school project in a rural South African province.

Stemnet ambassador Kathryn Dryden, of Atkins, came a close second, followed by University of Cambridge graduate Emily Woodhouse, who is a graduate engineer at Aecom.

All three received cash bursaries from the prestigious Rumford Club during the ceremony at the Institution of Mechanical Engineers (IMechE).

Holley, who graduated with a first class honours master's degree in architecture and environmental design from Nottingham University this summer, works at Buro Happold's Bath office.

Accepting the award, he said he hoped to learn as much as possible from his colleagues.

'In the long run, I hope to create projects that stimulate environmental sustainability and make a measurable difference to people's lives.'

'As an engineer, I believe I have a moral obligation to push the boundaries in terms

JUDGING PANEL

- **Tim Dwyer** CIBSE ASHRAE Group chairman
- **George Adams** CIBSE president
- **Bill Bahnfleth** ASHRAE president
- **Patrick Kniveton** IMechE president
- **Lee Tabis** Graduate of the Year 2012
- **David Hughes** Rumford Club chairman

Top row, left to right: Emily Woodhouse, Chris Iddon; Middle row: Kayley Lockhead, ASHRAE president Bill Bahnfleth, CIBSE president George Adams, William Holley, John Hughes; Bottom row: Carla Bartholomew, Bonnie Brooks, 2013 winner Lee Tabis, Sandra Camacho, Elinor Huggett, Kathryn Dryden



of design, to make sure people really enjoy where they work and live.'

The 22-year-old said that designing and building the school in South Africa inspired him to join the building services profession.

'Putting designs on paper is completely different to when you go on site and see them in context, and the effect they can have,' he said.

'Designing a building with no mains electricity and on a limited budget forced



PHOTOGRAPHS BY SIMON WEIR - WWW.SIMONWEIR.COM

Winners, runners-up and full shortlist

William Holley, winner

University of Nottingham and Buro Happold

■ Holley's passion for engineering and design was nurtured at the King's School in Grantham, where he was awarded the product design creativity award and elected head boy. He chose to study for an MEng in architecture and environmental design at the University of Nottingham, and this summer was awarded first class honours. His degree combined professional accreditation from both CIBSE and ARB/RIBA, spanning the historic divide between engineering and architecture. He now works as a graduate building services engineer in Buro Happold's Bath office.

Kathryn Dryden, runner-up

University of Sheffield and Atkins

■ Dryden graduated last year from Sheffield University with a first class master's degree in mechanical engineering with German. During her degree studies she spent a year living in Germany working at the technical University of Dresden. In her final year at Sheffield she was awarded the prize for best project. She joined Atkins' building services department in September 2012. Dryden is a Stemnet ambassador and an active member of both the London CIBSE YEN and the Greater London IMechE Young Members' Panel in addition to being the volunteer networking officer between the two institutions.

Emily Woodhouse, runner-up

University of Cambridge and AECOM

■ Woodhouse graduated from Cambridge University with a master's degree in structural, civil and environmental engineering, having already completed a BA in mechanical engineering. She joined AECOM as a Year in Industry student in 2007 and was subsequently sponsored while at university, returning to work for the St Albans office during summer holidays. She is now a graduate engineer in the Cambridge office, and is a member of the Sustainable Development Group. She has been involved in Stemnet activities, run by the University of Cambridge, aimed at getting eight-to-14-year-olds interested in engineering.

Carla Bartholomew

University of West of England and AECOM

■ Bartholomew completed a two-year part-time HNC in building services engineering at the City of Bath College with distinction and won the Young Achiever of the Year award 2009. She then enrolled on a part-time BSc (Hons) building services degree at the University of the West of England graduating in 2012 with first class honours. She is now a mechanical design engineer at AECOM and is chair of CIBSE Young Engineers Network (South West), and also sits on the CIBSE South West regional committee.

Bonnie Brooks

London South Bank University and URS Infrastructure and Environment

■ Brooks has recently graduated from LSBU

with a First Class BEng (Hons) degree in building services engineering. She studied part-time while working for URS and has progressed from trainee to senior electrical engineer, gaining wide experience in electrical design. Before joining URS, Brooks trained as an electrician and was the first woman apprentice at Devon and Cornwall Training Centre. She also worked for MITIE Engineering. She helps to promote electrical apprenticeships and regularly supports work experience students from local schools.

Sandra Camacho

Loughborough University and Colombia Green Building Council

■ Camacho is a civil engineer from Colombia. She received the highest marks in her cohort for her undergraduate dissertation on sustainable technologies applicable in her home country. In 2007 she was awarded a Young Engineers Scholarship from the German Academic Exchange Service allowing her to live in Germany and study international construction practices. In 2011, she was awarded the Santander Postgraduate Scholarship to study at Loughborough University where she achieved a distinction and won the Energy Institute award. Camacho is now working at the Colombia Green Building Council.

Elinor Huggett

University College London and Max Fordham

■ Huggett left the University of Bath with a BSc in mathematics in 2010, moved to Fiji to work for Architects Pacific, and then to Auckland for a stint with Structure Design. She returned to London to study for an MSc in environmental design and engineering at University College London, and graduated last year with distinction. Her dissertation – *'The effect of London's Urban Heat Island on overheating in night cooled office buildings'* – won an award at the 2012 NCEUB People and Buildings conference. She now works for Max Fordham.

John Hughes

University of Ulster and Semple & McKillop

■ John has recently graduated with a distinction in masters in energy and building services engineering from the University of Ulster. For his dissertation, he carried out a joint research project with the Belfast Hospital Trust to establish the potential energy, environmental and economic benefits of using ultraviolet germicidal irradiation in hospital HVAC systems. He took up the position of graduate engineer and BIM specialist with Semple & McKillop in June this year, having previously worked with the company for a year in its student placement programme.

(Shortlist continued overleaf)

This year's awards were sponsored by renewable heating and air conditioning supplier Daikin UK; boiler and water heater manufacturer Lochinvar; and ventilation specialist Ruskin Air Management

me to do a thorough climate analysis and embrace environmental design.

‘What I really enjoyed was integrating engineering rigour into the architectural design.’

‘I believe this holistic and sustainable design approach will be key to the industry when we have issues facing us, such as reducing energy usage in buildings and the incoming UK zero carbon building design in 2016 and 2019.’

Holley added: ‘Ever since I completed



The 10 finalists with David Fitzpatrick, sales director at Ruskin Air Management



Runner up
Kathryn Dryden

▶ this project, I've aspired to utilise my engineering skills, not only to design energy-efficient buildings, but spaces that really offer delight and beauty to the occupant. This was confirmed when I saw the happiness of the children when they first entered the classrooms.'

Holley said he wanted to 'design a legacy for the project and the community'. And a vital part of this process was educating people on how to use energy effectively.

Another important factor for Holley was the economy.

He said: 'There is considerable evidence that even simple building elements such as access to views and a comfortable internal environment can significantly reduce recovery rates in hospitals and improve productivity in offices.

'If you follow these things to create

a more sustainable built environment, I believe my fellow building services engineers and I really have the power and the huge social responsibility to be able to tap into the biggest global issues such as climate change, security and supply, and urbanisation.'

He added: 'I have a real ambition to be an ambassador for CIBSE and ASHRAE in utilising and promoting a sustainable and holistic design approach to make sure that I really encourage fellowship across the engineering disciplines and architecture to tackle these issues head-on.'

'I think if we manage to do this, we will be able to create projects that not only embody and stimulate environmental sustainability, but will make a measurable difference to people's lives. And that's what I want to do in my future career.'

William Holley accepting his award from ASHRAE president Bill Bahnfleth, left, and CIBSE president George Adams



Shortlist continued

Chris Iddon

Loughborough University and SE Controls

■ After graduating from the University of Nottingham in 1995 with a BSc in biochemistry and genetics, Iddon went on to complete a PhD in the regulation of cholesterol homeostasis at the University of Sheffield followed by a research post in developmental genetics. After six years in design management, latterly with Kier, he embarked on the Low Carbon Building Design and Modelling master's degree course at Loughborough University. As design manager at SE Controls, Iddon's work involves the development and application of innovative natural ventilation solutions.

Kayley Lockhead

Leeds Metropolitan University and NG Bailey

■ Lockhead began her apprenticeship with NG Bailey in 2009, completing a BTEC NC, HND and also a NVQ Level 3 to an exceptionally high standard. She qualified as a project engineer in 2011 and continued her education with a BSc (Hons) degree in building services engineering, which she completed in May this year with First Class Honours. Lockhead is working on a charity clean water project in Mozambique and was supported by CIBSE's Ken Dale travel bursary, which allowed her to travel to Africa this year.

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Feedback

ASHRAE president Bill Bahnfleth told young engineers that a focus on energy performance had been at the expense of indoor air quality. We put the question to CIBSE's LinkedIn board

Mike Barker

Prof Francis Allard said something similar when he opened the IBPSA Building Simulation 2013 Conference in August. He noted that there was more to building performance than just energy.

There seems to be a growing realisation that a building that uses little energy is of no real value if it is not a productive and healthy environment. The knee-jerk reaction to the energy crisis in the 70s were smaller windows and excessively recirculated HVACed air. Perhaps our current obsession with energy could lead us down the wrong path again?

In the big picture, you would be better-off using more energy if you could realise a building that amplified the abilities of its occupants. That is not to say that such buildings should be wasteful, though – energy efficiency is still required.

Schools are a challenge. There is no doubt we need to look to air quality, along with thermal, aural, visual and social comfort. And, all along, we thought we were just building services engineers

Simon Owen

This is something of a hot topic – looking at the buildings, the materials that go into them, and the environment created as a result.

I was at a very interesting seminar where Prof Dejan Mumovic presented his findings of a study he conducted comparing a Victorian School building to a modern BREEAM-accredited one. The findings were startling from an energy and health perspective, but also from how the building was used, compared to design.

Something I learned from the

event is that services engineers, architects, and structural engineers have never been able to work effectively in a silo (possibly despite best efforts) because of coordination issues. Now, they are even less able to because of the end-users' demands going beyond a building that doesn't leak, is cool in summer and warm in winter.

Kirsty Aldridge

Of course, having good air-quality doesn't necessarily mean high energy costs. With high efficiency heat recovery now available, it is possible to include ventilation systems introducing more than the minimum fresh air into a space without being penalised. It may cost a little more up-front but considerably less in the long run, while ensuring everyone is healthy and productive. There are alternatives out there – it doesn't always have to be one thing or another. Opening people eyes, minds and pockets to the trade-offs and benefits can be hard work, especially when they just see the bottom line.

Jim Kingston

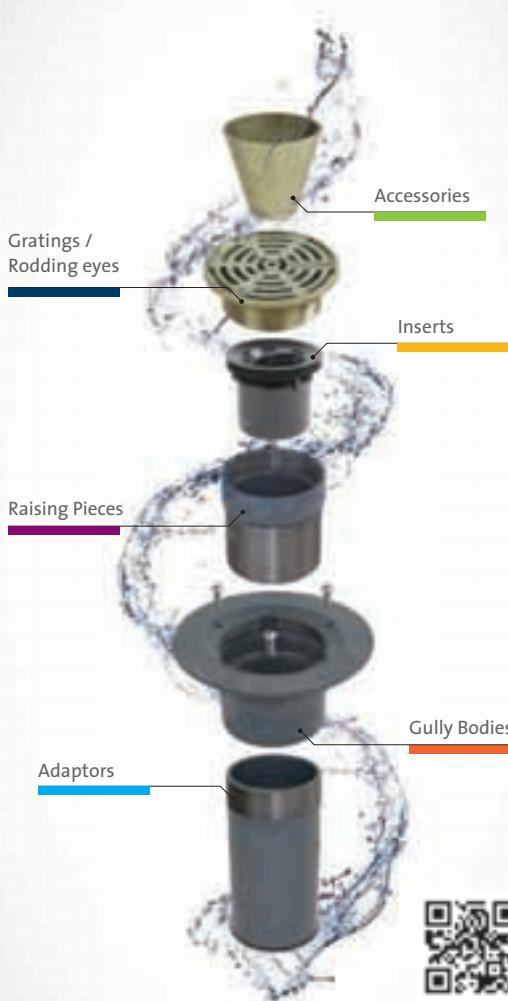
ASHRAE has made available its 'Indoor Air Quality Guide' for free. You can go to its website at the link below and download it (you only have to register to do this). Well worth a read:

www.ashrae.org

CIBSE Journal welcomes readers' input, whether it be letters, opinions, news stories, events listings, humorous items, or ideas and proposals for articles.

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TAXPAYERS COUNT COST AFTER LANDMARK CASE

In September, then housing minister Mark Prisk announced that taxpayers had to pay Landmark Information Group £5.7m in compensation. The government blames its predecessors: Hywel Davies asks whether that is justified

Inappropriate behaviour for government departments. A more legitimate way to make embarrassing confessions is a written ministerial statement on the Friday the House rises for the party conference season. On Friday 13 September, Mark Prisk – then housing minister – slipped out a statement about the government's contract with Landmark Information Group.

Landmark won a contract to run the national energy certificate register in 2007, extended to cover lodgement of air conditioning inspection reports in 2012. Thanks to the lower-than-expected level of certificate lodgement, Landmark's revenues are short of what it costs to run the register. The minister said this was a consequence of the poor contract negotiation skills of the previous administration. And as a result of their alleged incompetence, the 'government', or more precisely taxpaying *Journal* readers and their employers, have had to find £5.7m to compensate Landmark. Blaming the previous government makes for a good story, but it ignores several inconvenient facts.

The first is that the Department of Communities and Local Government (DCLG), responsible for the Energy Performance of Buildings Regulations (EPBR), which the register supports, admits it has no idea how many of the buildings that should have energy performance certificates (EPCs) have actually got them. On 18 June this year Don Foster, then Building Regulations Minister, said: 'The Department does not hold information on the number of new commercial leasing transactions, and so is unable to

estimate the proportion of new commercial leases granted together with a current [EPC]. So, some 63 months after EPCs became a legal requirement, DCLG had no idea how many people are obeying the law, although the coalition had by then run the department for the previous 37 months.

In November 2009 Andrew Murrison, then a shadow defence minister, asked a very similar question about the number of commercial buildings that should have an EPC. John Healy told him: 'There is no centrally held information upon which to base such an estimate.'

Mr Murrison should not have been surprised. In May 2009 Grant Shapps asked, 'how many fixed penalties have been imposed on landlords in each month since the [EPBR] took

effect in England?' Iain Wright, then Parliamentary Under-Secretary in DCLG, replied: 'Penalty notices are issued by local weights and measures authorities... There is no requirement for the department to be informed when a penalty charge notice is issued.'

Between 23 April and 12 May 2009, Mr Shapps had already asked a further 21 questions just about air-conditioning inspections in government buildings. When he arrived in DCLG as housing minister in 2010, he knew the EPBR regime was broken and unfit for purpose. More than three years after the coalition came to power, it still is.

So as long ago as May 2009, it was a matter of public record that the regulations are set up in such a way that the government has no idea how effectively they are being complied with. And the coalition has been in power for three of the four years since that information emerged.

They acted swiftly to abolish HIPs; surely they knew enough about the lack of compliance with the EPBR to have acted swiftly on that issue too. ➤



The government admitted as long ago as 2009 that it had no way of monitoring compliance with the EPBR

If DCLG does not know what level of compliance is being achieved, how can the minister blame the previous administration? Especially when it appears that the shortfall is not the fault of those who negotiated the contract, but a direct consequence of the failure of both this government and its predecessor to make appropriate arrangements to enforce these regulations.

Concerns about lack of compliance with the EPBRs have been articulated many times to DCLG in private. But there has been no attempt to tackle the problems of which either CIBSE, or our assessors, or any of the other energy assessor schemes – or many other property professionals – are aware.

The response from officials to appeals for action on EPBR compliance is that the government does not want to increase burdens on small businesses, and that enforcement is the duty of trading standards. But action to improve compliance with the EPBR is not burdening business. It may require those breaking the law to comply and pay the costs, but that is only asking them to pay their fair share, just like everyone else. Not enforcing the regulations quite clearly burdens every law-abiding business that both complies with the EPBR and has to compete with a cheating competitor which has not.

This is not just an appeal to enforce for the sake of enforcing. These regulations are in place in order to inform businesses about the energy efficiency of buildings, and to enable them to choose buildings that have the potential to save them money on energy bills. And the regulations also require both the public sector to monitor their actual energy use, and everyone who uses air conditioning systems to have them inspected. Again, the information they get can be used to inform and motivate energy efficiency actions.

The recast of the Energy Performance of Buildings Directive, which the Regulations implement, is quite clear that: 'Member States shall lay down the rules on penalties applicable to infringements of... this Directive and shall take all measures

necessary to ensure that they are implemented. The penalties provided for must be effective, proportionate and dissuasive.' It is hard to imagine the European Commission viewing the current situation as being any of those.

Proper enforcement of the EPBR is not a drag on growth, either. The CBI, not a noted supporter of business burdens, identifies energy efficiency as a means to boost overall business and economic competitiveness, and calls for government to step up its efforts to deliver coherent policies to support positive investments. Overall it estimates that energy efficiency could provide a £17bn market in the UK.

The lack of proper compliance with the EPBR is a burden on every taxpayer, and on every taxpaying business that has contributed to the £5.7m payment to Landmark. It's also a significant burden on Energy Assessors, who have invested in gaining the skills and government required accreditation for the role, only to find that role greatly reduced by endemic evasion of the EPBR, with the return on their training investment also reduced.

Many commercial energy assessors could also be accredited for the Green Deal. Very few have chosen to do so through lack of confidence in or expectation of that scheme ever providing enough income to justify it. Given the saga of the EPBR, can we blame them? When considering whether to become an assessor for the proposed Energy Savings Opportunity Scheme, many of those assessors will once again ask themselves why they should bother with that, either. Again, can we blame them?

The failure of compliance is also a burden on schemes, set up to accredit assessors in 2007–9, including that operated by CIBSE Certification, to provide government with the infrastructure for the implementation of the EPB Regulations. They were established on the basis of the figures provided by DCLG in its impact assessments, and all the schemes have lost out significantly from the complete failure to enforce the regulations. Yet



If DCLG does not know what level of compliance is being achieved, how can the minister blame the previous government?

none of these schemes, or assessors, is to receive any compensation from the taxpayer for the lower level of take-up of energy certificates.

The £5.7m payment to Landmark demonstrates not just the incompetence of the previous administration, but the failure of the enforcement and penalty regime operated by this government too. It demonstrates the enormous cost of passing regulations without effective mechanisms either to monitor compliance or to inform and direct enforcement. It debunks the myth that 'light touch regulation' which allows widespread non-compliance to go unchecked, lightens the regulatory burden.

Finally, it demonstrates why this administration, if it is serious about being supportive to small businesses, or being the 'greenest government ever', needs to move urgently to tackle the fiasco that is 'compliance' with the Energy Performance of Buildings Regulations. We need effective, persuasive and proportionate enforcement measures now.

Ministerial changes

In the recent government reshuffle, Don Foster moved to another post and Mark Prisk left the government.

HYWEL DAVIES is technical director of CIBSE www.cibse.org



WHAT NEEDS A CERTIFICATE OR REPORT?

Any building that is constructed, sold or rented out is required by the EPB Regulations to have an energy certificate. The best estimate that CIBSE has seen, which is also known to DCLG – although not in the public domain, suggests that in the commercial rented sector as few as two in five transactions have the required certificate. CIBSE is unaware of any intention to address this widespread non-compliance.

Any air conditioning system of more than 12kW effective rated output must be inspected, and the report lodged, every five years. There is considerable uncertainty about the number of these systems, but the lowest estimates, made in the 2007 Regulatory Impact Assessment for the EPBR, suggest at least 300,000, based on historic sales data for this equipment.

This implies 60,000 inspections a year, on average. Yet lodgement data is stubbornly stuck at around 1,000 a month, or 20% of what it should be. This represents a revenue shortfall of almost a quarter of a million pounds per annum, just on air conditioning inspections at the old lodgement fee.

For the full Written Statement on 13 September see <http://www.publications.parliament.uk/pa/cm201314/cmhsnd/cm130913/wmtext/130913m0001.htm> Column 67WS



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AFTER RACE TO SAVE ENERGY, IT'S TIME TO COME UP FOR AIR



With the recent drive to improve post-occupancy evaluation, indoor air quality should become as much a key performance indicator as energy use, says **Chris Iddon**



concentrations of other pollutants – many of which can be detrimental to health – are also high. Typically, these include volatile organic compounds (VOCs), mould spores, bacteria, viruses and other pathogens. Increased humidity and water vapour can also compound mould growth and lead to damage to the fabric of the building.

For many, it seems counterintuitive to open vents and allow warm internal air to escape and be replaced by cooler outside air, especially with the highly visible emphasis on saving energy. It is important to appreciate that – however provided – adequate ventilation comes at an energy cost, either through heat to temper, or through mechanical energy to distribute the fresh air.

With buildings becoming ever-more airtight to reduce uncontrolled infiltration, classrooms and the like are likely to be more prone to poor IAQ.

It is clear that improved education on ventilation for occupants, facilities managers and designers is required, so it is not compromised by the drive to save energy. The health, well-being and productivity of a building's occupants is paramount, so it is, therefore, important that measures to deliver adequate ventilation are not just provided, but monitored to ensure they are operating as designed.

Is it sufficient to just provide a means of ventilation, or should regulations and guidelines be improved to demonstrate that adequate ventilation is being met? IAQ should become as much a KPI target as heating energy use – otherwise what appears to be an energy reduction success story is simply concealing a failure in air quality.

Hopefully, the recent drive to improve post-occupancy evaluation will provide further data to help better understand both the performance of building ventilation and what is required to ensure that design intentions are being realised.

DR CHRIS IDDON is design manager at SE Controls

IThe importance of minimising heat losses and reducing energy consumption in buildings are, undeniably, key factors in construction design. Yet good ventilation – also an essential facet of good building design – is particularly important in relation to schools.

Back in 1874, renowned architect Edward Robert Robson recognised this issue and said in his book on schools design that: 'Warming and ventilation must be treated as inseparable or, at least, in the treating of one the other must be always present in our mind.'

So, have recent climate concerns and a drive to cut building energy use led to more focus on heating over ventilation?

Tall Victorian classrooms, designed to maximise daylight, have fallen out of favour over recent decades, as a consequence of the increased emphasis on reducing room volumes and the corresponding heat load, with the process of ventilation often derogated to the simple manual opening of windows or some other vent. This fact has been reinforced further by data collected from classrooms in schools that were a mix of early and mid-to-late 20th century construction. At a Midlands

school, for up to 34% of the year the average occupied CO₂ levels exceed the existing BB101 guidance of 1,500ppm.

During the heating season, this figure increased to 60%, indicating that these classrooms were often delivering inadequate indoor air quality (IAQ). On several occasions the CO₂ concentration surpassed the threshold limit of 5,000ppm. These results suggest that manually opened vents are not being operated to meet the needs of IAQ.

Numerous academic studies have shown that higher concentrations of CO₂ lead to poor task performance, which begs the question: is poor classroom IAQ negatively impacting on pupil performance and concentration?

Exhaled air is approximately 4% CO₂ by volume, and has a high water vapour content. At rest, each person produces approximately 0.25 litres of the gas per minute. The CO₂ concentration in an occupied room will continue to rise until a steady state is reached and – if ventilation is insufficient – the steady state concentration of CO₂ in the room will exceed guidelines.

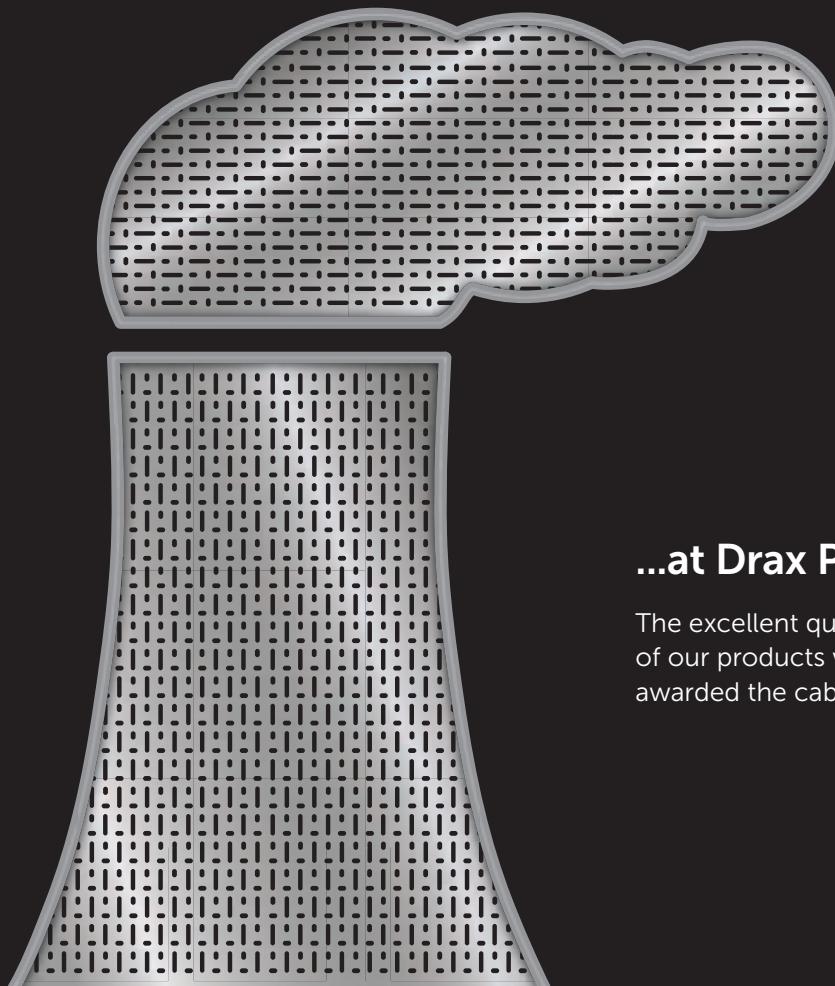
High CO₂ levels, caused by poor ventilation, are indicative that

There are numerous academic studies that have demonstrated that higher concentrations of CO₂ lead to poor task performance

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SUPERMARKET SWEEP?

The retail sector features prominently on the shortlist for the 2014 Building Performance Awards. **Liza Young** gets the inside track as 11 expert judges decide on the finalists

CIBSE BUILDING PERFORMANCE AWARDS 2014

Join the best of the industry talent and be there on the night to see who will scoop the awards. The glittering event, taking place on 11 February at London's Grosvenor House hotel, will see the industry come together in a night celebrating the achievements across the building services supply chain. Don't miss your chance to be there. To book a table, visit www.cibseawards.org

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The diversity and quality of entries in the Building Awards 2014, sponsored by Imtech, has been higher than previous years, according to chair of judges Hywel Davies, CIBSE technical director.

'The entry numbers were slightly down on last year,' he said. 'However, I would say that at least 10% of the entries last year were well short of our expectations. So, overall, the numbers were down, but the quality was up.'

He said the increased level of interest in the awards from the retail sector was notable.

'That certainly suggests the leading players in the retail sector are taking energy performance in their estates quite seriously.'

'In fact, people who are entering the awards are taking it more seriously than the CIBSE Low Carbon Awards five years ago – the building performance awards are not just about impressive design aesthetics, we want evidence of performance,' said Davies.

This year, there was an even split between categories that were clear-cut, and categories where the judges had a debate.

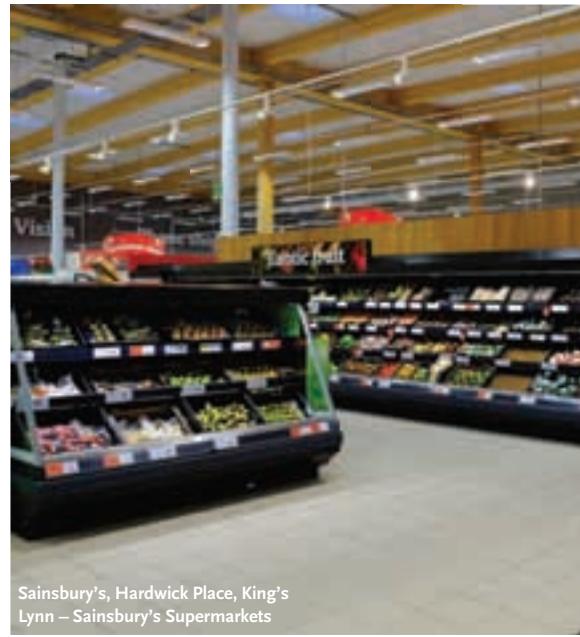
The panel spent time poring over the detail of the entries in the Building Operation category, which was the toughest to separate. Davies said it was the hardest to judge because there was 'really fierce competition'.

'We had more data about the performance of the buildings in that category than we ever had before,' he said.

'Many entries showed more honest and real data about the performance of the entry, but there's still room for improvement. It's important to get over that this is about performance not about PR – we want to award buildings that work.'

The panel was encouraged by several entries that were transparent in giving the whole story.

'We would far rather have entries that have



Sainsbury's, Hardwick Place, King's Lynn – Sainsbury's Supermarkets



Velodrome London 2012 Olympics – ChapmanBDSP





South Place Hotel,
London – Hoare Lea



Houghton Primary Care Centre, Tyne and
Wear – Breathing Buildings/Mott MacDonald



Marks & Spencer, Cheshire Oaks,
Ellesmere Port – Sustainable Design
Solutions/Marks & Spencer



Giant's Causeway Visitor Centre, Co Antrim,
Northern Ireland – Bennett Robertson Design

a story to tell, and give us warts and all, than a product where everything is perfect. We're not a bunch of perfectionists who are only interested in things that work the first time – because that doesn't exist.'

The Building Services Consultancy of the Year category stimulated a lively discussion. Although advertised as a single award, due to the diversity and quality of entries, the panel decided to split it into two categories – more than 100 employees, and up to 100 employees.

'I found myself feeling slightly sorry for the little ones. They're good, but they can't begin to compete with some of the big firms,' said Susie Diamond, founding partner of Inkling LLP.

Graham Manly OBE, business development director at Gratté Brothers, added: 'It's comparing apples and pears – how do you score one against the other? Why should they lose out against a multinational that has all singing and all dancing facilities.'

In the category for New Build Project of the Year (value over £10m, shortlist entrants pictured left), the judges praised the depth and quality of evidence provided in some submissions. 'All of them would be worthy winners,' said David White, managing director of Building Services Design.

The judges felt that some projects in the Training for Building Performance category were limited in scope and lacked innovation.

Manly said: 'Yes what they're doing is great, but does it warrant a prize when other companies are doing that all the time?'

The panel was impressed with the Client Energy Management award shortlist. It was pleased to see it had attracted entries from companies taking a long-term approach to cutting energy emissions and delivering significant savings year on year.

But some of the entries for the International Project of the Year award left the judges wanting.

Diamond said some entries failed to provide comparisons against a benchmark. 'It was just numbers – not good or bad numbers.'

Davies added: 'We're looking for people who are going to give us clear evidence that they know how well their building is working, and there's an ongoing managing process. It's like Peter Drucker once said: 'If you can't measure it, you can't manage it'.'

The category that attracted the most entries was Energy Saving Product of the Year.

Will Pitt, principal mechanical engineering manager at NG Bailey, said some entries could make a real impact on energy consumption.

The awards will be presented in London on 11 February 2014. **CJ**

6 The leading players in the retail sector are taking energy performance in their estates quite seriously

– Hywel Davies



THE JUDGES



Hywel Davies, technical director and chair of judges, CIBSE



Susie Diamond, founding partner, Inkling LLP



John Aston MSLL, vice-president, Society of Light and Lighting



Sarah Cary, sustainable developments executive, British Land



Paddy Conaghan MCIBSE, Consultant, Hoare Lea



David Fisk HonFCIBSE, CIBSE immediate past president



Graham Manly FCIBSE, business development director, Gratté Brothers



Foroutan Parand, technical director, URS



Michelle Perry, key account manager, Trox



Will Pitt MCIBSE, principal mech eng manager, NG Bailey



David White MCIBSE, MD, Building Services Design



SHORTLISTS FOR THE CIBSE BUILDING PERFORMANCE AWARDS 2014

BUILDING OPERATION AWARD

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- Exchange House, Broadgate, City of London - British Land/Broadgate Estates
- Harrods, Knightsbridge, London - Harrods
- MoD, Abbey Wood, Bristol - Debut Services (South West)

BUILDING SERVICES CONSULTANCY OF THE YEAR (OVER 100 EMPLOYEES)

Sponsored by Baxi Commercial



- AECOM
- Arup
- Grontmij
- Hoare Lea
- Max Fordham

BUILDING SERVICES CONSULTANCY OF THE YEAR (UP TO 100 EMPLOYEES)

Sponsored by Baxi Commercial



- Beattie Flanigan
- Beverley Clifton Morris
- CBG Consultants

CLIENT ENERGY MANAGEMENT AWARD

Sponsored by Lochinvar



- Aston University (Birmingham Campus) - Aston University
- British Land (Portfolio) - British Land
- M&G Real Estate Shopping Centres (Various UK) - M&G Real Estate
- UK Power Networks (Bankside Substation, London) - Arup

CLIENT OF THE YEAR

Sponsored by Imtech



- BBC nominated by Arup
- Harrods
- Sainsbury's Supermarkets
- Tesco Stores

COLLABORATIVE WORKING AWARD

Sponsored by Mitsubishi Heavy Industries Europe



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- Energy Management Team (Debut, the Defence Infrastructure Organisation and supply chain specialists) - Debut Services (South West)
- Finchley Memorial Hospital, London - Galliford Try Partnerships
- HVAC Roof Infrastructure, Harrods, Knightsbridge, London - Harrods
- Norland and EE

ENERGY SAVING PRODUCT OF THE YEAR

Sponsored by Spirotech



- Armstrong OPTI-VISOR - Armstrong Fluid Technology
- Ceiling Rose Motion Sensor - Adaptarose
- Dow Corning Architectural Insulation Module - Dow Corning
- EcoMESH Adiabatic System - EcoMESH Adiabatic Systems
- Energy Consumption Optimizer - Energy Intelligence Worldwide
- External thermal roller blinds - Alonso Marshall Associates / Enviroblinds
- GTEC Weather Defence - Siniat
- NUDURA Insulated Concrete Forms - NUDURA
- Supafil CarbonPlus - Knauf Insulation
- XBOXER XBC Heat Recovery Range - Nuaire

INTERNATIONAL PROJECT OF THE YEAR

Sponsored by Excool



- Aporti Palace, Milan, Italy - Studio Planning
- Chater House, Central, Hong Kong - Hong Kong Land
- Commonwealth Bank Place, Darling Quarter Sydney, Australia - Arup / Lend Lease
- Gardens by the Bay, Marina Bay, Singapore - Atelier Ten
- International Commerce Centre, Kowloon, Hong Kong - Kai Shing Management Services
- Parkview Green, Chaoyang District, Beijing, China - Ove Arup & Partners Hong Kong

NEW BUILD PROJECT OF THE YEAR (VALUE OVER £10 MILLION)

- Giant's Causeway Visitor Centre, Co Antrim, Northern Ireland - Bennett Robertson Design
- Houghton Primary Care Centre, Tyne and Wear - Breathing Buildings / Mott MacDonald
- Marks & Spencer, Cheshire Oaks, Ellesmere Port - Sustainable Design Solutions / Marks and Spencer
- Sainsbury's, Hardwick Place, King's Lynn - Sainsbury's Supermarkets
- South Place Hotel, London - Hoare Lea

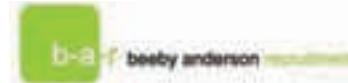
- Velodrome London 2012 Olympics - ChapmanBDSP

NEW BUILD PROJECT OF THE YEAR (VALUE UP TO £10 M)

- CarbonLight Homes IV, Kettering - VELUX Company
- Montgomery Primary School, Exeter - HamsonJPA
- Preston Manor Lower School, Brent - HLM Architects
- Si Yuan Centre, University of Nottingham, Nottingham - URS

REFURBISHMENT PROJECT OF THE YEAR (VALUE OVER £5 M)

Sponsored by Beeby Anderson Recruitment



- 199 Bishopsgate, London - ChapmanBDSP
- HVAC Roof Infrastructure, Harrods, Knightsbridge, London - Harrods
- The Brassworks, London - Belsize Architects
- Wiltshire County Hall, Trowbridge - WSP UK

REFURBISHMENT PROJECT OF THE YEAR (VALUE UP TO £5 M)

- Hollywood House, Woking - M&G Real Estate
- Hope Villa, London - Parity Projects
- Scotstoun House, South Queensferry, Edinburgh - Ove Arup & Partners

TRAINING FOR BUILDING PERFORMANCE AWARD

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- Better Building, Putting the Fabric First - Ecological Building Systems
- BREEAM Accredited Professional - BRE Group training
- Crack the Carbon - GEA Consulting / FreshWater Communications
- Green Stripes - Green Gauge Trust
- Harrods Multi Generation Apprenticeship Scheme - Harrods

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Every **TRICK IN the BOOK**

With its shimmering façade, Birmingham's new landmark library is a decadent nod to the city's glittering past. Thankfully, the ingenuity of the engineer means that the building's performance more than matches its head-turning appearance. **Andy Pearson** reports



-
- 6 While the façade makes a bold architectural statement, its impact on the environmental engineering was minimal



Looking for all the world like a gigantic pile of boxes stacked one on top of another, Birmingham's new library towers nine storeys above the city's Centenary Square. These boxed floors are veiled beneath a brash filigree skin of ornamental metal hoops – latticework that serves little purpose other than as an architectural nod to the city's industrial past and its role as a centre for jewellery manufacture.

Given its showy overcoat of architectural embellishment, what is surprising about Europe's biggest lending library is that it is a gleaming example of clever, low energy design. The £189m scheme not only creates a new focus for the city, but answers Birmingham City Council's brief for a library to have a BREEAM Excellent rating.

The design competition was won by engineers Buro Happold, working with Netherlands-based Mecanoo Architecten.

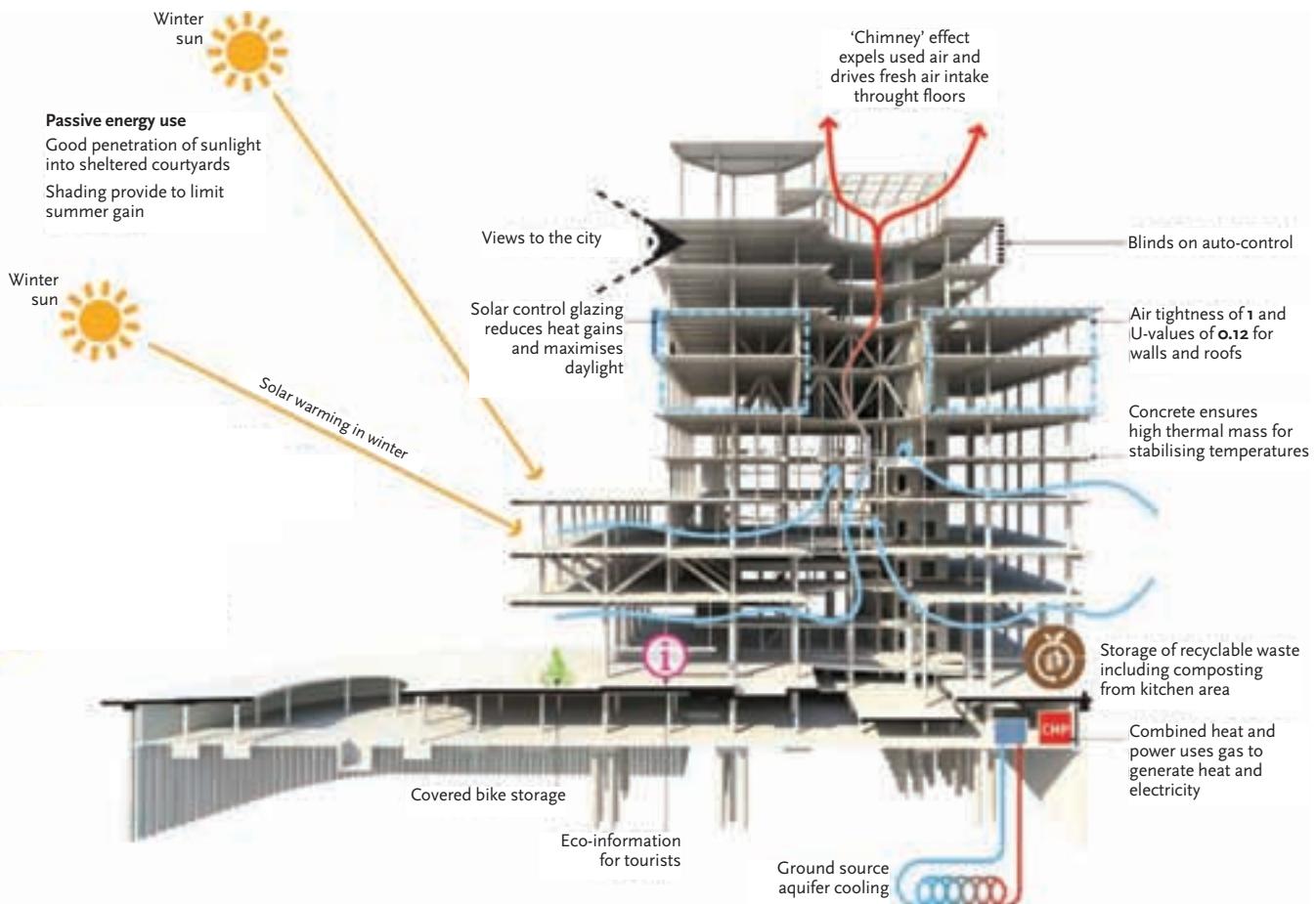
From the outset, the team set out to minimise the building's energy demands by maximising passive performance to deliver the brief in the most cost-effective way. 'We worked with the architect on developing the massing so that it had a positive impact on the way the building would perform,' says Sam Haston, building services engineer at Buro Happold.

Visitors enter the 39,000m² building, which opened in September, on the ground floor. From here they ascend an escalator through a circular atrium, formed by a series of off-set openings in the floorplates.

On their journey the visitor passes through the open-plan first, second and third floors, which house the bulk of the lending library's books. On the fourth floor is a closer space where the city's archivists work. Floors five and six house the archive repositories floor seven the offices, and floor eight is mostly plant space.



Watch a fly-through of the library on the app at cibsejournal.com/app or Android/web from cibsejournal.com



6 The chilled beams are kept cool by ground water pumped from an aquifer below Centenary Square

The building is crowned by a gold cylinder at level nine containing the Shakespeare memorial room. Below ground, the building has a mezzanine level and giant basement.

Form and layout resulted, partly, from the engineer's desire to maximise the potential of natural ventilation as part of the low-energy, mixed-mode ventilation solution. Critical to the design was a series of acoustic studies of the site and its surroundings, combined with a monitoring exercise to test air quality.

'The studies showed it was possible to naturally ventilate the building, with the exception of the north elevation, which is close to a major road,' says Haston.

As a result of these studies, the building is arranged with cellular spaces. Rooms requiring mechanical ventilation are located on its noisier north side, with the open-plan spaces on the east, west and south elevations. The atrium is the building's circular heart; the full-height opening helps drive Buro Happold's natural ventilation solution.

'A clear focus from our perspective was to position the spaces that could be naturally ventilated – such as the library and open-plan areas – near the bottom of the building where we could utilise the biggest stack effect,' Haston explains.

Clustering the open-plan spaces on the

first four floors of the building has enabled a hybrid, mixed-mode ventilation strategy to be adopted for these floors. 'The sealed archive spaces located above the open plan floors help drive the stack for the natural ventilated lower areas,' says Haston.

The British Standard was used as the basis for the archive design although there were a number of derogations made, such as moving air conditioning into the archive vaults, for reasons of space, energy and fire.

The strategy allows natural ventilation to condition the floors when external temperatures are between 13°C and 21°C. With the building open from 8am to 8pm throughout the year, Buro Happold estimates that natural ventilation will be possible for approximately 30% of the time. See Figure 1.

The mixed mode system has been designed so that when conditions allow, fresh air is introduced to the lower floors through openings above the ceiling. They are fitted with a weather louvre, a mechanical damper, and an attenuator, to help keep external noise out of the library. A louvred ceiling allows fresh air to enter the open-plan spaces. 'We needed a good stack ventilation system to be able to cope with the higher pressure losses from having to draw fresh air through the extensive louvre arrangement,' says Haston.

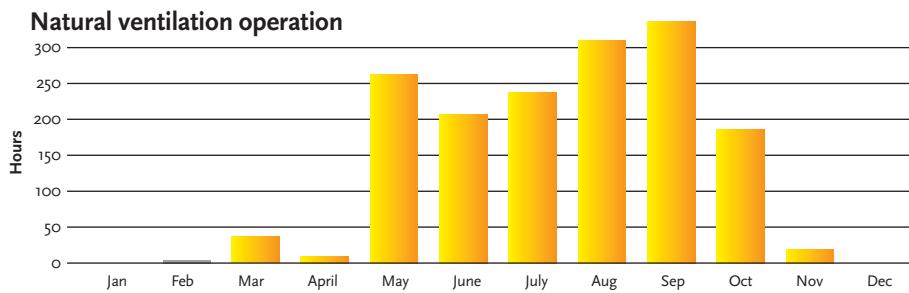


Figure 1: The number of occupied hours when natural ventilation can be used. Occupied hours were taken as 8am to 8pm, with the external temperature range for natural ventilation operation being 13°C and 21°C

Fresh air is pulled across the floors to the atrium. From here it rises up and out of the building through roof-level louvres. 'There was a lot of work and computational fluid dynamics (CFD) analysis done in trying to resolve the architect's desire for off-set openings in the atrium, against our need to provide an efficient path to draw the air up easily through the atrium,' Haston explains.

In winter, when outside air temperatures are too low to use the natural ventilation system, the roof-level louvres close. Fresh air is supplied to the reading rooms mechanically by a series of handling units, which are housed in the eighth-floor plantroom. Again, the atrium provides a return path for the warmed exhaust air. However, in winter, fans pull the air up through the atrium to the roof level where a heat exchanger recovers heat to

pre-heat the supply air, before it is discarded. 'It's an efficient solution to use the atrium as an exhaust air path, from both an energy and space perspective,' explains Haston.

Extra heat is supplied to the perimeter of the floors from trench heaters set into the raised access floors. Underfloor heating performs a similar role on ground and lower ground levels, which have no raised floors.

In summer, when external temperatures are too high to maintain comfort conditions using natural ventilation, the dampers shut off the façade fresh air intakes. As in winter, a mechanical ventilation solution keeps the spaces supplied with variable quantities of fresh air-based on measured CO₂ levels. Unlike winter, however, mechanical extract is not used in the summer, since there is no need to reclaim heat. Instead, the warmed

air will enter the atrium, where it is allowed to rise up and out through the roof-level louvres to minimise fan energy use. A night-cooling strategy helps cool the buildings post-tensioned concrete floor slabs to keep daytime cooling loads to a minimum.

Cooling is provided by chilled beams hidden above the slatted ceilings. They are kept cool by ground water pumped from an aquifer below Centenary Square. This subterranean solution supplies water at 14°C. According to Haston, the aquifer is capable of providing the library with up to 40kW cooling. He says this will be: 'enough to take the edge off the load at peak cooling duty and should be sufficient to meet the cooling demand at other times of the year'.

When the water temperature returning from the beams rises above 17°C, additional cooling is provided by the library's absorption chiller or from conventional chillers linked to roof-mounted cooling towers.

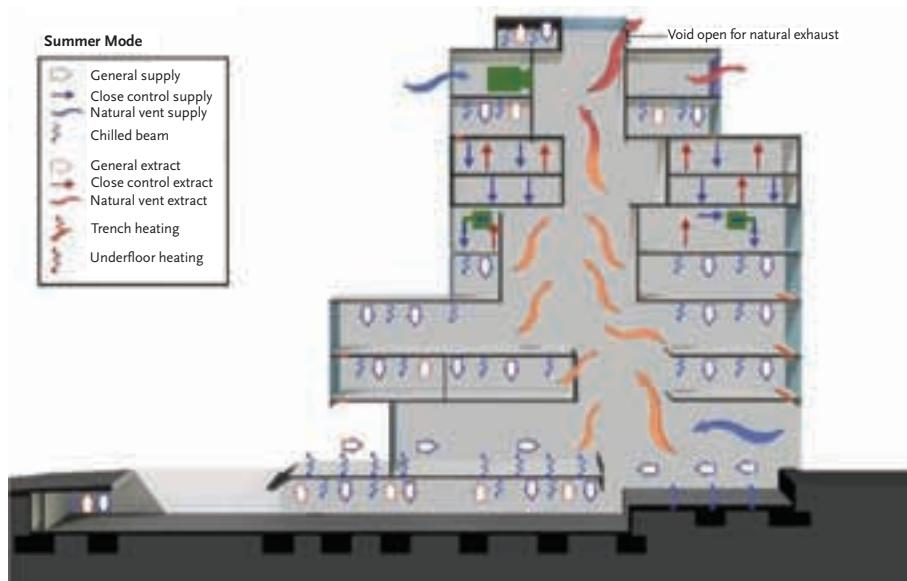
In contrast to the natural ventilation used for the lower floors, a more sophisticated close-control environmental control is used to protect the valuable material housed in the archive spaces on the building's upper floors. 'The archivists were adamant that they didn't want storage below ground, because they felt the precious material would be safer at the top of the building,' says Haston.

The archives are designed to have an air leakage rate of less than 1m³/hr/m² at 50Pa, which is considerably lower than the 5m³/hr/m²@50Pa of the main façade. Temperature and humidity are controlled in these sealed, highly insulated repositories using a mechanical ventilation system and mechanical cooling.

There are many archive spaces, each with a slightly different environmental strategy dependent on the contents. The large vaults, for example, have to be maintained at about 16°C, 50% RH +/- 5%. By contrast, there are smaller spaces that have to be maintained at conditions as low as 5°C, 40%RH.

Initially, Buro Happold's solution was to maintain the precise environmental conditions for each space, using a ducted solution fed from air handling units located two floors above, on the eighth floor. This scheme was abandoned in favour of individual close-control units located in each archive space, consuming less energy than the ducted solution and helping keep the service riser dimensions to a minimum.

Another significant benefit of changing to the in-room units for the archives was that it allowed the use of an oxy-reduction fire prevention system. This works by reducing



Summer environmental strategy: Warmed air rises up through the atrium and out through roof-level louvres to minimise fan energy use. See cibsejournal.com for the winter environmental strategy



ENGINEERING THE FAÇADE

The library is wrapped in a filigree of overlapping aluminium circles from the first to the eighth floor. The pattern consists of an inner layer of 1,800 mm diameter circles and an outer layer of 5,400 mm diameter circles.

The inner circles are assembled from aluminium extruded, curved, rolled, hollow sections (RHS), 100 mm deep, 50 mm high, and 4 mm thick. These interlocking circles are assembled from a series of quarter-circumference extrusions. Two quarter-circumference arches are attached to each other to form a leaf-shaped object and welded at each end. Four of these are connected through a bolted connection plate to form a four-leaf clover shape. The clover leaves are then connected to form a series of interlocking circles.

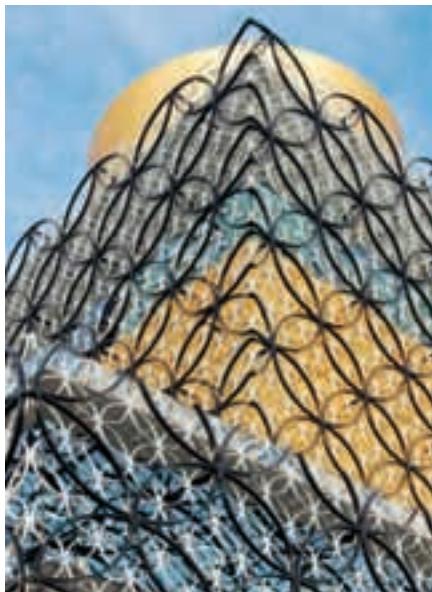
The outer circles, which are also extruded aluminium RHS (200mm deep x 100mm high x 5mm thick), are bolted through the smaller circles to the connection plates.

The frieze was pre-assembled into 5.4m high, 1.8m wide units, before being delivered to site. Gaskets and weatherproofing were provided at bolted connections to prevent water entering the RHS.

The bespoke façade beneath the metal gauze reflects the building's ventilation strategy. A thermally broken, unitised aluminium-framed flush curtain walling system is glazed with 4,000mm high x 1,800mm wide rectangular glass panes to give visitors glimpses out of the library over the city's skyline.

At the top of the building, where the archives are located, the glazing is replaced by opaque aluminium infill panels, while at the base, where it encloses the plantroom, the façade is louvred.

The life of the building is expected to be 50–60 years and the façade has been designed to achieve a similar lifespan.



the amount of oxygen in the rooms to a level too low for a fire to ignite. This is a much more effective solution for the precious archives than the alternatives of a sprinkler or gas suppression system. Both are triggered to operate only after a fire starts. Once triggered, the sprinkler system would seriously damage the archived materials. The oxy-reduction scheme also required much less space than the gas suppression solution, which would have needed an enormous floor area to store the bottles of inert gas.

Power for the in-room units is supplied by a combined heat and power (CHP) engine, which is housed in the library's basement energy centre. This gas-fired unit generates 725kW of electrical energy and 1MW of heat. The CHP is coupled to a 400kW absorption chiller, which will make full use of any excess heat. Supplementary heat is provided by

two 2.25MW high-efficiency gas boilers.

The library is connected to Birmingham's district heating network. This will not only provide an additional source of heating to the building, but will also enable excess heat generated by the library's CHP to be fed into the district heating system for use by other city centre buildings.

An illuminated read

While the façade makes a bold architectural statement, its impact on the environmental engineering was minimal. Computerised daylight simulations were undertaken by Buro Happold to enable room daylight factors to be calculated in response to the façade's intricate covering. Lighting is delivered to the levels recommended in the SSL Code for lighting using metal halide downlights. These are set out in a grid arrangement to provide background light levels to the floors.

The downlights grid is overlaid with smaller fittings, set closer together, to increase light levels on key areas like bookshelves and reading spaces. Break-out spaces and meeting rooms are lit with a combination of downlights and decorative circular rings of light that appear to echo the motifs of the building's façade. The downlight arrangement is continued out through the façade and on to the external entrance canopy.

To help visitors with navigation and orientation, the walls of circulation routes, stairs and lifts are all illuminated, as is the central escalator, which glows an electric blue. Feature lighting around the atrium is provided by the rotunda of circular book shelves, which are illuminated by LED lighting integrated into the units.

A central PC controls the lights based on the time of day, daylight levels, and occupancy, to minimise energy usage. To prevent the bling of the façade disappearing into darkness, the building is given a night-time presence using light fittings mounted at the back of the façade. These illuminate the circle patterns and wash the building in colour. The colours can be programmed by the DMX control system to form a backdrop for events in Centenary Square, ensuring that, even at night, the building can still maintain a brash presence. **CJ**



PERFORMANCE AS DESIGNED

Predicted regulated energy consumption
160kWh/m²/a
Regulated carbon emissions 19 kgCO₂/m²/a
EPC rating: B

ENERGY EFFICIENCY: A TEAM EFFORT

The right team right from the start is essential to energy efficient building projects, says Bill Wright, ECA head of energy solutions



Integrated approach

Whether it's a new build or a major refurbishment project, the secret to a highly energy efficient building is a team philosophy; and the collective expertise of building services professionals working together to produce the design brief.

With many active energy efficiency measures built into the fabric and infrastructure of a building, early decisions in the design process will determine how energy efficient a building will be.

This means shifting the construction approach away from the classic client-architect-contractor arrangement to a more holistic process, where electrical contractors are part of the multidisciplinary team who consult as a unit at the planning stage.

BMS

Including a Building Management System (BMS) in the specification is becoming an increasingly essential step in energy management; BMS allows control of lighting, heating and ventilation systems in a pre-programmed sequence or to reflect building usage.

A full building refurbishment or new build offers an opportunity to install or optimise a BMS, together with central timers or occupancy switches to control not just lighting and heating, but also small powered items across a building. When properly

planned early in the design phase, this allows the building to use energy in the most efficient way.

Responsive

Plans should be responsive to the external environmental climate, while still meeting the needs of those who will eventually use the building.

Any brief must include a requirement for energy efficiency, backed by targets for energy consumption (kWh/m^2 p.a.) and power density (W/m^2). This should sit alongside specifications for particular energy efficient equipment, such as variable speed drives; or energy sources, such as solar panels or combined heat and power systems.

The end user

It is important to keep things simple for the end user - regardless of whether the project is retrofit or new-build. Easy-to-use energy efficiency measures are more likely to be used, and used correctly. Also avoid overspecifying; even in a high energy-use building, such as a major hospital, building services will spend most of their life at part load, so consider efficiency under those conditions.

Winning formula

With their specialist knowledge of electrical systems and energy outputs, electrical contractors can advise how the building should be constructed or adapted to use energy intelligently, minimising its eventual running costs.

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BLOWING IN THE WIND

This year's Napier Shaw Bronze medal for highly rated research was awarded to a paper by **Mike Barclay, Steve Sharples, Jian Kang and Richard Watkins**, which looked at the impact of warmer temperatures on natural ventilation design

CA more important issue was the clear increase in overheating with all the future weather data sets

The majority of buildings in the UK still rely on natural ventilation as a key environmental control mechanism to maintain comfortable internal air temperatures in summer. Natural ventilation is driven by wind forces (pressure differences) and buoyancy forces (inside-outside temperature differences).

In a warming world, outside summer air temperatures will often exceed recommended internal comfort temperatures, making natural ventilation by buoyancy forces more problematic. Do future wind climate scenarios offer any hope that natural ventilation can still be a viable summertime cooling strategy? And how does the choice of future scenario influence the effectiveness of natural ventilation?

In the paper, Barclay, Sharples, Kang

and Watkins investigated the potential consequences of alternative climate scenarios for the natural ventilation of buildings¹.

The study was part of the Engineering and Physical Sciences Research Council (EPSRC)-funded project *Cope* (*Coincident Probabilistic Climate Change Weather Data for a Sustainable Built Environment*),

They considered future natural ventilation rates in modelled example buildings, the risk of summer overheating and whether natural ventilation will be a viable thermal control option for future summers.

The wind is obviously a key driver of natural ventilation, and a necessary component of building simulation weather files. However, perhaps surprisingly, wind data was not included in the latest UK Climate Projections (UK09). This led to a range of methods being used to produce the necessary wind information for the climate weather data sets used in building simulation.

What these different approaches meant for building evaluation was an important subject for the investigation. One data set was found to give a small – but consistent – increase in air exchange rates. A more important issue was the clear increase in overheating with all the future weather data sets.

Dynamic thermal modelling, using DesignBuilder, was employed to see how the different estimates of future wind speeds affected the predicted ventilation rate of a

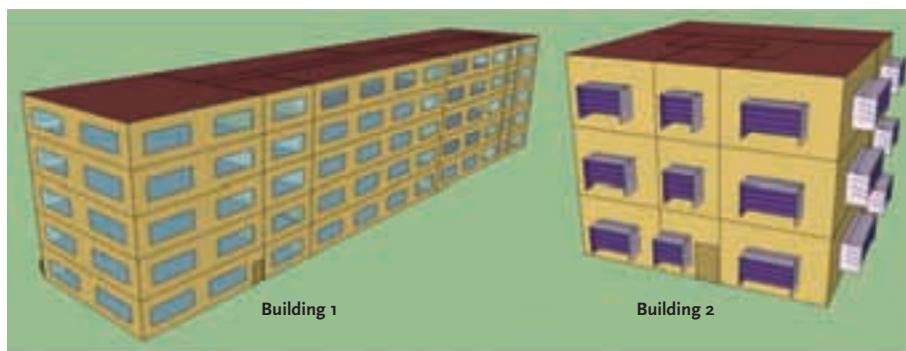


Figure 1. Buildings used for the comparison of weather data

typical office building (Building 1, Figure 1). It was found that the ventilation rates resulting from the Prometheus² project gave consistently higher ventilation rates than those from the Copse and CIBSE datasets. The difference was between 0.1 and 0.9 air changes per hour (ACH) and could help avoid the need for mechanical ventilation. At present, it is not possible to say which estimate will be more reliable as a predictor of future wind speeds.

Overheating was investigated using the same building, which employed a range of passive measures, such as solar shading (Building 2, Figure 1). Overheating was judged with both the 28°C threshold for overheating and adaptive comfort. Each showed clear increases in overheating as the warmer climate scenarios were used.

There was a range of overheating performances for the different weather files but, overall, overheating was consistently above the guidance for all future scenarios. The most variation in the results was seen for the UKCP09 data sets (Prometheus and Copse) and a steadier increase was seen for the UKCP02 (CIBSE) weather data.

With the extreme 2080 High Emissions scenario, there was a worryingly high level of overheating – 15% to 20% of the occupied time above comfort thresholds. These results call into question whether natural ventilation would continue to provide acceptable environmental conditions without assistance from mechanical cooling systems during some part of the year, for example, a ‘mixed mode’ approach to cooling.

The increase in overheating encourages the adoption of mechanical cooling and increases the proportion of time that windows are opened for natural ventilation. Building users are inhibited from opening windows if the external environment is noisy but may accept a degree of external noise for a small portion of the year if that reduces internal temperatures.

Noise reduction measures can increase the use of natural ventilation, if applied carefully to a building. The energy saving

potential of noise reduction measures applied to ventilation systems can be about a third of the mixed mode cooling³. This is due to using more natural ventilation through the year than would otherwise be acceptable.

Even though a warmer climate should reduce the effectiveness of natural ventilation due to smaller temperature differences, when viewed over a whole year, the overall cooling effect due to natural ventilation increased with warmer climates. This is due to increases in the time windows are open – increasing the overall airflow through the year⁴.

This does not help at times of peak need, such as a heatwave, but it does suggest that this year-long cooling resource should not be ignored. The ranges of climate scenarios underline the need for flexible solutions. The challenge is to allow occupants to maximise their access to natural air exchange through systems with noise reduction and the flexible control of mixed mode cooling. **CJ**

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NAPIER SHAW BRONZE MEDAL

Each year, CIBSE can reward two papers that have been deemed to be the most highly rated published in the year relating to research – the Napier Shaw Bronze Medal; and relating to application and development – the Carter Bronze Medal. In recent years these have been selected from those published in *Building Services Engineering Research and Technology* (BSERT) – the peer-reviewed journal of CIBSE that covers all areas (aside from lighting technology) of energy and environmental services in buildings.

The first recipient of the Napier Shaw award in 1949 was Thomas Bedford whose writings (notably in his 1948 book *Basic Principles of Ventilation and Heating*) considered the needs of the occupant as the cardinal pre-requisite for effective design – any technology simply being a contingent requirement.

This is seemingly a lesson often ignored by some of the intervening excessively serviced solutions, but a strategy that is seeing a latter-day revival in some of the exciting modern ‘passive’ designs.

The first Carter Bronze medal was awarded to Derrick Braham in 1982 for his paper on *Heating systems for well insulated buildings* – clearly a treatise ahead of its time and maybe a portent of things to come. Although it would be interesting to know what defined a ‘well’-insulated building some 31 years ago.

This year's Napier Shaw Bronze medal is awarded to *The natural ventilation performance of buildings under alternative future weather projections* by Michael Barclay, Steve Sharples, Jian Kang and Richard Watkins (see page 15 for awards ceremony at the annual President's dinner).

The Carter Bronze Medal was awarded to YH Yau for *Climate change implications for HVAC&R systems for a large library building in Malaysia*.

Both full papers may be viewed online at <http://bit.ly/H3qRFv>. For a short time they can be retrieved openly by anyone, including non-members, from the BSERT website. CIBSE members can access BSERT papers at any time as a benefit of membership, via the CIBSE website at www.cibse.org.

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BREAKING *the* SOUND BARRIER

When you're designing and building Europe's biggest urban shopping centre, you need a mega sound system to match. Vic Swain explains how Westfield Stratford City was successfully wired for sound

A vast 1.9m ft² development serving a catchment area of more than four million people – the £1.8bn Westfield Stratford City retail project is the largest urban shopping centre in Europe.

The sheer scale of it is like nothing we have seen before and required those involved in its creation to use all their experience and talent in their separate fields to bring the project to fruition, on time and to exacting standards.

System design

The public address system for a development of this size and complexity requires detailed acoustic modelling before any thought of system design and equipment specification can be entertained. Mechanical and electrical (M&E) contractor Essex Services Group engaged acoustic consultancy AMS Acoustics to work jointly on the project with UK systems company, PEL Services. AMS was responsible for specifying the system performance requirements and PEL for determining the constituents of the system and its configuration.

The first key stage of the process involved AMS taking the architectural plans detailing building materials, surface finishes and so forth and, using proprietary and in-house development design software, undertaking acoustic modelling of the entire retail complex. AMS identified six acoustic areas: two main areas (the Northern Mall and Central Arcade) and smaller ones, such as

lift lobbies and the welcome halls.

Loudspeakers were then entered into the software program to allow the computer to predict speech intelligibility. This is done by means of high-resolution ray tracing, which systematically probes each surface within the computer model. This assimilates the raw data required to fine-tune the system, and acoustic properties to optimise music and speech reproduction. This laborious, yet vital, exercise demands the enormous processing power of three six-core computers, with each trace taking more than two days to generate the resultant data.

From here, AMS was able to specify the sound pressure level (SPL) required and the speaker placement, allowing AMS to confirm the suitability of PEL's loudspeaker selection and system architecture.

With a system of this size and complexity, a digital system running across a dedicated fibre-optic network was chosen, using a network configuration, rather than having all system elements connected to a central controller. This architecture gives real freedom in system design.

The 'daisy-chain' network topology means system elements can be connected to virtually any point and any type of equipment, to be located wherever most suitable in the building (for example, power amplifiers closer to loudspeakers). What's more, by connecting the network ends together, a 'redundant' loop is created so any break in the cable does not affect operation – an important consideration in an emergency system.





PAOLO COCCINI / SHUTTERSTOCK.COM

This digital system was specified to drive the cabinet speakers for the main mall, with ceiling speakers installed at the lower levels. Modular ceiling loudspeakers were used in the smaller locations, such as welcome halls and communal areas.

The system is designed to be controlled from two independent fire command centres via a multi-zone microphone console and graphical user interface (GUI). It is interfaced with a number of 'packages', including the fire detection system, the centre's own radio station and a special events package.

Challenges faced and overcome

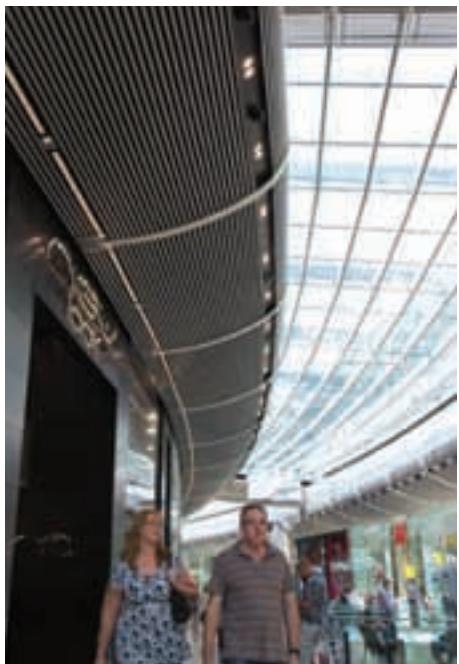
Once specified, PEL produced system schematics and calculated the amplifier (50,935 watts in total) and battery power required to maintain it in the event of mains failure. To replicate operating conditions and thoroughly trial its performance, the entire system was set up in an empty warehouse. It was then witness-tested by the client and professional team, before handing over the detailed specification to Essex Services Group for them to install the loudspeakers.

Once it was installed, commissioning of the system was carried out and operator training provided.

But it was not just the scale of the public address and voice alarm (PA/VA) system that posed challenges; other aspects that had to be considered included the acoustically hostile environment that a shopping centre poses, and how to make a system perform to satisfy two separate – almost mutually exclusive – requirements.

FAST FACTS

- 250 shops
- 70 dining facilities
- 3 hotels
- 1 casino
- 1 cinema complex
- Extensive office space



6 A development of this size and complexity requires detailed acoustic modelling before any thought of system design and equipment specification can be entertained

For example, all PA/VA systems in a retail environment are used partly for ‘performance’, such as music and messages, but with the emphasis given to life safety – that is, voice evacuation. Typically the ‘performance’, in respect of clear, intelligible enunciation of the safety messages, is compromised by the desire for good bass response to satisfy the ‘entertainment’ quality. Clearly Westfield Stratford City did not want safety compromised under any circumstances, but it did want the performance aspect to play a far more prominent role than is usual.

While it is exceptionally difficult to achieve, it is possible when all members of the team collaborate.

When, at the early acoustic modelling stage, it was not possible to find an equipment-based solution to audio intelligibility, AMS worked closely with the architects to solve the problem, even advising on changing building materials and adapting the building design where necessary.

AMS Acoustics refers to this aspect of a building’s design as ‘aural aesthetics’. Modern architectural design often focuses on open spaces and bringing light into the building, using materials such as metal, glass, and marble. However, these can cause rampant acoustics – the sound literally bounces off the surfaces and reverberates, making it difficult to communicate and, in the worst case, making the space an unpleasant place to be.

At Westfield Stratford City, a very good working relationship was established with the architects, who were very receptive to AMS’ advice. In the top Northern

Mall, for example, the plan was to put speakers behind ‘ribs’ in the ceiling. This compromised the system performance, so discreet insertions were made in the ribs for the speakers, overcoming the problem. Additionally, in the central mall, acoustic absorption material was added to the ceiling to good effect, without adversely affecting the overall visual element.

The main malls proved challenging, given their height and the number of levels. The danger posed here was incoherent sound merging from these different levels, but we overcame this with skilled use of delays. AMS calculated the signal delay required and PEL set the individual delays and equalisation (EQ) of each amplifier.

The system proved so good that Nicole Scherzinger’s performance at the official opening ceremony was fed through the centre’s PA system, in preference to the dedicated system hired specifically for her. This had the benefit of allowing the singer to be heard – not only by the assembled dignitaries within a localised area – but by everyone throughout the centre.

The other main acoustic challenge came from exceptionally noisy giant extractor fans used to remove smoke and fumes in the event of a fire; this is a case of one life-safety device negatively affecting another – in this case the VA system. With the higher than anticipated sound output of the extractor fans, it was evident that they would drown out the VA system. The generally accepted maximum sound pressure level (SPL) for noisy public areas is 90 dBA. But to overcome the output generated by the fans, 93 dBA was a critical requirement, and so the solution was to go bigger and louder, with twice as many amplifiers used.

Experience counts

The PA/VA system at Westfield Stratford City is a testament to the quality of the equipment used, and to the expertise of those involved in system design, specification and installation. From the acoustic modelling and speaker placement, to the equipment specification and calculations, the testing, commissioning – and even the logistics involved in such a large system – every part of the system design had to be pre-planned and scrutinised to provide Westfield with a PA/VA system to be proud of. **CJ**

VIC SWAIN is engineering director of UK systems company, PEL Services.



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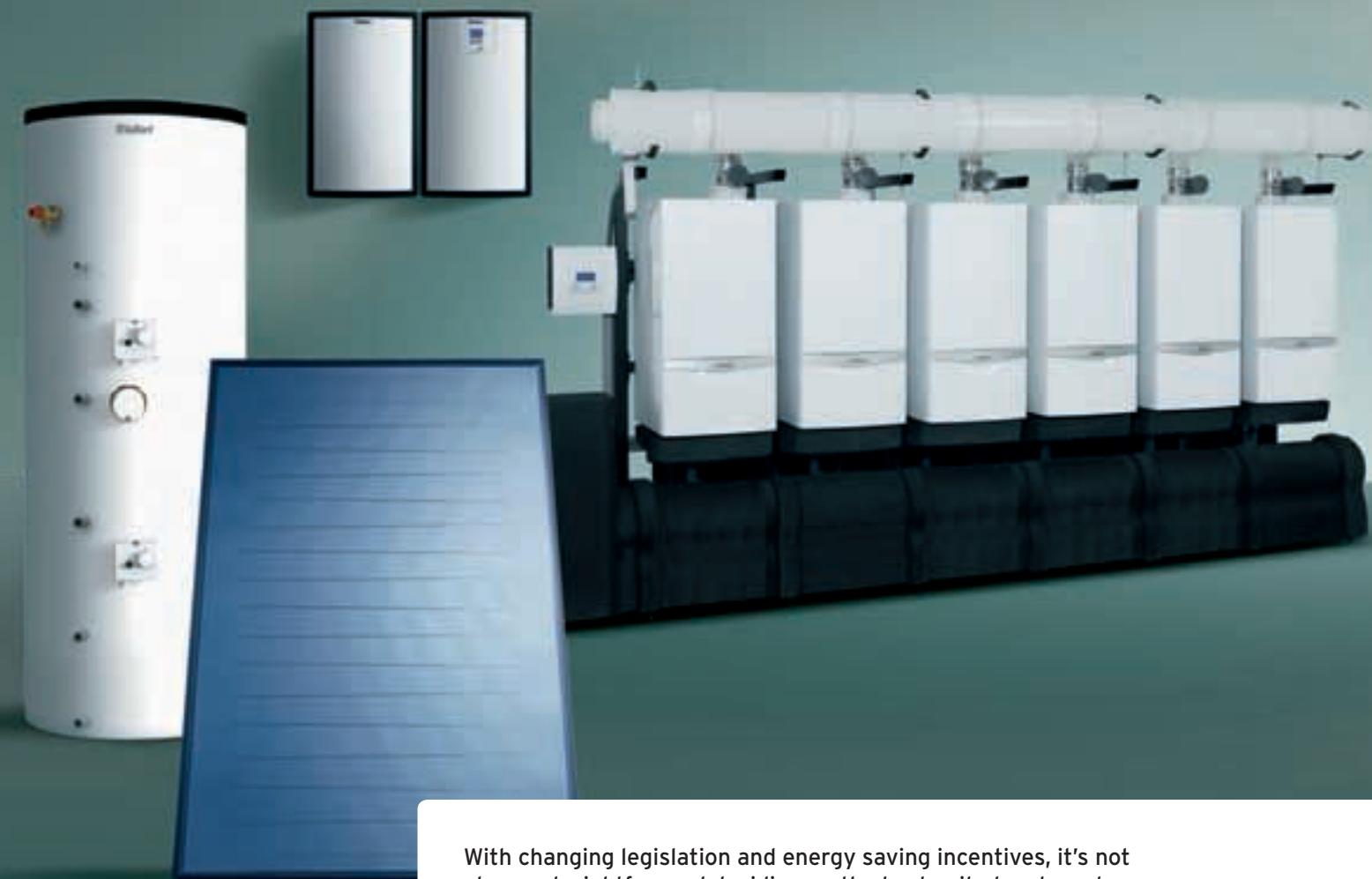
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CARROTS *or* STICKS?

As the government limps towards its carbon reduction commitments, *CIBSE Journal* and Vaillant convened a roundtable to debate how industry can drive a truly 'green deal' for energy-efficient buildings. **Andrew Brister** reports

The Labour Party stole the headlines in the recent conference season with plans to freeze energy prices if it wins the next election.

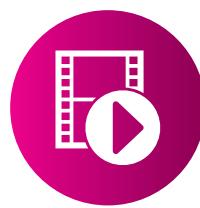
Another way to avoid soaring fuel bills and that's to improve energy efficiency. And with the landmark report from the UN's climate panel saying scientists are 95% certain that humans are the 'dominant cause' of global

warming since the 1950s, it's about time that energy efficiency grabbed the headlines.

With the government making slow progress towards meeting its carbon reduction commitments, *CIBSE Journal* and Vaillant convened a roundtable to debate how industry can drive a truly 'green deal' for energy efficient buildings in the UK. There is no shortage of drivers in the

WHO'S WHO AROUND THE TABLE

- **John Bailey**, commercial and renewables systems director, Vaillant
- **Mark Barson**, renewables technology manager, Vaillant
- **Marcos DeCastro**, managing director (London), Crofton Design
- **Tim Dwyer**, *CIBSE Journal* technical editor and UCL teaching fellow (chair)
- **Zachary Gill**, energy solutions engineer, Willmott Dixon
- **Richard Jenkins**, managing director, Ecolution Renewables
- **Farah Naz**, senior engineer, sustainability, Ramboll
- **Chris Twinn**, director and Arup Fellow
- **Aseai Zlaoui**, energy and environment manager, Harrods



WATCH NOW

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‘In a market-based system there has to be market demand and that is lacking

Chris Twinn

‘People do not know about the Green Deal

Zachary Gill

‘The simpler the system is to grasp, the more successful the scheme will be

John Bailey

► marketplace: the Green Deal, the Renewable Heat Incentive, Feed-in Tariffs to name but a few. Equally, there are many sticks, such as Part L of the Building Regulations and the Code for Sustainable Homes. Yet, they don't seem to be having the desired effect. ‘There is a disjoin somewhere,’ said roundtable chair Tim Dwyer. ‘In the 1990s, the amount of energy used in homes worked out about 8 MWh per annum, per capita. Despite all the legislation, the figure is exactly the same now.’

Marcos DeCastro, managing director (London), Crofton Design, argued that the data shows the drivers are working, but not fast enough to meet the carbon reduction targets that are in place. ‘The carrots and sticks are not big enough and there is not enough benefit to be had.’

Chris Twinn, director at Arup, thought there were two problems: ‘It's a lot more

complicated to get hold of the funds that are available through grants than it is elsewhere and – in a market-based system – there has to be market demand and that is lacking.’

‘The end-user suffers from the fatigue of constant change,’ said Aseai Zlaoui, energy and environment manager, Harrods. ‘Nothing gets a chance to bed in.’

Simplicity was seen as key to any incentive scheme. ‘The simpler the system is to grasp, the more successful the scheme will be,’ said John Bailey, commercial and renewables systems director, Vaillant. He cited the recent boiler scrappage initiative as one that had captured the public’s imagination.

‘The big piece that is missing is education,’ said Richard Jenkins, managing director, Ecolution Renewables. ‘The public want to reduce their energy bills but they



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‘The end-user suffers from the fatigue of constant change’
Aseai Zlaoui

‘The carrots and sticks are not big enough and there is not enough benefit to be had
Marcos DeCastro

have to see that they can do that with the Green Deal.'

By the dozen

While there has been some success with the Green Deal in terms of initial energy assessments (some 71,200 up till the end of August), only 12 schemes have installed energy-saving equipment so far. Perhaps many are purchasing equipment but have found more advantageous loans with better interest rates outside of the Green Deal.

‘People do not know about the Green Deal,’ argued Zachary Gill, energy solutions engineer, Willmott Dixon. ‘When you have a proper discussion with the homeowner about energy and comfort there is a lot of enthusiasm for it, but the majority – more than 90% – don’t know about it.’

‘It’s important for people to see a

reduction in their energy bills,’ said Mark Barson, renewables technology manager, Vaillant. ‘The path is complex and it’s up to us to make that path clear.’

‘What we need is a focused, national campaign,’ said Chris Twinn. ‘There’s a lack of a coherent, single message as the government has left it to the scheme providers to promote.’

Other countries do things differently. Take Oregon in the United States, for example. In two years, its green energy scheme has more than 2,000 schemes up and running. There, only 51% of the loan has to be for energy-saving measures; the remainder could be for home enhancements such as a new kitchen, thereby incentivising the homeowner.

Farah Naz, senior engineer, sustainability, Ramboll, gave another example: Copenhagen. ➤

‘In the 1990s, the amount of energy used in homes worked out about 8 MWh per annum, per capita. Despite all the legislation, the figure is exactly the same now

Tim Dwyer



6 We could look at tax discounts to make people look at their business holistically
Farah Naz

6 The big piece that is missing is education
Richard Jenkins



6 It's important for people to see a reduction in their energy bills
Mark Barson

ACTION STATIONS

Original thinking from the experts

Apply the 15-minute rule You have 15 minutes to say how the end user wins – you have to sell it to them that it's in their interests to do it

National campaign There should be a national campaign to highlight the benefits and to deliver a compelling story

Tax breaks Incentives for take-up, in the form of tax discounts, would make people look at their business or home holistically

Government-sponsored manufacturing Could the government set up a company to manufacture goods to reduce the cost of materials like solar PV and other renewables? This would bring the base costs down and start to make the Green Deal more attractive

► 'Copenhagen has a strong social sustainability agenda so it will look at how an environmental measure impacts on living conditions. So why don't we review those 12 projects and look at the impacts socially?'

The 15-minute rule

So what solutions could the panel suggest to drive take-up of the green agenda? Marcos DeCastro wanted something radical: 'The government could set up a company, like the Hudson's Bay Company or the East India Company, to manufacture goods to reduce the cost of materials like solar PV and other renewables. If we do that, we bring the base costs down and start to make the Green Deal more attractive.'

Farah Naz suggested creating some kind of incentive for take-up. 'We could look at tax discounts to make people examine their business holistically.' Equally, on the homefront, this could apply to council tax.

Chris Twinn proposed a solution to the complexity inherent in schemes such as the Green Deal.

'We need to apply the 15-minute rule,' he said. 'You have 15 minutes to say how the end-user wins – you have to sell it to them that it's in their interests to do it. There should be a national campaign to highlight the benefits and we need to deliver a compelling story. We are just not able to



get that across at the moment. If we can't explain it to them in 15 minutes, how can they explain it to a neighbour?'

There is already much case study evidence – from schemes such as Retrofit for the Future – which could be used to provide data on the benefits and the energy and cost savings.

Whether the UK has the audience for such messages remains to be seen. Clearly, our approach as a nation to energy, the environment, and social issues, appears to be very different from the citizens of Oregon and Copenhagen talked about here.

With the government's commitments to reduce carbon and increase renewable energy production looming large on the horizon, it would do well to listen to the calls coming from around the table. **CJ**

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DO WHAT IT SAYS ON THE TIN

A new system of efficiency reporting on heating products is what is needed to reduce the 'energy performance gap' on refurbishment projects, argues Remeha Commercial's **Mark Northcott**

As our demand for energy continues to grow, an increasing number of experts are calling for more progress on the adoption of energy efficiency measures to deliver energy and carbon savings. Given the question mark that hangs over the UK's national energy security and the powerful environmental, legislative and financial reasons to reduce our high-energy consumption, improving our energy efficiency – our 'fifth fuel' – is crucial. With a reduction in energy consumption comes a corresponding cut in carbon emissions. The government has set the

UK a steep carbon reduction target of 80% by 2050. As buildings are responsible for nearly 50% of the UK's carbon emissions, improving their energy efficiency is essential if we are to achieve this goal.

Despite the focus on new build design and development, the bulk of the problem lies with our existing building stock. According to the Building Research Establishment (BRE), of the buildings that will be standing in 2050, 60% are already built and 40% will pre-date 1985, the year when Building Regulations relating to the conservation of fuel and power (Part L) were first introduced. The real challenge in the UK is refurbishing these buildings, as minimum compliance with Building Regulations alone will not achieve the scale of carbon emission reductions now required.

The Carbon Trust reports that space heating and hot water generation account for around 60% of a building's total energy use and some 40% of our greenhouse gas emissions, so addressing heating is a good starting point. While the UK's long-term goal is to generate energy from renewable sources, many of our old existing buildings ➤

6 Around 90% of the condensing boilers in the UK fail to achieve their maximum combustion efficiencies



A high-efficiency condensing boiler will remain a key component in low carbon, heating systems



RELATED CIBSE PUBLICATIONS

- **TM53: Refurbishment of non-domestic buildings** focuses on refurbishment and its challenges
- **TM54: Evaluating operational energy performance of buildings at the design stage** provides guidance on the performance gap
- **AM14 Non-domestic hot water systems** looks at heating systems. It also has separate guidance for new build and refurbishment projects



NUMBER CRUNCHING

- 60% – buildings standing in 2050 that are already built
- 80% – UK carbon reduction target by 2050
- 90% – condensing boilers that are installed in the wrong conditions in the UK
- 10-15% – amount by which boiler efficiencies could be raised

have aged heating systems in place which may, by their nature, preclude the use of renewable technologies. Retrofit might not always seem the most exciting option, but replacing an ageing or less efficient boiler with a modern, clean-burning, fully-modulating, high-efficiency boiler is a cost-effective and rapid solution, proven to more than halve energy usage and costs and reduce harmful greenhouse gas emissions by as much as 90%.

For this reason, the new EU eco-design and energy-labelling regulations, raising energy-efficiency standards for boilers and water heaters, are commendable. The role of the high efficiency condensing boiler will remain a key component in low carbon, energy-saving heating systems in future years, whether as the sole heat provider or working in conjunction with renewable equipment such as biomass boilers, solar systems or heat pumps. The new regulations, which are to be implemented in European member states by 2015, are intended to encourage less efficient products to be replaced with higher efficiency, new generation heating technology and improve the efficiency of bivalent heating systems that incorporate renewable energy technology.

The question, though, is whether

even these tighter labelling regulations are sufficient to improve the efficiency of heating in UK buildings. Heating manufacturers already quote high efficiency figures of around 98% for their products, which meet the new standards of energy efficiency. These figures might be impressive, but in reality, they are rarely achieved: around 90% of the condensing boilers in the UK fail to achieve their maximum combustion efficiencies, with efficiencies dropping to the standard 80%.

Real-life performance

The reason for what is arguably an 'energy performance gap' between anticipated and actual energy use is that the efficiency figures quoted represent the maximum efficiency that a boiler can achieve in idealised conditions – typically at half load and low temperatures. As a typical existing low temperature hot water (LTHW) system will generally have been sized on high flow and return temperatures, this prevents the boiler from fully condensing. Operating at full load and high temperatures (82/71°C flow and return, for example), even a high efficiency condensing boiler will waste 10-15% of the energy input up the flue.

It seems an anomaly that no requirement exists for heating manufacturers to



provide a range of efficiencies on their products. In the car industry, for example, manufacturers provide not only the maximum fuel efficiency for their models but also a combined fuel consumption figure, an average of the efficiencies achieved in its typical mix of town and motorway driving. While not flawless, this system does provide drivers with a more accurate and realistic understanding of the car's real life performance.

Providing a range of efficiency figures for boilers would facilitate more precise calculation of the predicted energy performance across various heating systems, including retrofit projects. Armed with not only the maximum combustion efficiency at different common flow temperatures of the boiler but also its seasonal efficiency, an average of how it performs across the different loads and conditions, specifiers would be better informed to design the smartest system for optimum energy efficiency. This is just the first piece of the puzzle, however. Budgets for boiler plant renewal generally never include an allocation for control upgrades, terminal unit replacement, passive energy

saving technologies such as flue gas heat recovery or complementary low and zero carbon technologies (LZCTs). If we are to meet our carbon goals, we must ensure that when there is an opportunity we engineer to maximise the building's saving potential.

Implementing regulations for improved ecodesign and energy labelling for heating is undoubtedly a step in the right direction. However, only when the figures and ratings relate to more than just the maximum efficiencies produced in test conditions will they fully address the unique problems we face in the UK in terms of refurbishing our existing building stock. Mandatory requirement of a range of efficiencies for heating products would encourage the industry to question accepted wisdom, challenge current condensing efficiencies, and innovate with 'super condensing' technology to achieve the Holy Grail: full-time maximum efficiencies regardless of primary circuit temperatures. Perhaps then our carbon reduction target would seem less daunting. **CJ**

MARK NORTHCOTT is the managing director of Remeha Commercial

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Steam was fundamental in heating some of Britain's most famous buildings during the Victorian age. **Laurie Brady** and **Derek King** argue that the 19th Century technology still has a role to play in providing cost-efficient energy for hospitals today

Return of the STEAM AGE?

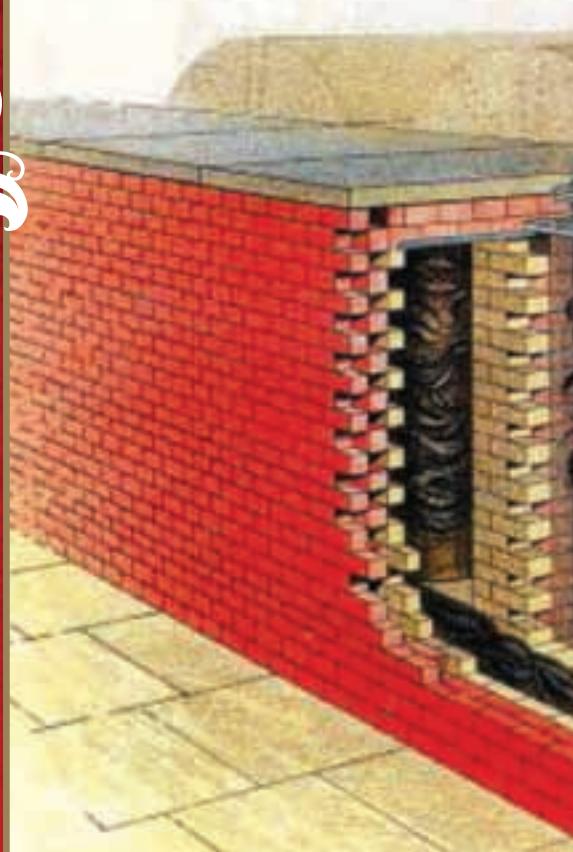
Steam may be old-fashioned, but, even in this day and age some hospitals still use it and industry experts consider it to be 'proper engineering'.

But is steam a viable way to convey heat energy from the central boiler plant in modern district heating systems, or is it just a Victorian hangover? Some would argue that pressurised hot water systems are the more modern option. They do the same job as steam, more efficiently, and without all those technical headaches, don't they? Maybe...

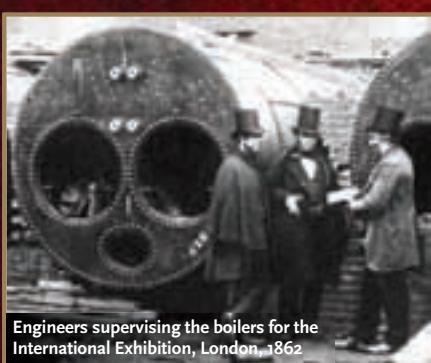
Perhaps a way to assess the feasibility of steam, is to make a technical comparison with pressurised hot water systems. Steam has a higher heat capacity than hot water, so is capable of conveying a lot more heat energy in smaller pipework. Thinner pipes not only reduce capital cost but also normally mean lower heat emission losses. But it's not quite as simple as that; the higher temperatures of steam may reduce – or even eliminate – this benefit, though steam enthusiasts would always point out that the high standard of modern insulating materials and techniques make this point largely moot.

Another advantage is that, in steam systems, the pressure differences caused by condensing steam provide sufficient energy to propel steam through the pipework, so a circulating pump is not required – although,

ANDERTON & BOLTON'S
Patent Steam Superheater.



Steam boiler with superheater 1900



Engineers supervising the boilers for the International Exhibition, London, 1862

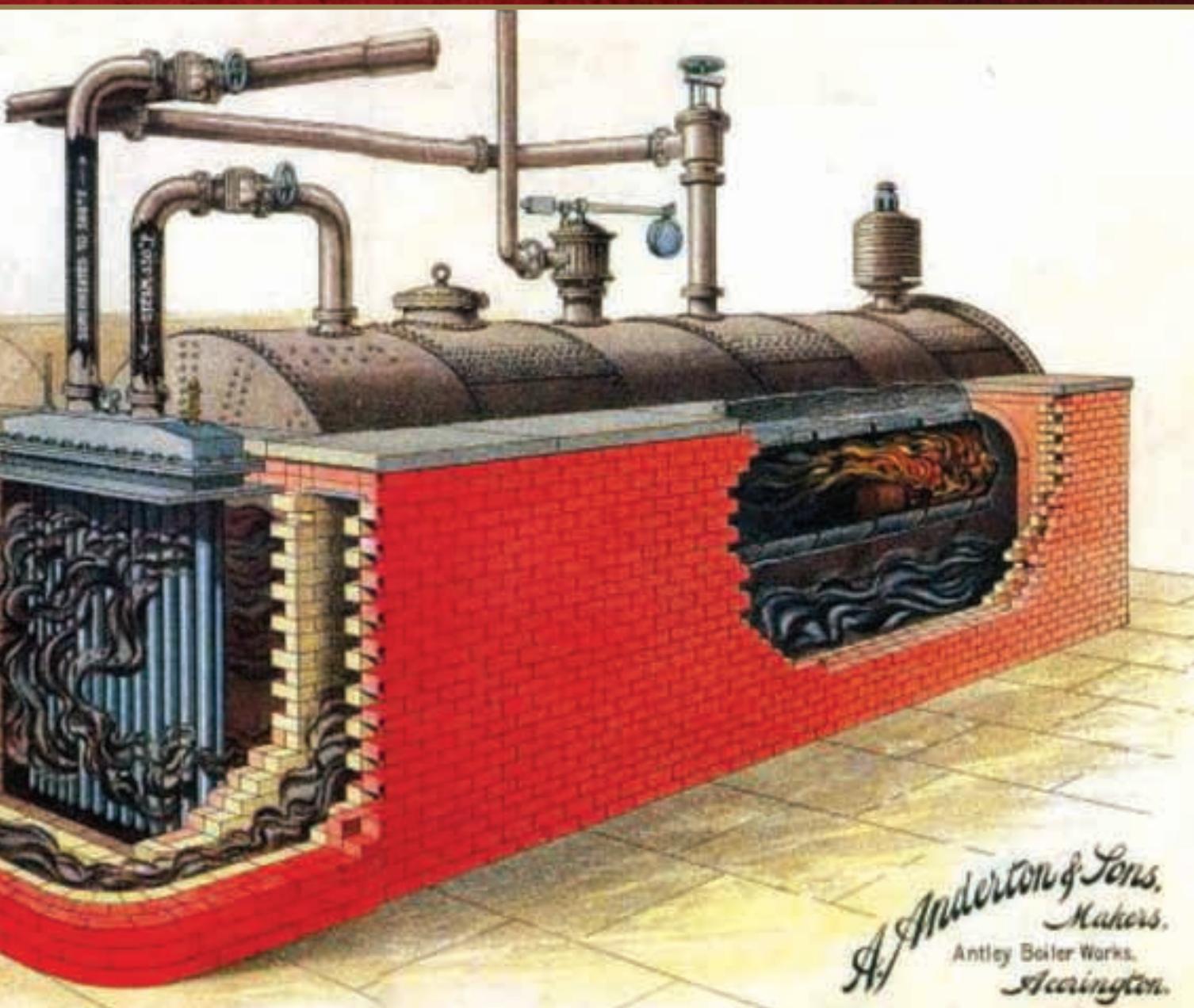


Hick Hargreaves Lancashire steam boiler

in reality, steam systems cannot be entirely pump-free. Condensate must be returned to the boiler via the hot well tank, and boiler feed water must be pumped to overcome boiler pressure. Condensate return flow rates are, however, smaller than those for hot water systems and this means lower pump duties.

Condensate tends to bring its own technical challenges into the mix, though. In poorly designed or incorrectly functioning systems, condensate can cause water hammer (when a fast-moving fluid or gas is made to stop or change direction suddenly) in steam pipework, and this is one reason why it must be captured by strategically located steam traps before being returned to the boiler.

These are a critical factor in the efficiency of steam systems – it is important that they are carefully maintained. Depending upon its



pressure, condensate can contain significant amounts of energy, which can prove awkward to manage. For instance, if pressurised condensate is delivered into a vessel that allows the liquid to evaporate, flash steam can result, though this can be utilised for low pressure applications.

The efficiency of steam systems is enhanced by its potential to deliver large amounts of heat energy by condensing and releasing latent heat. A correctly functioning steam trap controls this process by only opening once steam has condensed. Traps passing live steam will waste energy and can create problems in condensate lines. Nowadays, however, traps can be monitored via wireless technology and a building management system (BMS) can raise an alarm if a trap fails.



RECORDING THE PAST

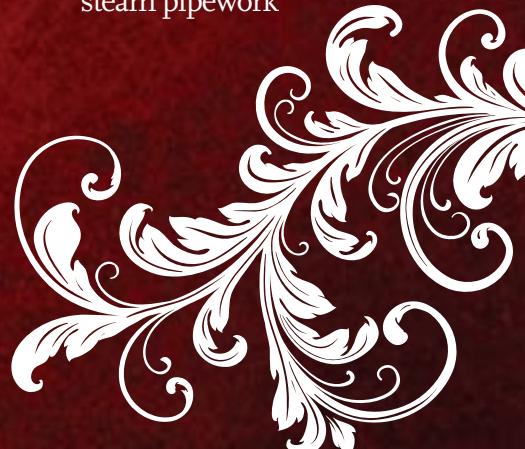
The CIBSE Heritage Group, which supplied the pictures for this article, is celebrating its 40th anniversary this year.

The group, which was established in 1973, aims to discover and record all aspects of building engineering services history, including information and pictures on pioneers, companies, services and equipment.

The committee is made up of representatives from CIBSE, English Heritage and the National Trust. Visit www.hevac-heritage.org to see more.



In poorly designed or incorrectly functioning systems, condensate can cause water hammer in steam pipework



The main differences between steam and pressurised water

Steam	Pressurised hot water
High heat content (latent heat approx. 2100 kJ/kg)	Moderate heat content (specific heat capacity 4.19 kJ/kg K)
Extensive water treatment required	Less extensive water treatment needed
No circulating pump needed (though condensate pumps are required)	Circulating pumps needed
Smaller pipe sizes	Larger pipe sizes
Steam traps and condensate handling techniques required	No condensate handling required
Less complicated zone controls – that is, two port valves are sufficient	More complex zone controls, such as three-way mixing/diverting valves needed
Certain hospital processes require steam	

➤ The evaporation process for steam systems means that distillation of the water occurs, increasing the concentration of dissolved salts in boiler water. Feed water treatment is, therefore, vital to prevent corrosion and deposits on heat transfer surfaces, but automatic monitoring of total dissolved salts and blowdown can minimise heat energy and water losses. Of course, while hot water systems also require chemical treatment for similar reasons, such treatment is required less than in steam systems, since it should only be necessary when the system is filled – some leakage is always expected.

It is self-evident that hot water cannot transport as much heat energy per kilogram as steam can, so larger pipe sizes should be used. However, hot water systems that are pressurised can run at higher temperatures, which means that the integrity of insulation is just as vital for reducing emission losses as it is in steam systems. Furthermore, pressurisation of hot water systems requires supplementary equipment such as gas-filled vessels, pressurisation pumps, expansion tanks and circulating pumps.

Temperature control in steam systems can be achieved by exploiting the thermodynamic relationships between temperature and pressure, whereas hot water systems tend to require a mixing and/or diverting valve arrangement, or two port valves linked to variable speed pumps.

Direct energy comparisons between the two systems hinge on emission losses and pumping costs. Steam systems can use steam generated on site for pumping, whereas pressurised systems rely on electricity, which – if generated in power stations – results in the use of more primary energy. Of course, if combined heat and power (CHP) is available, the balance of the primary energy comparison changes.

Bearing all of the above in mind, it is evident that direct technical comparisons

are inconclusive. A more significant factor for specifiers might be the maintenance associated with each system. Both steam and pressurised hot water systems require skilled, trained maintenance engineers.

However, in today's well-run systems, maintenance is about coaxing maximum efficiencies from plant, rather than preventing explosions.

Modern medium

Where steam is required for a particular industrial or manufacturing process, it can

Steam boilers at Wythenshawe hospital

Some interesting and useful work has been performed recently by Ken Eaton, a hospital engineer at Wythenshawe Hospital in Manchester. Eaton was able to carry out some first-hand observations and make working comparisons between steam plant at Wythenshawe and a medium temperature plant at the Royal Derby Hospital.

Eaton found that the maintenance requirement in terms of man-hours was similar for the two types of system. Both require regular boiler strip downs and inspections, though the medium temperature hot water (MTHW) boiler plant has additional pressure vessels, which must also be inspected, while the steam system incorporates steam traps that come with their own maintenance needs. Domestic hot water and plate heat exchangers for both systems again had similar requirements for strip down and inspection.

For condensate return pumping at Wythenshawe, a comparison study was carried out between electrically driven and steam-driven pumps. The electric pumps were found to handle greater quantities of fluid and could be conveniently arranged in duty/standby mode. However, the electric pumps required more maintenance because of mechanical seal



Modern steam boiler at Wythenshawe

problems and tended to suffer from cavitation problems if steam traps were not operating correctly.

No cavitation problems were reported for the steam-driven pumps, which reliably operated for long periods without developing faults. The Wythenshawe engineers described them as 'maintenance-free'. The steam supply to power the piston/drum, which propels the condensate, is supplied through a valve operated by a float arrangement. When the condensate fills the pump to a prescribed level, the steam forces the drum to deliver the condensate into the condensate line. This type of pump provides a steady flow, which tends to limit the cooling effect that can occur if pumping is intermittent.

be beneficial to provide the primary energy for the heating and hot water requirements of associated or nearby buildings. Hospitals, of course, have particular processes where steam is a requirement, particularly for the sterilisation of equipment and materials, and some hospitals also include large laundries. If we add absorption chillers to the mix, then the economic and energy arguments can stack up in favour of steam on hospital sites.

The choice between pressurised hot water and steam requires a careful analysis of the capital and running costs for the particular installation. Each situation will have unique factors, and it is important that decisions are not based solely on the preconceptions that steam is 'old-fashioned' or technically problematic. Design, installation techniques, and equipment have advanced considerably.

In addition, there are several advanced technologies that can greatly enhance the viability of steam in modern installations. These include: the injection of steam into feed water tanks to remove oxygen, so reducing water treatment requirements; the use of virtually closed systems to reduce water losses; blowdown heat recovery techniques; and the intelligent use of flash steam.

Another vital factor is to draw on the knowledge and experience of the facilities managers, who will eventually operate and maintain the system. Not only can this beneficially influence design, but it also enables engineers to balance the sophistication of the design with the facilities management resource available.

CIBSE Knowledge management committee is preparing guidance on the design and operation of steam systems, which is due to be published next year.

LAURIE BRADY MCIBSE and **DEREK KING MCIBSE** are senior lecturers in building services engineering at Liverpool John Moores University
Technical adviser: **KEN EATON**, Wythenshawe Hospital



VICTORIAN BOILER DISASTERS



Between 1882 and 1893 in Britain, there were 660 boiler explosions resulting in 313 deaths. Essentially, the reason that boiler explosions no longer occur is because of enhanced engineering knowledge and properly planned

maintenance regimes, using appropriately skilled maintenance technicians. Boiler explosions would often have been due to poorly planned maintenance, coupled with unskilled maintenance fitters.



A boiler explosion at Bass & Co's brewery, Burton-on-Trent, 1866



Before and after... the disastrous effects of a boiler explosion c1890 – right, the path taken by the boiler

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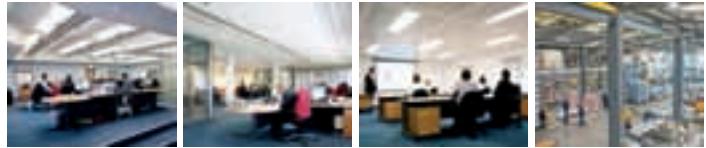


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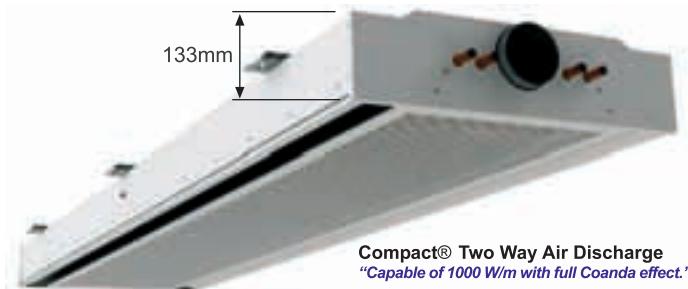


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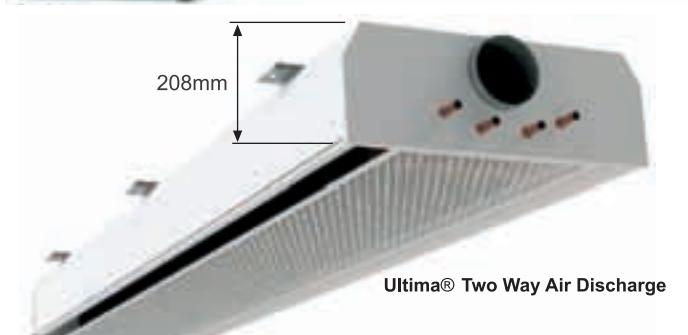
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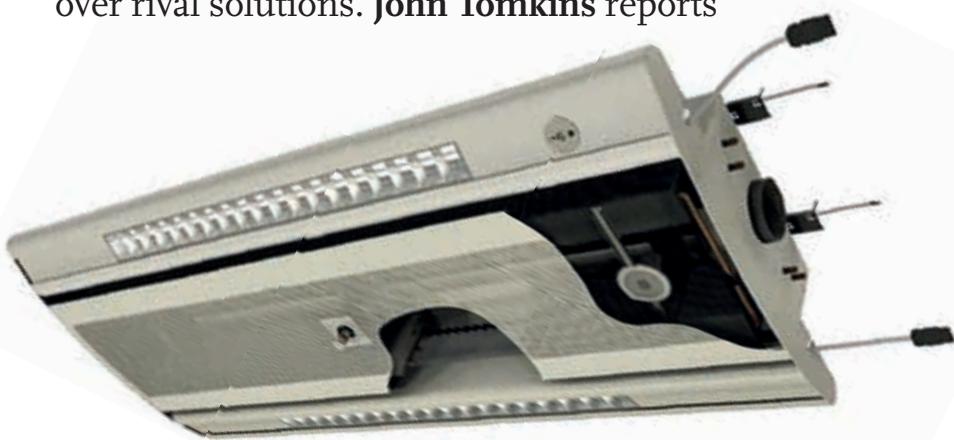
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Ceiling the DEAL

A report from the Chilled Beam and Ceiling Association has compared the performance of heating, ventilation and air conditioning systems and found that chilled beam technology could achieve energy savings of 17-22% over rival solutions. **John Tomkins** reports



This summer the government finally unveiled the long-awaited changes to Part L of the Building Regulations, covering energy efficiency of new and refurbished homes and non-domestic buildings. Compliance with the regulations will require a 6% improvement in energy efficiency standards for new homes, and a 9% improvement for non-domestic buildings on 2010 regulations. Minimum energy efficiency standards for non-domestic buildings will also be strengthened when specific building services work, including air conditioning and lighting, is carried out.

While the changes, which come into place on 6 April 2014, are not as demanding as the original government proposal for a 20% uplift for non-domestic buildings (with 11% as the lower option), they will nevertheless

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Building no.	Location	VAV fan coil		Passive chilled beams		Active chilled beams	
		Consumption (kWh)	CO ₂ emission (kg)	Consumption (kWh)	CO ₂ emission (kg)	Consumption (kWh)	CO ₂ emission (kg)
1	London	198,897	92,203	173,037	78,644	163,756	73,828
	Birmingham	185,447	84,217	159,717	70,747	150,598	66,002
2	London	404,008	189,191	346,557	159,182	327,919	149,525
	Birmingham	375,536	172,884	317,825	142,774	299,479	133,244
3	London	392,231	183,131	338,129	154,846	319,457	145,177
	Birmingham	365,010	167,389	311,031	139,187	292,599	129,630
4	London	800,175	377,178	679,824	314,497	642,348	295,106
	Birmingham	742,509	345,003	621,389	281,945	584,320	262,748

Figure 1: HVAC plant annual consumption and CO₂ emissions.

force designers to examine the energy consumption of their building services solutions closely.

It is timely, then, that the government announcement was closely followed by the results of a study commissioned by the Chilled Beam and Ceiling Association

(CBCA) that compared the performance of various heating, ventilation and air conditioning (HVAC) systems. The CBCA study, carried out by consultant Environmental Design Solutions Ltd (EDSL) using its Thermal Analysis Software (Tas), revealed potential energy savings of 17-

22% with chilled beam technology, against variable air volume (VAV) fan coil systems.

It is hardly surprising that the report has opened up a debate between the various equipment camps. Indeed, following publication of the report, HEVAC's Fan Coil Group has announced that it is to

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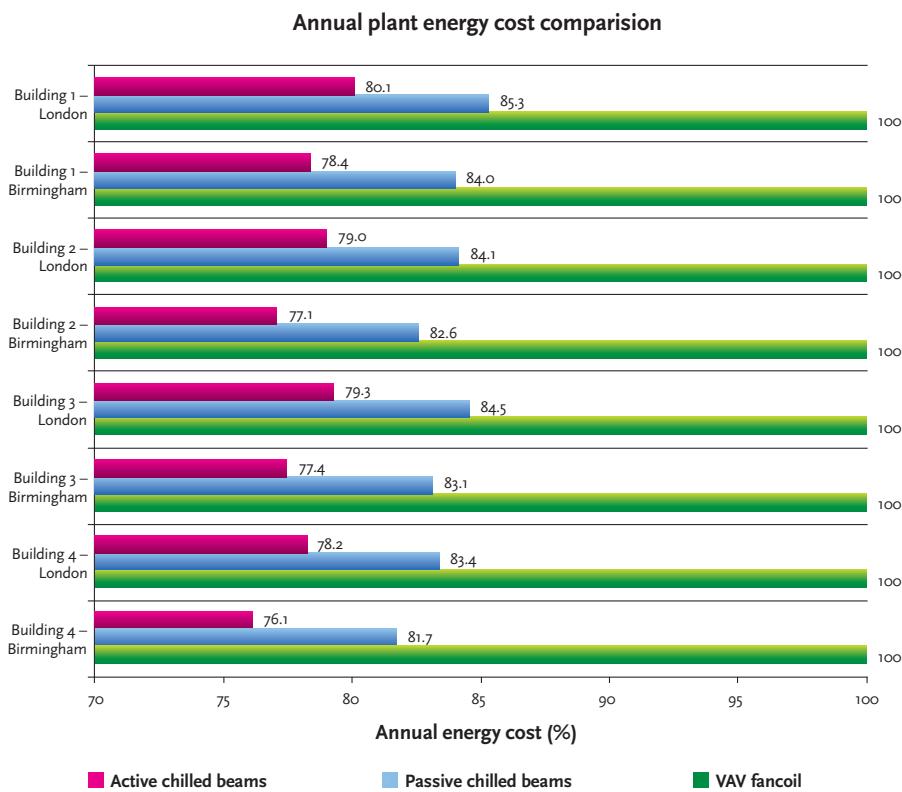


Figure 2: Annual plant energy cost consumption

issue its own paper defining the advantages that it believes a fan coil system can offer.

'We welcome the debate the report is creating, as these findings mean the market can now ascertain for itself the conclusions that can be drawn from this study,' says Andrew Jackson, chairman of the CBCA.

'This is timely for the industry to examine the options for cooling technology in order to assess the most energy efficient solutions. As an industry, it is important we share knowledge to help design or refurbish buildings to perform more efficiently. Chilled beam technology offers a viable solution – it is technology that is available today and proven to enable energy savings.'

The EDSL study simulated the dynamic thermal performance of four differently-sized office buildings, and compared the energy consumption, CO₂ emissions and the running costs of different HVAC systems within these office buildings. The three systems analysed were:

- VAV fan coil units with EC motors and specific fan power (SFP) of 0.25 W/l/s
- Passive chilled beams (95% convective/5% radiant)
- Active chilled beams

The buildings modelled have Part L notional constructions and glazing percentages. The models have been zoned as specified in the National Calculation Methodology (NCM) modelling guide and incorporate 6m perimeter zones,

which enabled different solar gains to be analysed. EDSL has looked at the effects of building location in terms of free cooling by ensuring that a location with limited free cooling possibilities was modelled (London) as well as an average central location (Birmingham). Weather data used was an average year from the past 20 years, as published by CIBSE.

Each HVAC system included a high efficiency chiller, which supplies chilled water to the terminal units being analysed. An air source heat pump supplies heating and cooling to the direct expansion (DX) coils in the air handling unit (AHU), which includes heat recovery – the AHU for all systems is sized to provide the minimum fresh air requirements, in accordance with NCM methodology for an office.

All systems included a boiler with an efficiency of 90% and DX performance was taken from a typical Mitsubishi VRF heat recovery unit.

The annual plant energy running cost savings achieved using chilled beams can be seen in Figures 1 and 2. Figure 2 is split for each particular building and shows the available annual running cost saving, expressed as a percentage against the VAV fan coil system benchmark (100%).

Reduced energy consumption

The completed energy study modelling shows that both the passive and active beams' energy consumption is lower than the VAV fan coil system; the average annual energy cost saving over the buildings for both locations is approximately 17% annually for the passive chilled beam and approximately 22% on average for the active chilled beam over the VAV fan coil system modelled.

Interestingly, the passive chilled beam system's energy consumption was slightly higher than the active beam. This was primarily because the passive beam's displacement ventilation system requires a higher fresh air supply temperature to meet occupant comfort.

Both systems had the same fixed AHU SFPs. The increased air supply temperature on the modelled displacement ventilation system results in increased energy usage on the fresh air re-heat DX, circuit and in less airside cooling being available. Therefore, at certain times of the year, where outside conditions effectively allow the active beams to have a higher level of 'free' airside cooling than a passive system, the passive system will have to make up any shortfall of

6 While the changes are not as demanding as the original government proposal for a 20% uplift for non-domestic buildings, it will nevertheless force designers to examine the energy consumption of their building services solutions closely

airside cooling via waterside cooling, which results in a slight increase in the chiller's energy consumption.

Additional energy savings can be achieved by increasing the chilled water flow and return temperatures to the chilled beam units – the relationship between water flow temperature and chiller coefficient of performance (COP).

Cost v energy reduction

Recent advances in chilled beam design have delivered high performance beams. These could be used in a highly efficient way by keeping the same quantity of units on a project as you would using conventional beams, but opting to use elevated water temperatures of a few degrees above the industry standard of 14°C flow – this will reduce energy consumption as highlighted during this energy study. For every 1°C above 14°C flow temperature, there is a potential reduction of around 3-4% on the overall system energy consumption.

However, if capital cost reduction is the driver, rather than energy reduction, the use of high output beams as high efficiency units could be used to reduce the quantity



A FAIR COMPARISON?

In the study, the VAV fan coil terminal fan had an SFP of 0.25W/l/s at 100% volume flow rate, and was typically running at half that flow rate with VAV turn down to minimum fresh air for respiratory being 20% of the design volume.

This was not necessarily an ideal combination, says Alan Jones, managing director of EDSL.

'Since the issue of the energy study comparison, we have carried out an alternative simulation with a turn down to 60% air flow, which is more typical, and have used an enhanced SFP of 0.2W/l/s for the VAV fan coil units to represent the best-performing

VAV fan coil units available. This resulted in an overall reduction in total system fan energy of 2.5% and netted out at 1% overall reduction in the VAV fan coil system's energy consumption, thus narrowing the gap from approximately 22% to 21% more energy consumption associated with VAV fan coils, as opposed to active chilled beams.'

The fundamental difference in the specifications was the chilled water supply temperature: 6°C-12°C for the fan coil and 14°C-17°C for the active chilled beam. 'We were asked to use these temperatures to represent the most widely used practice, and to create a typical baseline as

both VAV fan coils and active chilled beams can respectively elevate their chilled water flow temperature from their respective base lines,' says Jones.

'The improvements in chiller COP and amount of DX cooling offered by the high chilled water temperature is – and was – the fundamental difference in energy consumption for the alternative systems,' says Jones, adding that the VAV fan coil terminal fans are so efficient that they have a secondary effect on relative energy use. 'I believe the energy use debate is mainly down to chilled water supply temperature,' says Jones.

of active beams when compared with traditional units. If going down this road, designers should be mindful of guidelines for occupancy comfort (*CIBSE Guide A: Environmental Design*).

The CBCA Technical Fact Sheet 2 – *EDSL Tas Energy Study Summary Findings* is now available at: www.feta.co.uk/hevac/specialist-groups/chilled-beams-ceiling-association **CJ**

SPONSORED FEATURE LINDAB



Lindab's eHybrid Chilled Beam System offers the end user both control flexibility and energy saving benefits in one elegant solution. Kirk Bracey, Lindab's indoor climate manager, explains how.

Some of the major energy costs associated with building services come from the heating, cooling and distribution of fresh air, as well as the demands of lighting. Lindab realised that reducing the energy demands of one or more of these items would lead to significant Life Cycle Cost reductions.

It goes without saying that providing lighting and conditioned air to empty rooms is akin to leaving the taps and lights on in a bathroom 24/7. However Lindab realised that this is alarmingly commonplace within commercial buildings. The challenge therefore was to provide a cost effective

solution without detriment to the comfort of the building's occupants.

Demand Controlled chilled beams have been used in the European market for a number of years, reducing the amount of fresh air to the space when either CO₂ or PIR sensors indicate a lack of occupancy in the specified zone. Likewise, an additional set of these sensors have provided the same service for lighting. However these individual solutions inevitably led to a pick and mix approach to design as well as interconnectivity issues between the two systems.

Lindab's solution to meet this challenge is **eHybrid**. Following Lindab's core philosophy of "Simplifying Construction" **eHybrid** has been designed from the outset to integrate the provision and control of ventilation, heating, cooling and lighting within a single "plug and play" product. This has resulted in a simplification of the installation process which has in turn led to both space saving and installation cost reductions. The integration of PIR & CO₂ sensors, water valves, air flow regulators as well as the option of DALI lighting controls within the **eHybrid** beam ensures simplicity and functionality without compromising aesthetics. **eHybrid** has been designed with the future in mind

and its production process as well as the materials and components utilised in its manufacture have all been carefully chosen from a sustainability standpoint.

eHybrid provides an ideal indoor climate solution at no additional cost, in fact a recent report by the independent testing institute, WSP, indicated that **eHybrid** could provide savings of up to 34% when making comparisons to typical chilled beam installations.



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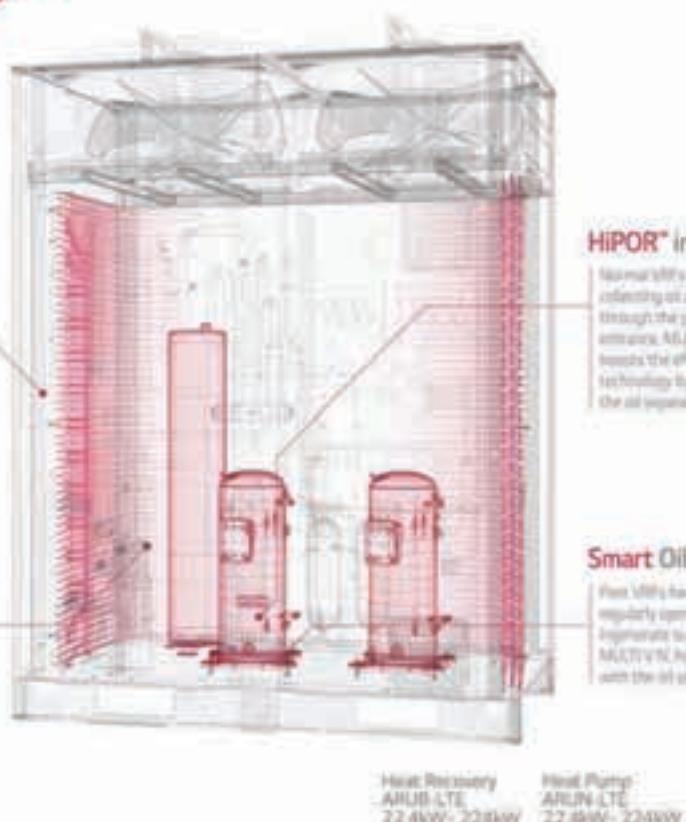
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Most VRFs generate energy loss from collecting oil and refrigerant at the same time, through the pipe connected to the compressor's entrance. Multi V IV, on the other hand, boosts the efficiency with LG's patent HIPORTM technology by collecting oil from the oil separator directly to the compressor.

Smart Oil Return

Most VRFs have used unnecessary energy from regularly operating the oil return system and regenerate oil when operation stops. Multi V IV, however, runs the oil return system with the oil sensor only when it's needed.

The four key elements of any effective VRF system are the compressor, the heat exchanger, the oil and the refrigerant. LG's Multi V IV employs cutting-edge technologies in all of these areas, enabling it to go beyond the standard and claim the title as the true leader of 4.

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Improving VRF systems

This module explores some of the main areas of focus for manufacturers seeking to enhance VRF performance

The application of variable refrigerant flow (VRF), 'multi-split' technology is now commonplace as a means of providing temperature control and limiting maximum humidity for commercial buildings in Europe and Asia. Although still in its infancy in the USA, it is soon likely to see a step change in application, following a positive assessment by the General Services Administration (GSA)¹ of VRF technology in US government new-build and refurbishment projects. There are a handful of principal manufacturers in this buoyant and competitive marketplace, and each one is striving to improve their product to provide an increasingly effective solution. This CPD will consider some of the key areas that manufacturers are concentrating on to improve VRF performance and further reinforce the global reach of the technology.

The current credentials of VRF

In recent years, there has been a shift in what many users consider as 'air conditioning'. The conventional view is that 'air conditioning' is a system that controls the internal environmental conditions through moving conditioned air into the space. However, contemporary users are increasingly considering 'air conditioning' as systems that comprise an internal fan coil unit (often as part of a larger network of internal coils)

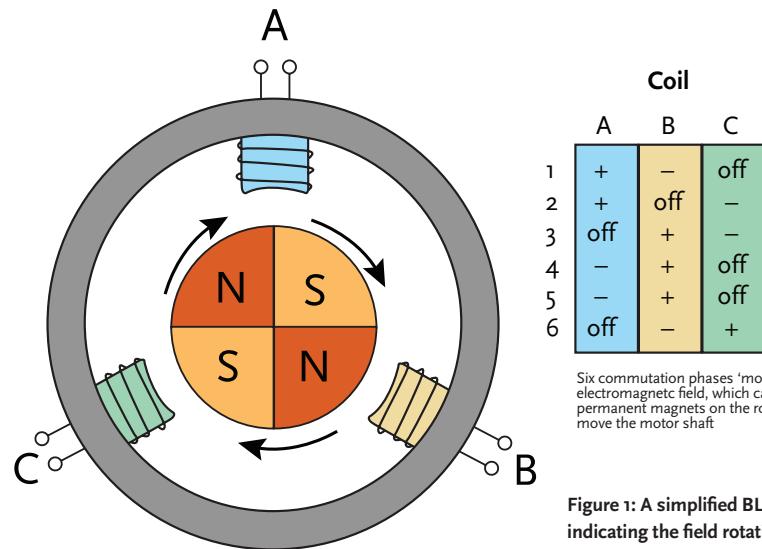


Figure 1: A simplified BLDC motor indicating the field rotation⁵

connected, via refrigerant pipes, to an outdoor coil and a refrigerant compressor – known as a 'multi-split'. Practically, the HVAC engineer understands that these multi-split units provide what has been traditionally termed 'comfort cooling and heating', where the space temperature is controlled by re-circulating room air through the room coil to provide sensible cooling. Dehumidification (latent cooling) can also be provided through the room unit coil temperature being designed to operate at temperatures below the dew point of the incoming room air where there is

appropriate condensate drainage. By varying the refrigerant flowrate to the room units using electronic expansion valves (EEV) and variable speed compressors, in conjunction with variable speed fans passing air across the heat exchangers, the internal re-circulated air temperature may be closely controlled to meet the demands of the room.

A separate ducted air system (increasingly known as a 'dedicated outdoor air system', or 'DOAS') typically provides filtered and partially conditioned outdoor air and, optionally, humidification. Since the VRF

system is operating to meet the majority of the heating and cooling load, the air system is sized to provide only the outdoor ('fresh') air requirement, so is often much smaller than a traditional ducted system that meets the full load. As discussed in the April 2013 CIBSE Journal CPD article,² the advances in control and refrigerant piping techniques have boosted the potential operating efficiencies of VRF systems by effectively shifting heat from one room unit to another, so allowing concurrent heating and cooling to benefit from heat that would otherwise be rejected through the outdoor unit.

This, of course, is in addition to the unit acting as a heat pump, using outdoor air as a heat source. Recent research^{1,3} has shown that the resulting properly applied VRF systems may not only consume less energy than traditional air conditioning systems – such as variable air volume and fan-coil plus fresh air – but can also provide good environmental control. Case studies indicate that the higher initial cost would be paid back in a relatively short time – the US-based study suggested payback of 1.5 years, but this would be dependent on local absolute and relative fuel prices.

Climates such as that of the UK can provide better opportunities for heat recovery (as opposed to warmer climates typical in southern Europe), especially if there are building zones providing constant cooling requirements. The opportunity is enhanced if there are significant north and south exposures on the same building.¹

Improving systems to lead the market

Although this technological application was invented in Japan more than 20 years ago, it has since become an international product. In the UK, the data collected as part of the EU Ecodesign research⁴ into air conditioning systems (with a cooling capacity of greater than 12 kW) indicated that in 2008 VRF already provided 18% of installed cooling (compared with 44% for more 'traditional' systems). This proportion is likely to have increased substantially in the last five years, but in that same period the demand for 'value engineered' products has also risen to meet ever more closely scrutinised budgets.

Manufacturers have evolved their product ranges to meet the demand for lowest life-cycle costs (LLCC) by examining the thermodynamic operation of their systems and determining areas where newer technologies – or applications – can enhance overall performance. Examples include developments in motors, coils and control techniques.

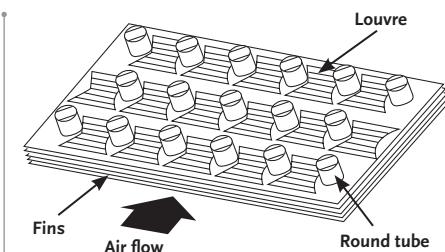


Figure 2: Example louvred fin coil⁶

Motors

Alternating current (AC) induction motors have been used traditionally to drive the fans and compressors in split air conditioning applications. Brushless direct current (DC) motors (BLDC) – otherwise known as electronically commutated (ECM) motors – started out in small domestic motor applications some 25 years ago and, due to their controllability and efficiency, have now usurped the AC motor in commercial VRF units.

These have pairs of windings arranged around the stator (the non-moving section of a motor) that are charged in sequence, so magnetizing specific sections of the circular stator that face a set of permanent magnets mounted on the perimeter of a circular rotor. The rotor can be arranged around the outside of the stator and, for example, used as the hub for an axial flow fan or, for applications such as scroll compressors, the rotor will be inside the circular rotor and act as the shaft for the scroll (as shown in Figure 1). The key advantage is that the speed may be closely controlled across a wide range by a pulsing field that moves around the stator. The controller (which is typically mounted in the end 'cap' of the motor) varies the rotating pulse speed, synchronising the pulses with the exact position of the rotor, delivering accurate and efficient control at a wide range of speeds (and loads). Although the motor itself is DC, the supply would normally be AC and the power will be rectified (in the end cap control circuit) – a low voltage line will provide the signal from the main controller in the VRF system to finely adjust the motor speed. The efficiencies at full load are similar to that of a good quality AC induction motor. However, unlike AC motors, relatively high efficiencies are maintained throughout the operating range. By virtue of the close control of field rotation, a BLDC motor can be 'soft' started and stopped, reducing the wear and noise in the motor and surges in the system.

As efficiency is uniformly high, less heat is produced in the motor, so less uncontrolled heat is passed to the surroundings (the air or refrigerant) and the motor runs cooler. BLDC motors create far less electrical and audible

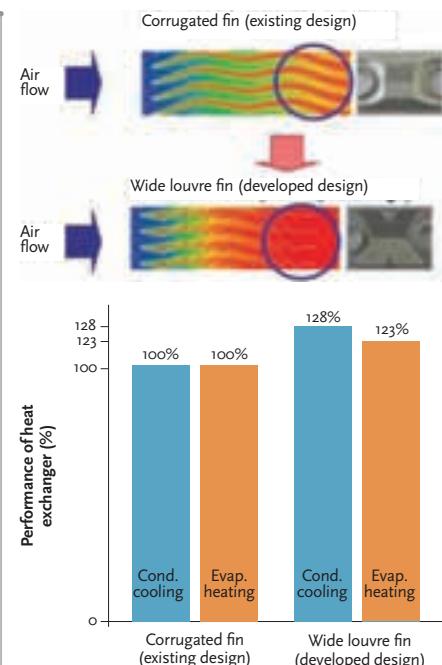


Figure 3: Example of manufacturer development coil fins to improve VRF system performance⁸

noise, but due to the switching action of the onboard controller, they will increase the harmonic distortion in the electrical supply – this can be readily ameliorated in the supply system.

Brushed DC motors are also able to offer variable speed control, but with the drawback of 'brushes' to carry the power to the mechanical commutator. Without carbon brushes that wear out, brushless DC motors have design lives equal to – or longer than – AC motors.

BLDC motors are applied in VRF units both to power both fans and compressors, providing a wide and efficient working range.

Coil fin geometry

The design of coils in any HVAC equipment determines the performance of the fundamental principle of the plant: to exchange heat from one medium to another without the two media mixing. In a VRF system, the internal and external coils have two-phase heat exchange inside the tubes of the coil (refrigerant liquid and vapour) and potentially two-phase heat transfer on the outside (air and condensation). An example of a coil made of round tubes (carrying the refrigerant) with air passing across the louvred fin coil is shown in Figure 2. The characterising performance of the air side of the coil is provided by the 'Colburn J-factor' – a dimensionless heat-transfer relationship that is used to determine the potential heat flow from the surfaces of the fin coil to the air; and the 'Fanning friction factor' that establishes the air pressure drop (and so, ultimately, fan

power) for the air passing through the coil.

Manufacturers undertake analysis (which would typically use computational fluid dynamics CFD) on the numbers of rows, the shape and sizes of tubes and the form of the fins required to establish optimum and cost-effective arrangements for heat transfer and pressure drop. This is a complex task for systems where the temperature, humidity and passing air velocity will vary independently. As reported by Wang,⁶ there appears to be a clear relationship between the velocity of the air and the most effective number of rows of coils (for heat transfer). However, the relationship is further complicated, as described by Wongwises,⁷ as the thickness of the fins and the number of rows will also affect the Colburn J-factor but be dependent on air velocity – very broadly, for coils with at least four rows, at lower air velocities thinner fins are preferable, whereas as the air flow rate increases the fins perform better when thicker. As fabrication methods evolve, the complex analysis used enables the design of such coils to progress so that, as in the example shown in Figure 3, what might be minor changes to the fin design visually can make significant improvements in performance.

Similarly, engineering developments on the refrigerant side of the coil can enhance performance. For example, to make optimum use of the internal heat transfer surfaces, the refrigerant should be distributed evenly across all the individual coil loops. Figure 4 provides an illustration of a developed distributor assembly that, through the use of a buffer section, ensures an improved

distribution across the multiple loops that make up the complete coil arrangement compared with an un-buffered plain pipe version that was typically used in previous systems.

Enhanced control techniques

The very existence of heat recovery VRF systems is a tribute to the imaginative digital control systems and closely engineered components that allow concurrent heating,

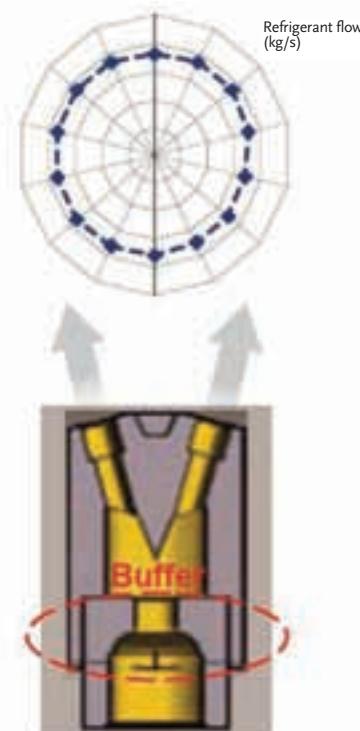


Figure 4: Ensuring evenly distributed refrigerant flow to coils⁸

cooling and optimised heat recovery across multiple room units, powered by a single external variable speed compressor unit.

But, as with all heat pump systems, at times of low external temperature, when the external coil is acting as an evaporator, the coil will accumulate ice that, if left, would prevent the evaporator functioning. All such systems require some 'defrost' arrangements (increasing the temperature of the evaporator to melt ice/snow) that will adversely affect the overall performance of the system, most notably below external temperatures of around 7°C. As the external temperature drops below 0°C, the air's moisture content becomes very low so there is a reduced rate of ice accumulation. By applying novel control arrangements, the adverse effect of the defrost cycle can be reduced. The example in Figure 5 shows that by segmenting the coil into separate sections, the controller can determine a cycle that selectively defrosts just part of the coil at a time. This will ensure that the overall system will still be able to use the remaining parts of the coil as an active evaporator (and so continue to heat the building from the heat pump) and, through using such arrangements, the manufacturer has shown that the heat pump availability is improved by more than 6% at 0°C.

The appropriate application of heat recovery VRF in buildings can reduce energy consumption, costs and the operational carbon footprint. The technology has matured so that it is supplanting traditional air based systems in many applications, and with continued developments such as those outlined in this article, it would appear to offer even greater opportunities in future.

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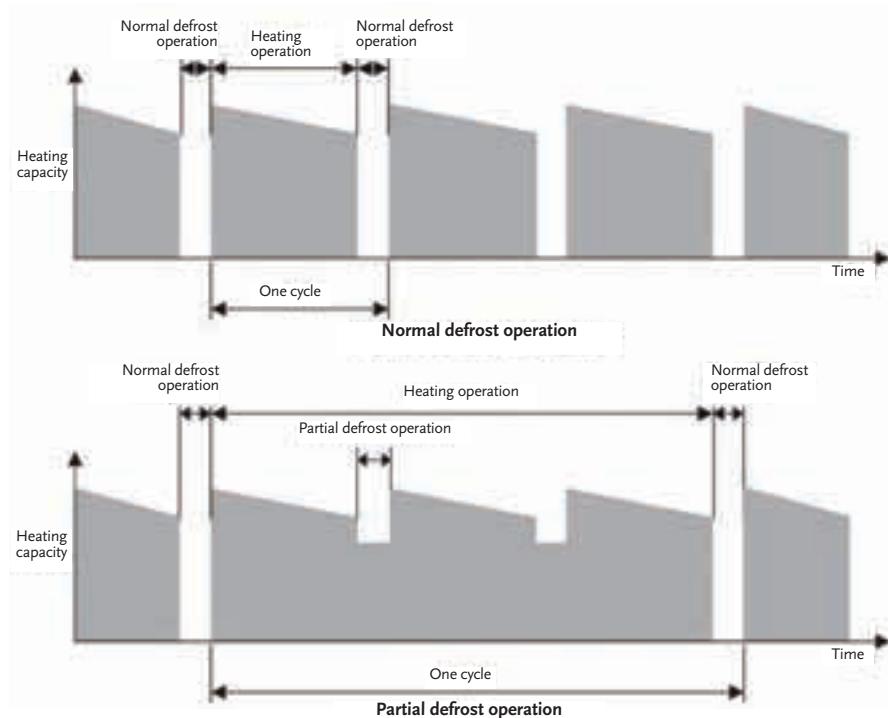


Figure 5: Using partial defrost cycle to enhance operation⁹

Turn over page to complete module ➤

Module 57

November 2013



1. Which of these is least likely to be provided by a VRF room unit?

- A Temperature control
- B Air movement
- C Dehumidification
- D Humidification
- E Sensible cooling

2. In the data given for the UK, what proportion of commercial cooling was provided by VRF in 2008?

- A Less than 5%
- B 5-10%
- C 10-15%
- D 15-20%
- E 20-30%

3. Which of these statements is least likely to be true for BLDC motors?

- A BLDC motors require a DC power supply in the building to operate effectively
- B BLDC motors have reduced maintenance requirements, compared with similar DC motors with mechanical commutators
- C BLDC motors may well add to the harmonic distortion of the building power supply
- D BLDC motors operate efficiently over a wider range of speeds, compared to AC induction motors
- E The speed of BLDC motors can be accurately controlled

4. In the example of improved fin design for a coil, what was the increase in thermal performance for the heat exchanger when cooling?

- A Less than 5%
- B 5-10%
- C 10-15%
- D 15-20%
- E 20-30%

5. By applying a partial defrost cycle, what was the quoted increase in availability of the heat pump, compared to 'normal' defrost operation?

- A >5%
- B >6%
- C >7%
- D >8%
- E >9%

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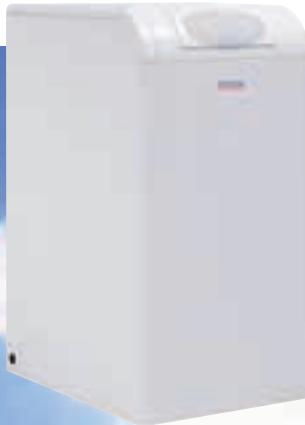
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SE Controls helps create a stimulating learning environment at Passmores Academy

Passmores Academy in Harlow is using a natural ventilation system from leading smoke and natural ventilation specialist, SE Controls, to provide a comfortable and stimulating learning environment for pupils, while helping to reduce the school's carbon footprint.

A range of low-impact design features and sustainable technologies have been incorporated in the BREEAM 'Very Good' rated school, including solar shading, biomass boilers and energy-efficient glazing.

To provide the level of control and flexibility required for the school's natural ventilation system to operate effectively within the pre-defined set points, SE Controls supplied and installed seven OS2 control panels to operate the rooflights, atrium louvres and entrance screens.

● Visit www.secontrols.com or call 015 4344 3060



LG introduces Multi V IV VRF step change

LG is introducing an advanced, new generation Multi V IV VRF solution, which delivers superior performance alongside industry-leading energy efficiency, and reduced costs.



The Multi V IV is equipped with four of LG's proprietary technologies – compressor, heat exchanger, oil and refrigerant – and a convenient new feature, smart control, which allows the user to adjust settings remotely. The Multi V IV has an energy efficiency ratio of 4.85, and its coefficient of performance in heating operation has been boosted by 6.7% and in cooling operation by 5.4%.

● Visit <http://uk.lgearcon.com>

Titan Products launches TPZ-Net Zigbee wireless range to monitor a building's health

The TPZ-Net is a new range of wireless environmental products from Titan Products. Incorporating Zigbee wireless technology, the range claims extremely stable, self-healing mesh networking capabilities. The TPZ-Net range is designed to monitor temperature, CO₂, humidity, light and occupancy levels wirelessly, and to convey this information back to the Titan Products coordinator, where the information can be transferred onto a BACnet network, to other Titan product controllers, or to I/O (input/output) devices.

● Visit www.titanproducts.com or call 016 1406 6480



Fläkt Woods tames the elements at new WWF HQ

Fläkt Woods, in partnership with Vision Vent, has designed, supplied and installed four bespoke rotating wind cowls for the WWF's new Living Planet Centre in Woking, Surrey. Built on a brownfield site, the building will be the new headquarters for the conservation organisation and aims, when completed, to be at the forefront of sustainable building design with a BREEAM 'Outstanding' rating. The four wind cowls form part of the building's natural ventilation system, providing fresh air to 3,600 m² of floor area divided over two levels.

● Visit www.flaktwoods.co.uk

Housing trust achieve 25% reduction in energy consumption

The Liverpool Housing Trust has used Atlantic Boilers' VF range of boilers to significantly reduce energy consumption at its Friendship House building. The trust manages more than 40 retirement properties for older people.

Friendship House, houses 31 flats with resident staff support, and contains lift, lounge, guest facilities, salon and garden.

The original boilerplant was replaced with two of the Atlantic VF 100kW all stainless steel pre-mix gas, low NOx condensing boilers.

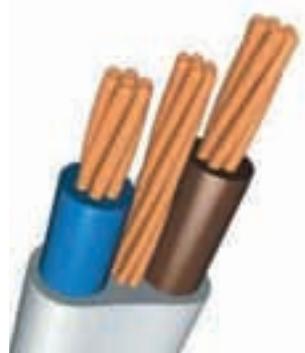
● Visit www.atlanticboilers.com



Two decades of CableCalc Level P marked with a free version of new twin and earth calculations

To mark 20 years of CableCalc, Castline Systems has released a free version of its popular CableCalc program, which will calculate single-phase radial and ring circuits wired in twin and earth cable. It includes free technical support by email. CableCalc Level P is a fully working, unlimited-use version and provides far more than just simple volt drop calculations. CableCalc Level P can be downloaded from www.castlinesystems.com free of charge.

● Visit www.castlinesystems.com or call 012 9387 1751



Birmingham turns over a new leaf

Few buildings have attracted the same level of public attention in recent years as the opening of the new Library of Birmingham. The façade of the 11-storey, £189 million building that was designed by Dutch architects Mecanoo, has been likened by many to a wedding cake.

The external impression is deceptive in disguising the vast 330,000 sq ft interior, which is home to multiple performance spaces, an exhibition gallery, music rooms, rooftop terraces and a large glass central book rotunda that contains many of the 1 m books it houses. Little wonder that this library has been dubbed one of a new breed of international 'super libraries'.

● Visit www.grundfos.co.uk, email grundfosuk@grundfos.com or call 015 2585 0000



Versatility comes as standard with Maxis

MHS Boilers, part of ELCO Heating Solutions, has launched Maxis – a new range of versatile cylinders, designed for traditional boiler systems, heat pumps and solar applications. The range is available in single and twin coil versions in capacities from 800 litres to 2,500 litres, as well as potable water buffer vessels in capacities from 800 litres to 3,000 litres. Cylinders are supplied with dual thermostats, allowing for user-adjustable temperature control. Both versions are suitable for use in solar thermal installations.

● Visit www.mhsboilers.com or call 012 6854 6700

Creature comforts from Remeha

A Remeha Quinta Pro boiler has been installed at the Gorilla House at Bristol Zoo as part of an impressive £1 m refurbishment and extension project. The newly-transformed BREEAM-certified enclosure is heated by a combination of underfloor heating, radiant panels and tubular heaters, all fed by a Remeha Quinta Pro 65 condensing boiler. Andy Murray, contract manager at Priddy Engineering, specified the ultra-low NOx Quinta Pro for its environmental credentials, space-saving dimensions and ease of installation. He said: 'Being able to fit the new boiler quickly and quietly meant the gorillas could stay in their familiar surroundings throughout the refurbishment without any unwanted stress.'

● Visit www.remeha.co.uk, email boilers@remeha.co.uk or call 011 8978 3434



PMI Software's new website enhances quality and availability of information for clients

PMI Software, a supplier of proven, dynamic software solutions to help companies maximise the value of their assets, has announced the launch of its new website, www.pmisoftware.com. The new website is designed to allow clients, prospective clients and other users to navigate easily through the company's suite of PEMAC products and related services, access relevant information by sector or position, download case studies, helpful product tips and related documents, register to join its mailing list and request a call back.

● Visit www.pmisoftware.com, email brendan.hyland@pmisoftware.com or call 003 5321 4915 232



Crane Fluid Systems WRAS-approved public health range now available

Crane Fluid Systems has launched a range of WRAS-approved Public Health Valves, designed for hot and cold water systems.

Available in multiple sizes and in pressure ratings from PN10 to PN25, they are ideal for a wide variety of construction projects and especially useful for buildings with a high footfall traffic, such as hospitals and medical centres, hotels, high-rise buildings, educational and sports facilities.

● Visit www.cranefs.com or www.cranebsu.com



Helvar launches 434 EnOcean Gateway

Helvar has launched a new module which allows the integration of EnOcean controls and sensors into a Helvar DALI lighting network. The 434 EnOcean Gateway can be wall or ceiling-mounted and is connected to a DALI network via a standard two-wire cable. Helvar recently joined the EnOcean Alliance and the 434 Gateway is the first product the company has launched that is compatible with EnOcean products. Andrew

Glossop, product manager at Helvar, said: 'The launch is a key step in our mission to develop energy-harvesting wireless control systems that are simple to install, easy to use and guarantee energy savings for all types of organisation.'

● Visit www.helvar.com



Kingspan first insulation to gain BES 6001

The ability to demonstrate responsible sourcing back up the supply chain is becoming increasingly important

in today's competitive and environmentally-aware market. Kingspan Insulation claims proudly to be the first insulation manufacturer to be certified to the demanding BES 6001: Responsible Sourcing of Construction Products standard. All Kooltherm, KoolDuct and Therma insulation products and cavity closers manufactured at Kingspan Insulation's British manufacturing facilities are now certified to BES 6001 'Very Good'.

● Visit www.kingspaninsulation.co.uk/sustainability, email literature@kingspaninsulation.co.uk or call 015 4438 7384



Virtual Power Plants win national award for innovation

A ground-breaking initiative to harness so-called Virtual Power Plants for cooling and heating homes and businesses has won a major national award for innovation. Virtual Power Plants use high-efficiency heat pumps, running on virtually frictionless magnetic bearings, to generate and store reservoirs of thermal energy and 'coolth', which can be used to supply heating and cooling. With a capacity of up to 10 MW each, the plants can generate high-efficiency, low-carbon energy to augment conventional electricity supplies.

● Visit www.klimatherm.co.uk or call 020 8947 1127



New book: Building Services Design for Energy Efficient Buildings

The role of building services engineers is undergoing rapid change and is pivotal to achieving low-carbon buildings. However, books in the field have largely focused on the detailed technicalities of HVAC systems, often with little wider context. This book addresses that need by embracing a contemporary understanding of energy-efficiency imperatives, together with a strategic approach to the key design issues impacting upon carbon performance, in a concise manner.

● Email construction@routledge.com or call 020 7017 6000



LG's Multi V IV – 30% increase in VRF efficiency

LG's Multi V IV's 4.85 EER is one of the highest in the world for a VRF system. As it effectively minimises energy loss under partial load conditions, the Multi V IV is able to offer a 30% improvement in integrated energy efficiency. The new Variable Heat Exchanger Circuit intelligently selects the optimal paths for heating and cooling, contributing a 15% improvement to integrated energy efficiency. LG's latest inverter technology produces extremely fast heating and cooling that is 64% faster than the previous model, while the partial defrost function improves heating capacity by as much as 27% in the winter months. LG's Snowdrift Detection system turns on the outdoor unit's fan to remove snow build-up only when necessary.

● Visit <http://uk.lgeaircon.com>



Prysmian supplies Gold cable to Leeds' First Direct Arena

Prysmian's FP 200 Gold 'standard' fire resistant cable has been specified and installed in both the fire and public address systems at the new First Direct Arena in Leeds. Andrew Hutchinson, sales director for the Yorkshire branch of FaelSafe, oversaw the installation of the cable in the UK's first fan-shaped construction. Andrew specified FP 200 Gold for its reliability. He explained: 'It's a tough, durable and dressable fire-resistant cable, which is easy to install and terminate.'

● Email cables.marketing.uk@prysmian.com or call 023 8029 5029

Building Services Handbook: new edition

This new edition has been reviewed and updated in relation to the latest building and water regulations, new technology, and new legislation. In addition, topics such as: alternative sources of natural energy, solar, ground source heat pumps, renewable energy sources, geothermal methods and wind power, are now covered. It summarises the application of all common elements of building services practice, technique and procedure, to provide an essential information resource for practitioners.

● Email construction@routledge.com or call 020 7017 6000



£50 m to help companies save energy

EMSc (UK), manufacturer of the UK's market-leading voltage optimisation solution, Powerstar, has £50 m funding available for administration to public- and private-sector companies wishing to invest in implementing specific energy saving technologies. The £50 m is for technologies that can deliver a return on investment within a five-year period, as identified in reports prepared by the NHS Sustainable Development Unit and St George's University.

Funds will be provided interest-free for up to five years.

● Visit www.powerstar.org



Growing gas safety company celebrates success with new offices

S&S Northern has sealed its success with a move to new and larger

premises. The new offices at Buckshaw Village near Chorley in Lancashire were officially opened by Nigel Haworth, award-winning chef of the Northcote Group, including the Michelin Star restaurant Northcote Manor.

S&S Northern was established in 1995 and now employs nine staff members. The company has enjoyed year-on-year growth, and is a market leader in the manufacture and supply of gas safety equipment for commercial kitchens, laboratories and boiler houses in the UK.

● Visit www.snsnorthern.com



Local company provides communal heating solution for Epsom station redevelopment

Epsom railway station has been redeveloped to provide new and improved facilities for the town, alongside 117 new homes, a Travelodge hotel, and three



retail units. The scheme has been developed by Solum Regeneration – a joint partnership between Network Rail and Kier Property. Evinox, a local company based in Epsom, has provided a complete communal heating solution for the station development. This includes M&E design support, heat interface units and an energy metering and billing service.

● Visit www.evinoxenergy.co.uk or call 013 7272 2277



Mitsubishi Electric renews strong partnership with customer-focused Logicool

Mitsubishi Electric has renewed its ongoing relationship with specialist air-conditioning supplier Logicool Air Conditioning Distribution, following the company's success as an official Value Added Reseller (VAR). Logicool, which celebrates its fifth year of successful trading, is a technically biased and customer-focused specialist supplier of air conditioning, heat pump and ventilation products. The company has built a strong reputation for superb customer service and project support. Founder, Karl Richardson has used his technical and customer service skills as building blocks for the growth of the company.

● www.logicool-ac.com

Joined-up thinking at 20 Fenchurch Street

Fitzpatrick Mechanical Services has just completed the shell and core drainage package at 20 Fenchurch Street, 'The Walkie Talkie,' in London EC3. In a contract worth £1 m, Fitzpatrick Mechanical Services has completed the package on budget and ahead of schedule. Designed by world-renowned architect Rafael Viñoly, 20 Fenchurch Street is visually distinctive, and designed for maximum efficiency with a density for all services of one person per 8 m².

● Visit www.teekaycouplings.com



The shape of things to come...

Nick Ryman, air conditioning and energy solutions general manager at LG, believes the development of ever-more sophisticated controls will enable air conditioning and indoor climate control to achieve ever higher efficiencies through total building management – it is the shape of things to come.

Developments in building control systems have improved exponentially over the past few years as systems developers vie with one another to produce the most efficient solution. And air-conditioning manufacturers are not being left behind when it comes to developing technology, achieving ever-more energy efficient outcomes.

● Visit www.lg.com/uk/air-conditioning



ACS wins recognition for making the business case for R22 efficiency

Specialist supplier Air Conditioning Solutions (UK) (ACS) has received an Award from Mitsubishi Electric for its work with the Connells Group on R22 replacement – in the first year of the new Green Gateway Awards, which

see the manufacturer recognise the important contribution of its partners in encouraging energy efficiency in the built environment. ACS has been working with Connells since 2000 and has helped the group achieve estimated cost savings of more than £150,000 a year, while cutting carbon emissions in each upgrade branch by more than half.

● Visit www.airconsolutions.co.uk

KE Fibertec is BIM-ready for 2016.

If you are looking to use fabric ducting on your BIM project, KE Fibertec offers 1253 products to choose from in the MagicAD database. The selectable products span the product range from low impulse systems for laboratories through inject hybrid systems for classrooms, all the way to Direjet long throw nozzle systems for swimming pools and warehouses. Fabric ducting is bespoke, so a range of lengths and diameters are selectable from the database. KE Fibertec is BIM-ready for 2016.

● Visit www.ke-fibertec.com or call 023 8074 0751



Growth sparks appointment of new Airius directors

Thermal fans manufacturer Airius is celebrating an impressive year

of new sales orders, which has seen the firm achieve growth of 70%. One considerable new win for the firm is major UK retailer, Morrisons, which has specified Airius units in more than 130 stores to date with more on the way. Strengthening the firm's senior management team, Airius has made Mark Waterhouse (sales director) and Guy Bridges (operations director) board members.

● Visit www.airius.co.uk



Radiant heating CPD receives RIBA approval

HCP, a division of SAS International, is pleased to announce a new RIBA-accredited CPD on water-based radiant heating solutions. The CPD

seminar covers the benefits of specifying radiant heating systems that meet energy efficiency demands. The presentation also looks at the standards relating to radiant heating, including their contribution towards BREEAM and LEED compliance. A radiant heating system, such as those manufactured by HCP, offers quicker heat-up times and smaller plant demands.

● Email cpd@hcp-sasint.co.uk or call 011 8929 0900

Wall-to-wall comfort with new Zehnder Nestsystems radiant conditioning

Zehnder, a manufacturer and supplier of indoor climate solutions, is proud to announce the launch of Zehnder Nestsystems. The company's next-generation radiant conditioning system for residential and commercial applications, is billed as a heating, cooling and dehumidification system for the perfect indoor climate. Boasting dual heating and cooling functionality, rapid response times, exceptional controllability and superior energy efficiency, Zehnder Nestsystems comprises a network of specially designed plasterboard panels, which incorporate an innovative radiant heating and cooling element.

● Visit www.radiant-conditioning.zehnder.co.uk or call 012 7660 5800



LG and Multi V IV VRF

LG's advanced, new-generation Multi V IV VRF solution delivers superior performance alongside industry leading energy-efficiency, and reduced running costs.

LG's Multi V IV's 4.85 EER is one of the highest in the world for a VRF system. As it effectively minimises energy loss under partial load conditions, the Multi V IV is able to offer a 30% improvement in integrated energy efficiency. LG's Active Refrigerant Control automatically regulates the amount of circulating refrigerant (per cycle) in five-step increments, leading to a three per cent gain in efficiency. Smart Oil Return monitors oil volume in real time, adjusting levels only when needed.

● Visit <http://uk.lgearcon.com>



Hitachi Air Conditioning Europe launches aircademy training centre

Hitachi Air Conditioning Europe is proud to announce the launch of its newly refurbished aircademy training centre in Maidenhead, Berkshire. Hitachi's aircademy has recently been updated to showcase its latest ErP-compliant air conditioning and MCS-approved heating products, many of which have also been awarded ECA status. All equipment is fully operational and is used extensively throughout the full-day, product-specific courses to enable trainers to deliver practical and theoretical training.

● Email aircon.training@hitachi-eu.com or call 016 2858 5394

One Angel Square alive with latest technologies

At One Angel Square, Manchester, stands the landmark building that houses the Co-operative Group's new headquarters. Striking in its architecture, it is an expression of the Co-op's values and commitment to the environment: it is a statement for sustainability. The Co-op's leadership in green architecture is supported by Luxonic Lighting, a leader in quality LED and interior lighting solutions across the architectural and commercial markets. The UK manufacturer has provided more than 11,000 luminaires throughout the office and communal areas in the headquarters.

● Email info@luxonic.co.uk or call 012 5636 3090 visit www.luxonic.co.uk



The new generation of VRF from LG

LG's Multi V IV has four of LG's proprietary technologies – the compressor, the heat exchanger, the oil and the refrigerant. Nick Ryman, general manager of sales at LG Electronics UK, said: 'The true fourth generation VRF system, Multi V IV offers the customer unparalleled energy efficiency via four of our own innovative technologies.'

'The Multi V IV boasts an energy efficiency ratio (EER) of 4.85, while our High Pressure Oil Return (HiPORTM) system effectively resolves the issue of compressor energy wastage. This product provides excellent operational savings and greater convenience to our customers.'

As it effectively minimises energy loss under partial load conditions, the Multi V IV is able to offer a 30% improvement in integrated energy efficiency.

● Visit <http://uk.lgearcon.com>



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LG new generation VRF

Multi V IV, a new benchmark in VRF, is the result of major investments by LG after extensive research with end users, specifiers and installers about their needs and the demand for efficiencies and integration into modern 'smart' building management systems. The new, global, technologies were designed and built by LG's Academy of Excellence at the company's research and development facilities in South Korea. Nick Ryman, general manager of sales at LG Electronics UK, said: 'The true fourth generation VRF system, Multi V IV offers the customer unparalleled energy efficiency via four of our own innovative technologies.'

● Visit <http://uk.lgeaircon.com/>



Vent-Axia's energy efficient heat recovery shortlisted in Energy Awards

Vent-Axia has made the shortlist in the prestigious Energy Awards 2013, which recognise and reward companies leading the way in reducing carbon emissions. Vent-Axia's Lo-Carbon Kinetic Plus E, Mechanical Ventilation with Heat Recovery (MVHR) system has been selected for the shortlist in the 'Energy Efficient Product of the Year' category. Launched in 2012, the Kinetic Plus E is the best-performing MVHR system listed on SAP Appendix Q.

● Visit www.vent-axia.com or call 084 4856 0590

GHA shows the way

Glasgow Housing Association (GHA) has been able to increase its CO alarm replacement cycle by using Kidde Fyrnetics' TenYCO range – the very first battery carbon monoxide alarms with a full 10-year guarantee covering both alarm and sealed-in lithium battery. GHA is one of the largest social landlords in the UK, with more than 43,000 tenants and has been fitting CO alarms for a decade, while undertaking heating installations. In 2008, this was extended to maintenance contracts as well.

● Visit TenYCO.kiddefyfnetics.co.uk or email kiddefyr@ukgateway.net



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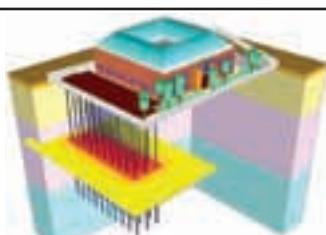
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Senior Electrical Design Engineer | Berkshire | to £50k | ref: 4214

A world renowned multi-disciplined consultant requires an Electrical Engineer with excellent leadership and design skills. Ideal candidates will be Chartered and have experience working on major commercial and residential projects.

Senior Mechanical Design Engineer | London | to £32LTD | ref: 4379

Candidates will join an open-plan, vibrant office and work on a variety of projects including stadiums both in the UK and overseas. Experience of HVAC systems and above ground drainage, including mains cold water and hot water services, is essential. Ideally you will be proficient in the use of IES and Hevacomp.

M&E Design Engineers | Birmingham | to £30K | ref: 4272

Our client is a leading multi-disciplined Consultant, with a large overseas presence. Candidates will have proven experience of conceptual design with a strong sustainability focus. Excellent opportunity.

Sustainability Consultant | North London | to £30K | ref: 4290

Our client is looking for a Sustainability Consultant to carry thermal modelling calculations, engineering design, building services and energy related work. A programme of training for Breeam and SAP is on offer.

Int. Electrical Design Engineer | Southampton | to £35K | ref: 4186

A market leading multi-disciplined Consultant is looking for a Electrical Engineer to join their established team. You will need hands on design experience and be fully proficient with AutoCAD and Dialux. Progression to Chartered status will be available.

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Senior Electrical Design Engineer | Manchester
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This is a fantastic opportunity to join a well-respected international engineering consultancy with a team based in Manchester. Our client has a very strong reputation for remaining at the forefront of modern engineering practice, securing a number of lucrative projects. They are seeking a Senior Electrical Design Engineer to help lead a number of multi-disciplinary projects; you will be expected to conduct client liaison meetings and manage project staff.

Mechanical Design Engineer | Brighton
£35,000 - £45,000 Plus Benefits

This medium-sized building services engineering consultancy in Brighton are currently looking for a Mechanical Design Engineer to work on commercial, leisure and educational projects. The candidate will have a minimum of 5 years' experience within a building services consultancy. Fantastic opportunity for an ambitious engineer, with opportunity for a partnership.

Project Associate (Mechanical) | London
£50,000 - £55,000 Plus Package

I am representing an international Engineering consultancy, whose office in London is expanding after successive framework and project wins. They are seeking a high calibre Mechanical Design Engineer to lead large mechanical teams on residential and commercial projects. You will be technically capable with senior level ambitions.

Mechanical Design Engineer | Cardiff
£35,000 - £40,000 Plus Package

A leading international construction and property consultancy are looking to recruit a Mechanical Building Services Engineer to join their building services department. This department is well known nationally to have some of the best engineers in the industry, with a reputation for regularly exceeding client expectations. Fantastic role offering support through further education and chartered applications.

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Mechanical Technical Director 50,000 AED PCM, Dubai, UAE

This client is one of the largest International consultancies, employing well over 8500 staff in its 30+ offices. They undertake a variety of schemes worldwide, typically, the Middle Eastern region carries out projects within the healthcare, government, commercial, and education sectors. They are looking for a technical authority that is a natural leader of people. The candidate should have a background in building services design, be employed in a similar position within a consultancy, and possess a very well developed commercial acumen. BAR1442/PA

Senior Mechanical Design Engineer £45k + benefits, London

An award winning, environmentally focussed multi-disciplinary design consultancy to the built environment, is currently seeking to bring on board a chartered mechanical design engineer to take a lead role on a number of prestigious UK projects. The role is client facing, and requires a technically capable, sustainability focused mechanical design engineer. You should have previous experience of mentoring more junior engineers and be capable of taking a lead role on projects. BAR1399/TA

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Mechanical and Electrical Building Services Design Engineers – Various Levels – Sheffield

Due to a significant increase in workload we are currently looking to expand our current team within our M&E and Low Carbon Engineering Section, therefore we have vacancies for various levels of Mechanical and Electrical Design Engineers within our Sheffield office.

The Electrical candidates must have at least 2 years' experience in an M&E consultancy environment and ideally a working experience in the use of AMTECH and RELUX.

The Mechanical candidates must also have at least 2 years' experience in an M&E consultancy environment and ideally they will have working experience of using IES virtual environment although not essential.

We may also consider applications for potential junior engineers from suitably qualified candidates who are currently looking to make the step from a practical installation background.

The successful candidates will be professional, ambitious, competent and enthusiastic individuals who are looking for a challenging role. The opportunities are excellent for engineers in this rapidly growing company that are able to demonstrate their ability, quality, professionalism and commitment.

To apply for any of the above positions please send a letter and cv marked Private & Confidential to: HR Department, Waldeck, Kesteven Business Centre, 2 Kesteven Street, Sleaford, Lincs NG34 7DT.

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Electrical & Mechanical Design Engineer

London | £45k + Benefits | Ref: 13862

An established company with a team of over 180 engineers is looking to expand their London team. This Building Services consultancy has a fantastic reputation within the Commercial, Hi-spec Resi and Healthcare markets. They offer excellent career and Chartership aligned opportunities. Contact: darren.warmington@bsvrecruitment.co.uk

Principal Mechanical Design Engineer

London | £50-60k + Benefits | Ref: 13861

An International consultancy requires a Principal Engineer to manage a team of engineers working on a Grade 1 listed building renovation. This is an £80m project, you will be based in their Central London office. Contact: darren.warmington@bsvrecruitment.co.uk

Intermediate & Senior M&E Design Engineers

London, Kent, Surrey & Hampshire | £36/55k | Refs: 13831/32/59/66/83

Due to numerous new Project awards, we have been contacted by various Consultants looking to strengthen M&E Design teams to work on Projects both UK and Internationally. Typical examples include Mixed-Use, High-end Residential, Large Commercial fit outs, Airports, Museums and Galleries. Full support and career development will be strongly encouraged. Contact: paul.bartlett@bsvrecruitment.co.uk

Principal HVAC & Electrical Design Engineers / Associates

London | £55/70k & Excellent Benefits Package | Refs: 13783 / 93

Recent Project awards and internal promotions have created opportunities with this International Building Services Consultant based in The City. This is an excellent chance for individuals keen on career development. They have an outstanding Project portfolio and ongoing works into 2015 and beyond. Contact: paul.bartlett@bsvrecruitment.co.uk

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Shortlist announced in this issue

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EDEN BETTER

The Eden Project in Cornwall has made cost savings of almost £500,000, saving 781.4 tonnes of CO₂ in the last three years. Energy officer Amy Hurst explains the challenges behind the project and plans for the future of the famous West Country biomes

Since 2007-2008, the Eden Project has reduced its energy consumption for electricity by 18%, heating by 20%, and its carbon dioxide emissions by 20%. And now, the project has set an even steeper target of a 25% carbon reduction by 2015. The Eden Project has been driving down energy consumption by using alternative energy sources, including wind, solar, biomass and air-source heat, and installing high-efficiency boilers and a new BMS. Sustainable construction, including insulation, natural lighting and ventilation, have also played a part. The project has also received planning permission to build one of the UK's first geothermal power plants, generating enough heat and electricity to supply the Eden Project and about 3,500 households.

What is your carbon reduction strategy at the Eden Project?

We have set ourselves a goal of 25% carbon reduction by 2015 (against our 2008 figures). We have made a 20% reduction so far and – with two years to go – we are hopeful we can achieve this. We have moved away from using heating oil, reduced our energy and water use, and hope to implement more renewable energy options on site.

How much energy has been saved in your carbon reduction projects?

As part of our energy saving project, which included installing efficient condensing boilers, direct hot water providers, inverters, and rolling out a BMS across the main site, we have saved 18% electric and 20% gas.

We have planning permission for a 3-4MW geothermal power plant, taking energy from the heat in underground granite rocks

What was the main driver for reducing the Eden Project's carbon footprint?

To improve on the government targets and prove efficiency can actually save money while reducing environmental impact.

What renewables are you focusing on at the Eden Project?

We are working with Cornwall-based EGS Energy and we have planning permission for a 3-4MW geothermal power plant on the site, taking energy from the heat in underground granite rocks. This plant would produce enough power for the Eden Project and about 3,500 houses, plus all the heat we can use. Solar is also a strong option when considering payback scenarios but we will consider all options when it comes to emerging renewables as well as established technologies.

Which is the most challenging biome in terms of energy efficiency?

It will always be the rainforest biome with its temperature and humidity requirements.

What are the main challenges in your role as energy officer?

Eden is a big site with around 400 staff. My role includes keeping all these people up-to-date with energy issues. So, as well as formulating awareness campaigns, I also attend team meetings. It is a challenge to make sure I keep in regular contact with everyone, but we have a great team here who understand and are engaged in our energy efficiency.



How has your job evolved over the years?

It certainly took me a while to learn the intricacies of this unique site and how both our BMS and EMT systems worked. Communication is always key in these roles and that has really improved as I have got to know everyone. I feel we are at a really good place at Eden where the whole team shares the same goals towards reducing our impact on the environment and working more efficiently.

How do you engage employees and the public to be more sustainable?

We launch a new energy saving campaign every year and offer staff help and advice for their own homes. Projects such as Cornwall Together – a groundbreaking collective energy-switching programme – help us communicate messages about energy efficiency to the public.

What are your next energy targets?

This year we have set strict energy saving targets of 6% gas and 7% electricity reduction against last year and, currently, we are on track to achieve this.

Could the Eden Project ever be zero carbon?

Our plans for increasing renewables across the Eden site – in particular our proposed geothermal power plant – will go a long way towards reducing our carbon footprint.

● **AMY HURST** is energy officer at the Eden Project

Events & training

NATIONAL EVENTS AND CONFERENCES

CIBSE/ASHRAE Joint Symposium 2013 - Innovation & Technology for Built Environment

12 November, Hong Kong

This annual symposium brings together international and local speakers to foster all aspects of advances in building design and building services engineering. CIBSE president-elect Peter Kinsella and CIBSE CEO Stephen Matthews will be among the speakers. www.cibse.org.hk/eventdetail.php?id=655

The Guardian Women in the City awards: Woman of achievement

29 November, London

A prestigious event celebrating women in leadership presents its awards for the Built Environment category. www.cibse.org/events

CIBSE Building Performance Awards 2014

11 February, London

The prestigious awards evening returns to recognise the businesses, team, products and projects that demonstrate engineering excellence in the built environment. Table bookings now accepted. www.cibseawards.org

CIBSE GROUPS AND SOCIETIES

For more information visit www.cibse.org/events

SoPHE Residential Sprinkler Design Forum

5 November, London

SoPHE members and industrial associates debate residential sprinkler design. www.cibse.org/sophe

East Anglia regional pub quiz 2013

6 November, Bury St Edmunds

Pit your wits against other teams from the industry to be crowned 2013 East Anglia region quiz champions. www.cibse.org/events

Light therapy - The power of light

6 November, Manchester

Experience the power of light therapy in a monochromatic light dome which allows the body to feel like it's floating. An event hosted by CIBSE YEN, NW region and the SLL. www.cibse.org/events

Design and simulation for zero carbon buildings

7 November, London

A half day Building Simulation Group event exploring current and future approaches to achieving zero carbon buildings (ZCB) design. www.cibse.org/bsg

SLL masterclasses

7 November, Portsmouth

3 December, Manchester

The popular masterclass returns focussing on energy reduction in quality lit environments. www.sll.org.uk

CIBSE Northern Ireland annual dinner

8 November, Belfast

The Ulster Reform Club in Belfast city centre hosts the Northern Ireland region for the annual dinner. The evening will feature entertainment, fundraising and an update from CIBSE President George Adams. www.cibse.org/events

Pre-Fabrication within Building Services

12 November, NSW, Australia

The latest in a line of monthly seminars arranged by the NSW chapter of the ANZ region.

<http://www.cibse.org/index.cfm?go=page.view&item=2612>

Internal environmental quality - The number 1 focus

13 November, Birmingham

An evening event organised by the West Midlands region. www.cibse.org/events

Renewables/Mine water extraction

13 November, Kegworth

An evening event hosted by the East Midlands region. www.cibse.org/events

Best practice heating & hot water plant refurbishment

14 November, Milton Keynes

Stuart Turner of Hamworthy Heating presents a practical guide on the refurbishment of buildings; particularly the plant rooms, heating, hot water systems and upgrade of boilers and water heaters. www.cibse.org/events

BMS Protocol

14 November, Brighton

This presentation by Anthony Dann explains the different networks and protocols typically associated with modern BMS systems and how these can be used to integrate third party equipment, together with other control manufacturers' devices. www.cibse.org/events

Jaguar Land Rover technical tour

14 November, Liverpool

Europe's top performing car plant houses all major production facilities for the Freelander and Evoque under one roof. The tour takes you from the initial process of stamping the panels through to final trim and assembly. www.cibse-mnw.org/events

Part L update

19 November, London

CIBSE Technical Director Hywel Davies will discuss 'Energy performance and the law - where do they meet?' There will also be a membership briefing from the CIBSE Membership team. www.cibse.org/events

Biological control for domestic water systems (incl healthcare premises)

20 November, Manchester

A free event organised by SoPHE and YEN (North West) with a presentation by Adrian Aylett of Hydrotec Ltd.

www.cibse.org/sophe

Energy Use in Buildings & Presidential Address

20 November, Bristol

Closing the performance gap: The three part session includes a presentation of the latest research from an academic, a case study presented by an

engineer in practice and a question time session. www.cibse.org/events

Is your building performing as well as it should be?

21 November, Leeds

Darren Wright and Richard Reid of Arup, and Adrian Leaman (curator of the BUS method) are presenting the BUS methodology - what it is, where it came from, the partner network, how it is used and how the results indicate the performance of the building. An event organised by the Yorkshire region. www.cibseyorkshire.org/events

The Sustainable Energy Awards 2013 - Gala Dinner

21 November, Dublin

Celebrating ten years of energy saving and ten years of worthy winners, reducing energy use and emissions. The Sustainable Energy Awards 2013 features exciting new categories that mark the heritage of the awards and recognise the ambitions of sustainable energy advocates. www.cibseireland.org

Local Exhaust Ventilation (LEV) information day

26 November, Derby

The ILEVE host another of the popular LEV information days. www.cibse.org/events

Site Visit: Beenyup water treatment plant

27 November, WA, Australia

The Beenyup wastewater treatment plant is operated by Water Corp. The advanced water recycling facility was built for the groundwater replenishment trial which began recharging recycled water into groundwater in November 2010. A visit arranged by the Western Australia chapter of the ANZ region.

<http://www.cibse.org/index.cfm?go=page.view&item=2613>

Building services in hazardous areas

28 November, Northampton

An evening event organised by the East Midlands region. www.cibse.org/events

CPD TRAINING

For more information, visit www.cibsetraining.co.uk or call 020 8772 3660

Design of heating and chilled water pipe systems

5 November, London

Electrical services explained (three days)

5 November, Newcastle

Practical project management

6 November, Manchester

Legionella control - role of the responsible person

7 November, London

Power system harmonics

12 November, London

Introduction to 11KV distribution and protection

14 November, London

Energy monitoring and targeting

14 November, Manchester

Effective maintenance management

19 November, London

Design of ductwork systems

20 November, London

Lighting legislation

21 November, London

Fire risk assessment to PAS 79

27 November, London

Gas safety regulations

28 November, London

WRAS water regulations

29 November, London

ENERGY ASSESSOR TRAINING

For more information visit www.cibsetraining.co.uk/energyassessor

EPC training

5-6 November, London

Lighting and energy efficiency

12 November, London

HVAC systems and building services

18 November, London

Air conditioning inspection for buildings

19 November, Birmingham

EPC training (two days)

26 November, Birmingham

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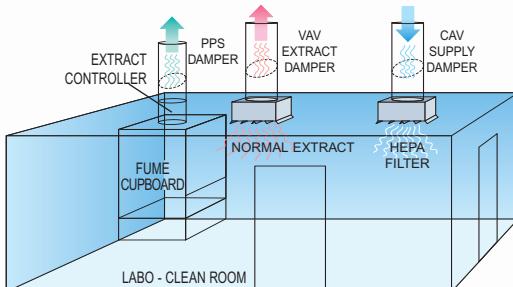


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