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May 2013

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Landlords at a loss

The clock is ticking for property landlords. From April 2018 it will be illegal to rent out residential or business premises unless they meet Minimum Energy Performance Standards.

This means that properties must have an Energy Performance Certificate (EPC) rating of at least an E. Under the law, tenants in property rated F and G can insist the landlord improves their building at his/her own expense.

To meet these requirements landlords need to start thinking now about improving the energy efficiency of their real estate. Unfortunately, according to Deloitte's Andrew Cooper, the tools chosen by government to implement the policy have left landlords in a state of utter confusion (page 18).

Cooper says the use of EPCs to measure energy is at the root of the problem facing landlords when they attempt to plan energy efficiency strategies. EPCs are based on energy modelling software and don't measure actual energy use. Figures measuring actual energy use from the Carbon Buzz website, extracted by Feilden Clegg Bradley's Ian Taylor, suggest that buildings are missing their energy targets by up to 250% (page 19).

This wild mismatch between designed performance and reality

will be a big issue for landlords in 2018.

Tenants will be able to check whether or not newly improved buildings are more energy efficient simply by checking their energy bills. What the legal position is when tenants' expectations fall short is not yet clear.

Such is industry's doubt over EPCs, that property firms are now developing their own rating systems, as pointed out by British Land's Justin Snoxall at the CIBSE Technical Symposium. Snoxall is helping to develop Landlord Energy Ratings, which will allow

property companies to measure energy used by tenants. Snoxall revealed that British Land had achieved a 39% energy reduction in four years on its estate, but this was only for energy that the landlord could control. The challenge of reducing occupiers' energy use is something that won't be achieved with EPCs.

Our striking cover picture is of Bingham Canyon Copper mine, which recently suffered a catastrophic landslide, putting the mine out of action. It's a reminder of how much our industry takes from the earth in delivering HVAC systems. Read how CIBSE has partnered with WRAP to explore more efficient use of resources on page 24.

Alex Smith, Editor

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CIBSE LAUNCHES INTERNATIONAL BUILDING PERFORMANCE AWARD

The 2014 CIBSE Building Performance Awards will see the introduction of a new category – the International Project of the Year award.

Two existing awards will also be revamped, with the Refurbishment

Project award divided into values above and below £5m, and the New Build Project of the Year award, divided at the £10 million mark. There are now 14 awards.

The award ceremony will be held on February 11 at London's

prestigious Grosvenor House Hotel.

The deadline for entries is September 12, and the shortlist will be announced in the *CIBSE Journal* in November.

The awards are free to enter. More at www.cibseawards.org

Developers 'frustrated' by energy rating schemes

● Gap in the market for landlord ratings

Leading property firms are demanding urgent action to incentivise landlords to improve the energy efficiency of multi-occupancy commercial buildings.

Speaking during last month's CIBSE Technical Symposium at Liverpool John Moores University, British Land's Justin Snoxall said it was frustrating that the industry had failed to develop a robust method for measuring operational efficiency.

He said Display Energy Certificates (DECs) are a 'step in the right direction' but are nowhere near good enough. The Better Buildings Partnership (BBP) has taken matters into its own hands and is developing the Landlord Efficiency Rating (LER) scheme. Snoxall said this is urgently needed.

'It is very frustrating how difficult it is to demonstrate energy efficiency to the property market and, as a result, there are no incentives for landlords to reduce their energy use,' he said. 'BREEAM, LEED and EPCs are not good enough because they don't demonstrate operational efficiency.'

'There is a gap in the market for a method that helps

landlords demonstrate energy savings in multi-let buildings.'

Snoxall said the LER scheme could become the rating scheme for new lettings in existing buildings as an equivalent to BREEAM, which is used for new builds. Widespread use of the LER could bring about 'market transformation' according to the BBP.

He also said there was not enough emphasis on 'good engineering management' across the commercial landlord market. 'There is too much focus on retrofit as the panacea for energy reduction, when so much can be gained from improving management practices and cooperating with occupiers.'

Snoxall told the Symposium that British Land had achieved a 39% energy reduction in four years on landlord services across its portfolio. That represents a cut in energy costs of £1.7m.

Landlords have control over only around 50% of energy consumption in multiple occupancy commercial buildings and that is where the BBP is focusing its efforts. However, Snoxall said it is also possible for landlords to tackle tenant usage by entering into new management agreements where occupiers agreed to pay for 'out of hours' energy use.

In brief

FETA PRESIDENT ATTACKS 'UNKNOWN MOTIVES'

The industry must take back control over its own destiny from 'individuals or groups with unknown motives', according to John Austin-Davies, president of the Federation of Environmental Trade Associations (FETA).

Speaking at the federation's annual lunch, he said people outside the industry had too much influence on the rate of change, particularly in the refrigeration and air conditioning sector, by influencing European legislation.

He said: 'It is inside our industry where the greatest knowledge and experience lies, to determine what is the appropriate, correctly supported, sustainable rate of change; this voice must be heard over and above the voices of individuals or groups with unknown motives.'

FM INDUSTRY BACKS BIM

Industry bodies have joined forces to form the BIM4FM group to improve engagement from facilities management in developing Building Information Modelling (BIM) and the Government Soft Landings (GSL) initiative.

The group is kicking off with a survey to gauge what facilities managers (FMs), owners and occupiers need from BIM, establishing the level of awareness across the industry and the barriers to be overcome. The survey can be accessed at www.surveymonkey.com/s/BIM4FM, with results due to be published this summer.

Geoff Prudence, the group's first chairman, said the time was right for all interested parties to come together: 'Although BIM has long been discussed at the construction end of the supply chain, it has only recently and repeatedly started to raise its profile with those operating and using buildings.'

Among the group's aims are: defining what BIM means to FM; identifying the benefits of BIM & GSL for owners and occupiers; and raising awareness from a strategic and operational (FM) perspective.

In brief

GOVERNMENT URGED TO EXCLUDE LATE PAYERS

The government and councils should not award contracts to firms that fail to pay their suppliers within 30 days, according to the National Specialist Contractors' Council (NSCC).

Chief executive Suzannah Nichol has written to business minister Michael Fallon urging him to take firmer action over late payment in the construction industry. She also asked him to toughen up the voluntary Prompt Payment Code so that firms with payment terms longer than 60 days are not eligible to join.

EXTENDED RHPP SOFTENS IMPACT OF RHI DELAY

The government says it is still committed to introducing the Renewable Heat Incentive (RHI) for households, despite another delay to the scheme.

The industry reacted with dismay when the domestic RHI was delayed until spring 2014 – making it at least three years late. Air-to-water heat pumps are also still excluded from the scheme and will not be fast-tracked in, according to a Department of Energy and Climate Change (DECC) spokesman.

The government said it would extend Renewable Heat Premium Payments (RHPP) to encourage residential users to invest in solar thermal, biomass and heat pump systems ahead of the full RHI.

The Micropower Council said the RHPP grants 'softened the blow', but called for the RHI to be implemented 'as quickly as possible'.

Poor standards threaten heat pump market

● RHI changes welcomed, but questions remain

The heat pump market is in danger of being set back by a decade or more because of inappropriate specifications, according to the Building & Engineering Services Association (B&ES).

The association fears heat pumps are in danger of going the same way as the underfloor heating industry, where poor understanding of the technology, untrained installers and mis-selling damaged the market.

The government wants to see 6.8 million heat pumps installed by 2030, which will require a huge leap from the current 20,000 a year to 600,000. However, the association is concerned such an ambitious target could encourage

inappropriate specifications.

David Frise, B&ES head of sustainability, said some electric heat pumps were being installed in properties that have gas supplies, which would make 'absolutely no sense in terms of carbon or cost' until the grid was decarbonised.

He also questioned installation quality, insisting: 'Some of the work is well below acceptable standards, overly complex and, in some cases, unsuitable for homes.'

Some developers and housing associations are choosing heat pumps just to get a 'tick in the box' for planning reasons or to meet the requirements of the Code for Sustainable Homes, said Frise.

Mike Malina, director of Energy Solutions Associates, said the supply chain was 'malfunctioning' and called on manufacturers to 'take the bull by the horns' and sort

out communication problems with contractors and end users.

In surveys of three domestic heat pump installations, Malina's firm uncovered repeated problems with handover, commissioning and end-user operation.

Many heat pumps are supplied through merchants and this means manufacturers lose track of their products and have no idea if they are being correctly or appropriately specified, according to Malina. He said end users are confused about how the systems work and their poor perception of the technology is being exaggerated by over-estimated electricity bills.

B&ES warned that poor experiences could easily turn consumers against the technology. One housing association ignored recommendations to improve communication with occupants and re-commission the systems and 'ended up ripping out 69 perfectly good heat pumps'.

'This is a minefield and is as much political as technical,' added Malina.

M&S SEES THE LIGHT

Marks & Spencer plans to cut energy use by 35% per square foot by 2015 across its estate. It has begun by replacing ribbon wall light fittings with low energy LED lighting in more than 170 stores. The work was undertaken by Balfour Beatty Engineering Services (BBES) and lighting manufacturer Phillips. BBES is also working with M&S to improve energy metering, and on remote management of in-store lighting, heating and ventilation equipment and food refrigeration systems, to reduce energy use and maintenance costs.



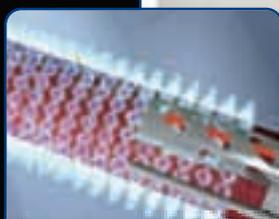
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CIBSE-certified advisers kickstart non-dom Green Deal

● Muswell Hill Golf Club is first lodged on register

The UK's first commercial Green Deal survey has been lodged by a CIBSE-certified Green Deal adviser.

Adrian Sweetman, of energy management company digitalenergy, is one of only two individuals to complete the new CIBSE Approval of Prior Experiential and Learning (APEL) route to become a Green Deal adviser. He was first to lodge a survey – of Muswell Hill Golf Club's premises – on the Green Deal national register.

The first CIBSE-certified Green Deal adviser was Richard Hipkiss, chief executive of digitalenergy, which was the first company to be APEL-accredited and helped the institution to develop the training.

Hipkiss said: 'The complexity of building services in non-domestic buildings is immense – heating, cooling, and ventilation. The amount of knowledge and experience needed to be an effective non-domestic adviser is significant.'

The APEL route to certification, which is accredited by UKAS, is already used by CIBSE to certify energy assessors. It allows experienced energy assessors and advisers, who aren't necessarily chartered engineers, to build on existing experience to become



Muswell Hill Golf Club Green Deal findings:

- Predominantly a 1930s building
- Solid walls
- Not very good levels of insulation
- Inefficient lighting

Recommendations include:

- Improve the loft insulation
- Replace the glazing throughout the building
- Replace hot water storage cylinders with

proper insulated units

- Change lighting to T5s and LED alternatives
- Include some solar hot water heating
- Replace electric heating in golf shop with an air source heat pump

'For this to work it is critical that all Green Deal advisers provide the best informed advice'

Green Deal advisers.

Andrew Geens, head of CIBSE Certification, said: 'CIBSE is welcoming the Green Deal initiative as a tool to help make buildings more energy efficient.'

However, for this initiative to work it is critical that all Green Deal advisers provide the best informed advice on where energy

performance improvements can be made.'

The commercial Green Deal became operational on 28 January in England, Scotland and Wales. The Muswell Hill Golf Club survey was one of a number of free, non-domestic Green Deal surveys that were carried out as part of the government's 'Pioneer Places' scheme. The government will analyse the outcomes, which offered assessments in areas including Brent and Kent.

For more on the Green Deal, turn to page 20

BIM 'wiki' to target supply chain

CIBSE is to launch a website aimed at demystifying building information modelling (BIM). BIMtalk will provide guidance aimed at the whole construction industry.

It will contain core information on BIM and include signposting for essential online resources. Based around a managed 'wiki', the resource welcomes input from other industry bodies, and has already had input from the Landscape Institute.

The site has been set up by the CIBSE BIM Steering Group, chaired by Paddy Conaghan of Hoare Lea. He said: 'We realised that there was a risk of a two-tier BIM society, not only in the world of the building services engineer, but across the whole of industry with a risk of many being left behind.'

'As part of the CIBSE BIM group we are developing a freely available web resource that will evolve into a non-partisan route to learning about BIM.'

CIBSE Journal technical editor Tim Dwyer said that BIM had to be accessible to the whole supply chain. He said: 'There is a tangible disconnect – even a gulf in understanding – between many a 'practitioner' and the BIM cognoscenti.'

BIMtalk.co.uk is currently in beta mode, and will be launched at the end of this month.

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In brief

BRE TO RESEARCH SOLID WALL INSULATION

BRE has been appointed by the Department of Energy and Climate Change (DECC) to carry out a 27-month research project aimed at understanding heat losses in the UK's seven million solid wall homes.

The research will look at how these walls perform before and after insulation, examining the energy use behaviour of occupants and the accuracy of techniques for measuring heat losses.

ALL PARTY GROUP TAKES ON SUSTAINABILITY BARRIERS

The All Party Parliamentary Committee for Excellence in the Built Environment (APPG for EBE) has begun gathering evidence for its inquiry into sustainable construction and the Green Deal. It hopes to identify best practice, as well as the challenges and barriers to sustainability in the built environment.

Experts will present their evidence to the APPG for EBE Commission of Inquiry, made up of members of both Houses of Parliament, senior members of the construction professions and key influencers and decision makers. The commission will be chaired by Oliver Colvile MP.

The Royal Institution of Chartered Surveyors (RICS), NEES (Natural Energy Efficient Sustainable) and UK Green Building Council (UKGBC) have already given evidence, with other bodies due to present this month. A report is expected to be published in the summer.

TRAFFIC POLLUTION CAUSES INDOOR AIR QUALITY ALARM

New European research revealing that traffic pollution near busy roads can cause chronic asthma in children should lead to greater investment in indoor air quality (IAQ) measures, according to an air purification pioneer. A study of 10 European cities, published by the *European Respiratory Journal*, found traffic pollution responsible for 14% of chronic childhood asthmas. Bengt Rittri, chief executive of Blueair, said research has found that air in homes and offices can be much more polluted than outside air.

Diversity panel to open up industry



Andy Ford launches diversity panel



Chi Onwurah, Labour MP for Newcastle

Panel aims to break barriers between groups

A new panel to promote diversity in the engineering sector was officially launched by CIBSE last month.

The Diversity for Improved Business Performance Panel was introduced by chair Andy Ford during an evening networking reception. The panel aims to break down the barriers to under-represented groups in the building-services industry.

On the night, five guest speakers presented, including Chi Onwurah, electrical engineer, Labour MP for Newcastle upon Tyne and a shadow cabinet office minister, and Loraine Martins MBE, director of diversity and inclusion at Network Rail and former head of equality, inclusion, employment and skills at the Olympic Development Authority.

Incoming CIBSE president George Adams said: 'The vision is for CIBSE to be the

leader among construction and engineering professionals and the built environment.'

Dr Dorte Rich Jørgensen, former sustainability manager at the Olympics for Atkins, said that diversity and collaboration was needed to tackle global warming. 'It's about making sure we challenge our own behaviour and values; are we being energy efficient? Do we care? That's absolutely key.'

Tackling diversity was one of Ford's four goals during his term in office.



Andy Ford with Dr Dorte Rich Jørgensen (centre) and Loraine Martins (right)

RHI applications held up by meter problems

Poor quality information continues to delay a high percentage of applications for the Renewable Heat Incentive (RHI).

Scheme operator Ofgem says close to 40% of applications are delayed by a lack of detail about either system capacities or heat meter eligibility, or the schematics are missing. Many lack all three, a seminar at last month's Nemex exhibition in Birmingham heard.

Jacqueline Balian, head of operations for the RHI, said around 25% of applications had not provided basic details about their meters. She also pointed out that there are major problems with the quality of some independent reports on metering arrangements (IRMAs) provided as part of the application process.

She said when sites are audited by Ofgem they often find meters not installed correctly. In some cases users have not kept records of their energy use, which leads to their payments being suspended.

'This is not fraud – it is just tonnes of error,' she told the seminar hosted by the Building & Engineering Services Association (B&ES). 'However,

this is taxpayers money, so we are not going to pay out unless we are satisfied.

'A good quality IRMA will speed up approval,' added Balian, who urged installers to refer to the *Heat Meter Guide* produced last year by B&ES.

She said applicants were making a lot of basic mistakes in their heat data calculations, which meant their payments were delayed or withdrawn. 'It is the applicant that loses out, not the installer,' said Balian.

Ofgem has revamped its RHI website to simplify the application process, but Balian conceded the scheme was 'very complex' and end users are usually not engineering experts.

Justine Grant of TEAM Energy, authors of the *B&ES Heat Meter Guide*, said heating engineers were still struggling to get to grips with metering and monitoring. 'It is unfamiliar technology and, historically, a very small industry. RHI applicants need to give more attention to getting the right meter supplier. In some cases, a poor quality meter will under-record the amount of heat generated, leading to reduced RHI payments.'

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Final fees prompt

Members are reminded that payment of subscriptions was due on 1 January 2013. Those who have not yet paid risk being lapsed, and so no longer receiving the benefits of membership.

Renew your membership as soon as possible or you will not receive the June edition of the *CIBSE Journal*, or any future journals until payment is made. Renew your membership online at www.cibse.org/payments or contact the subscriptions department on +44(0)20 8772 3655.

New engineering show airs on TV

The latest in a series of programmes produced by Business Channel.tv in association with CIBSE was screened on 30 April.

Innovative Engineering and Building Performance, explored the business case for specifying the latest products and services to meet the increasing challenges faced by CIBSE members, whether in refurbishment/retrofit projects or new build.

This episode features Herz Valves, The Wilo Group, Baxi Commercial, Imtech and Lifescience Products.

If you missed the screening last month, it is available to watch at www.thebusinesschannel.tv. There is also a link from www.cibse.org

Previous episodes on the *Low Carbon Refurb: The Retrofit Plan* are also still available to view.

Help us to keep in touch!

CIBSE would like to remind all members to keep their records current. If you don't receive the CIBSE newsletter, or *CIBSE Journal* newsletter it may be that we don't have a valid email address for you. To update your details, log into the members area: www.cibse.org/members

Three winners celebrate Ready, Steady, Light success



Corner of the studio by YLP



Lighting office by DPA Lighting



Fire at the gasworks by Light IQ

● Lighting competition sees 17 teams design an exterior scheme in just three hours

The Society of Light and Lighting's 2013 Ready, Steady, Light competition took place in March. Now in its 11th year, the event brought together 17 teams competing to design an exterior lighting scheme in just three hours.

Teams were randomly allocated an external site in the grounds of Rose Bruford College, Sidcup, and were given nine pieces of lighting equipment to create a lighting masterpiece in just three hours.

This year's theme was a return to basics, whereby the site should be lit in its natural state without the use of props borrowed from around the site.

This year's winner of the Technical Award went to YLP for its lighting of the 'Corner of the studio', with the Artistic Award going to the team from DPA Lighting, and the Peer Award being taken home by Light IQ, which christened its work 'Fire at the gasworks' due to its proximity to industrial pipework and machinery

For more information, visit www.sll.org.uk

Lighters meet for international event



The International Lighting Conference, organised by the Society of Light and Lighting (SLL) and CIBSE Ireland, took place in Croke Park Stadium, Dublin, on 12 April.

An impressive line up of speakers from the UK, Ireland and further afield, including Australia, Japan and Spain, presented a range of papers around the theme of energy usage

and energy efficiency in lighting.

Conference coordinator Dr Kevin Kelly, DIT and president elect of the SLL, said: 'The conference included cutting edge research and design practice and covered everything from legislation through to codes of practice, daylighting and maintaining quality, while reducing energy, electrochromic glazing and LED technology.'

The paper, by SLL president Iain Macrae, of Thorn, was titled *Fifteen ways to reduce energy, and only one was LED lighting*, says Kelly, who recommends that all building services engineers read it.

The conference was attended by 140 delegates and supported by SEAI, ILP, IET, IALD, DIT, Energy Institute and Engineers Ireland. Feedback from delegates about the venue and quality of the conference was very good, and overall the conference proved to be valuable for all who attended.

All papers and presentations can be downloaded from www.arrow.dit.ie/sdar/

CIBSE Members can also get free access to the *SDAR* Journal* through this link. This journal includes building services applied research in Ireland.

Trialling a new way of working together

The CIBSE publications team are looking at new ways to produce publications to give them a wider, more international appeal. They hope to do this by tapping into the knowledge and expertise of members living outside the UK and getting them to participate in project steering committees to help write and develop content.

The current project to update *TMO4: Design in the Middle East*, with a new title, *Buildings in Extreme Environments: Arid*, reflects this new approach.

From the outset of this project, all meetings have been 'virtual' and hosted online, allowing a broad range of international committee members to participate fully. Committee members have been based across the world, including in Chicago, Abu Dhabi, Dubai, Cambridge (UK), and Qatar.

This move away from face-to-face meetings makes greater engagement with our international membership possible. For everyone involved there are a lot of perks to meeting virtually – there are cost and time savings, and it makes it easier to fit meetings into working days. This flexibility has been positively reflected in the level of attendance and excellent contribution of members to the project.

The project team has found it to be a more efficient way of working, allowing the institution to benefit from, and engage with, a wider range of expertise independent from geographical location – a fact particularly pertinent for this one project. In addition, this project has moved forward more quickly than can sometimes be the case.

The intention is to continue this work and to start new projects through the use of remote steering groups. CIBSE already has a number of other projects being run from abroad.

In the end, the aim is to work towards improving the quality and applicability of CIBSE knowledge. Therefore, opportunities for more distant

CIBSE members actively to take part are growing, allowing those with time and knowledge to get involved in the whole process of producing, updating and sharing.

Notifications of suitable projects will be made in the e-bulletin and on the website at the initiation stage, so anyone seeking to assist should apply to participate at that stage. In the meantime, if you have any comments or suggestions, contact CIBSE head of knowledge, Nick Peake (npeake@cibse.org)

'This flexibility has been positively reflected in the level of attendance'

In review: CIBSE Lifts Group 2012

The CIBSE Lifts Group hosted a full schedule of events in 2012, kicking off with a seminar on 'The new health and safety framework'. March saw a seminar review of 'New EN and BS standards', featuring members of the revision panel. A second March meeting included presentations on 'BREAM in theory and practice', and 'A five-year review of the application of supplementary tests of in-service lifts and the guidelines for the safe operation of escalators and moving walks'.

The second symposium on lift and escalator technology was held jointly with the University of Northampton in September. The symposium attracted international speakers and attendees, with

12 peer-reviewed technical papers presented. In 2013, the symposium becomes a two-day event, bringing together experts from the field of vertical transportation.

Visit www.liftsymposium.org for further information on both the 2012 and 2013 symposiums.

In 2012, the group also



Ana Lorente at the Lift and Escalator Symposium

provided sponsorship for a PhD student, Ana Lorente. She used the award to attend ISO Committee TC178/WG10: Energy efficiency of lifts, escalators and moving walks. Lorente is supporting the working group by providing scientific evidence to formulate the methodology applied in the standard.

The CIBSE Lifts Group elected officers for 2013 at its annual general meeting in February 2013. Those serving this year include John Bashford as chairman, and Len Halsey as vice chairman.

A full schedule of events for 2013 includes a site visit to view the Paternoster lift in the Sheffield University Arts Tower.

For more information on the group and the 2013 events, visit www.cibseliftsgroup.org

Focusing on heat metering

Following on from well received Renewable Heat Incentive (RHI) training, which took place in March, CIBSE has scheduled two further training dates for June in London.

The two courses will cover an introduction to the RHI and also a focus on heat metering: **Applying for the RHI** – what you need to know – for potential applicants and installers, 18 June, London.

Metering requirements for RHI – for installers and independent meter report providers, 19 June, London.

For further details of both and to book, visit www.cibsetraining.co.uk/rhi or call 020 8772 3660.

LEED rating system training

CIBSE is to offer training for those interested in the LEED rating system. There will be two courses in June covering the Green Associate level, with the second of the courses examining buildings operation and maintenance.

For more information please contact Jennie Winterbottom on jwinterbottom@cibse.org

President sets address date

George Adams will be giving his Presidential Address on 9 May, following the CIBSE AGM.

Adams will present his address after his inauguration at the event, which will be held at The Royal Society, 6-9 Carlton House Terrace, London, SW1Y 4AG.

Anyone who would like to attend should register at www.cibse.org/agm

If you are unable to attend, the presidential address will be broadcast online as a webinar, allowing you to listen to the speech and post questions. The audio file and presentation slides will be available after the event on the CIBSE website. Next month's *CIBSE Journal* will also cover the event.

To register for the webinar visit www.cibse.org/agm



COME TOGETHER

The 2013 CIBSE Technical Symposium staged in Liverpool saw leading academics sharing their research findings with industry professionals. Recent graduate **Marcus Haydon** discovered that the issue of operational energy was as relevant in research circles as it is in the commercial world



“ If you have a technical innovation, this is the best forum to tell people about it. The audience won't be mystified – they understand the relevance of building services innovations
David Nicholson-Cole ”

Take a wander through Liverpool city centre and you can see why it made an excellent venue for the 2013 CIBSE Technical Symposium. From the neo-classical splendour of St George's Hall (the world's first air-conditioned building) to the strikingly modern Museum of Liverpool, the diversity of the architectural heritage reflects the variety of building stock we have in the UK, and the challenge we face in making it more energy efficient.

The subject of energy efficiency dominated the debates at the venue in Liverpool John Moores University. The opening day started on a positive note, with Justin Snoxall explaining how British Land had cut overall energy use in a set of their buildings by 39%. The head of British Land's business group highlighted that these savings were delivered through new management procedures and plant controls.

The need for external advice was interesting, given that the buildings were not old (almost all were less than 10 years old) and had a team of building engineers looking after them.

That notion of 'operability' was a strong thread running through the two-day event, with delegates expressing diverse views on how we, as designers, should be approaching the topic. Indeed, the question of whether buildings should be 'designed to be operated'

was debated, with Mike Smith of BSRIA remarking that the current procurement and commissioning process relied on a kind of miraculous 'osmosis of knowledge' between the building designer and building operator – a process that rarely seems to occur as intended.

Another delegate, Larry Spielvogel, suggested that designers might take their responsibilities more seriously if they were forced into operating one of the buildings they had designed.

There were a number of poster pitch sessions, too – informally dubbed 'CIBSE's version of speed dating'. University College London's Energy Institute PhD student Carrie Behar analysed user perspectives on whole-house ventilation, which revealed that almost all householders struggled to understand the processes and controls involved. As the airtightness of buildings increases, the relentless pursuit of energy reductions does risk overlooking the actual users of a building.

While the use of renewable energy sources continues to grow, consultants can be left in a challenging position when looking to accurately size these systems and predict their performance. As a consequence, there is often a lot of reliance on manufacturers who, as Cliver Earp of B&ES pointed out, aren't necessarily impartial when it comes to



advising on system sizing and selection.

Many of these technologies are new and require a fair level of understanding before being accurately specified, which makes studies by engineering researchers extremely welcome. Understanding the nuances of technologies such as biomass are fundamental in the successful implementation of newer technologies. And, if the specifier doesn't even know what he's specifying, how can the operator be expected to know how he/she should be operating it?

As Earp highlighted, for the last 30 to 40 years we have had a cheap and constant heat source in the shape of gas boilers, leading to a culture of specifying 'equal and approved'. However, new energy sources are harder to compare like-for-like and, perhaps, demand a more rigorous process of performance analysis before being specified.

A presentation from Ana-Maria Lorente, of Universidad de Zaragoza, and Dr Gina Barney, of Gina Barney Associates, gave a flavour of what's to come with respect to the energy classification of lifts. A number of us will be familiar with BREEAM's requirement for the demonstration of lift efficiency and it is hoped that the work being done in developing ISO 25745 will help standardise this process.

It is proposed that this energy calculation will take into account the energy used by the lift when running, idle and standby, and that the new methodology will also be included in the next edition of *CIBSE Guide D* when it is revised in 2015. The calculation would appear to be more involved than the current process, but if it provides a more accurate and holistic classification system it should be welcomed.

As the event edged towards its conclusion, B&ES chief executive Blane Judd took the stand and outlined the merits of direct current power use in building.

Judd suggested that by placing a single rectifier centrally within a building's electrical distribution, we could remove the need for numerous rectifiers and switch-mode power supplies that we currently require to operate many pieces of electrical equipment.

It would also be a way of centralising the heat produced by these types of devices, which could potentially then be recovered and used more usefully elsewhere in the building.

It certainly provides food for thought and illustrates the breadth of thought that will be required as designers strive to meet the challenges of future energy efficiency targets.

All the symposium papers are available at www.cibse.org/symposium2013 **CJ**

“The need for external advice was interesting, given that the buildings were less than 10 years old and had a team of building engineers looking after them

● **MARCUS HAYDON** is an engineer at Skelly & Couch LLP and gained an MEng in Civil & Architectural Engineering from the University of Bath

Best in class

Top presentations awarded prizes during CIBSE's Technical Symposium

David Nicholson-Cole and Samantha Mudie were both awarded prizes for their presentations.

David Nicholson-Cole's was awarded the 'Most effective delivery of material' for his paper on solar earth charging and follows last year's success, when he won best paper for the same subject.

Nicholson-Cole is a trained architect and has been a lecturer at the University of Nottingham since the 1970s. He is using his own home to see whether storing energy in the ground from solar thermal sources can improve the energy efficiency of his ground source heat pump.

To measure the effectiveness of solar earth charging, Nicholson-Cole created a model using geometric description language, a programming system within ArchiCAD. The data enabled Nicholson-Cole to understand the natural recharge rate and revealed that charging the earth with solar thermal energy can help the heat pump perform more efficiently all year round, not just in the summer. See more at www.chargingtheearth.blogspot.com

Of the symposium, Nicholson-Cole said: 'If you have a technical innovation, this is the best forum

to tell people about it. The audience won't be mystified by it – they understand the relevance of building services innovations.'

Samantha Mudie's paper, *Benchmarking energy use in licensed restaurants and pubs*, won the 'Most significant contribution to the art and science of building services engineering'. It revealed the results of monitoring more than 700 pub and restaurant kitchens. Mudie is studying an engineering doctorate at Reading University on energy reduction in food preparations in commercial kitchens. She says the benchmarks for the sector are out of date, so she created her own benchmark by installing 1,500 energy meters across Mitchell & Butler's pub and restaurant estate, of which 772 were used as the sample set.

Mudie found that the energy used by catering facilities in pubs and restaurants was more than twice that predicted by existing benchmarks.

Speaking of the symposium, Mudie said: 'I've enjoyed the networking, and finding out about the benchmarking work being done by UCL researchers. You don't hear about these projects by staying at home.'

WHAT'S HAPPENING TO PART L?

Many CIBSE members are asking for an update on Part L. It even featured in the full Budget statement. Hywel Davies explains the current position

The Budget statement does not usually include announcements about Building Regulations. But tucked away in paragraph 1.109 was this statement: 'The government is committed to implementing 'zero carbon homes' from 2016.

'The Department for Communities and Local Government will publish a detailed plan, setting out its response to the 2012 consultation on the energy efficiency requirements in building regulations, by May 2013.

'The government will then consult on the next steps, including on the means of delivering allowable

solutions, by the summer recess.'

So it announced an announcement, telling us to wait until May. So far, so good. There was once talk about publishing the revisions to Part L and supporting documents (see box, Part L timeline) in April, to give the industry six months to prepare for them to come into force in October, but this always looked a challenging goal.

Confusing picture

It is also not clear from the statement whether changes to Part L will come into force in October, whether there will be another consultation, or maybe both.



It is widely rumoured that the standards are viewed by ministers as red tape and burdensome to industry, and therefore ripe for cutting

There is further confusion over the ongoing housing standards review. This is addressing the role of standards that add to Building Regulation requirements, such as the Code for Sustainable Homes, or Secured by Design, or Lifetime Homes. This review is due to report in May, and it appears that the two announcements are planned to coincide, which seems logical. It is widely rumoured that the standards are viewed by ministers as red tape and burdensome to industry, and therefore ripe for cutting.

The Code was adopted by the last government to set requirements for social housing beyond Building Regulations, funded through the Homes and Communities Agency. It also serves as a 'forward look' for domestic Building Regulations. So housebuilders deliver taxpayer-funded new homes to Code levels that exceed the absolute minimum requirements of Building Regulations. This provides an early learning opportunity before the higher standards become the absolute minimum at the next revision of Part L. It provides a learning curve to take us to zero carbon homes, to which the budget statement recommits.

There are two drawbacks. The first is that requirements to build

WHAT DO WE MEAN BY 'PART L'?

The phrase Part L is often used to refer to those aspects of Building Regulations and the associated guidance that deal with energy efficiency in buildings. Part L is a reference to Schedule I of the Building Regulations, which sets out the specific statutory requirements relating to the conservation of fuel and power (as the Building Act 1984 describes energy efficiency or conservation). These are the specific requirements relating to energy efficiency, along with those regulations that explicitly cover commissioning, testing of airtightness, for example, and provision of information and sub-metering. These are the 'must do' elements.

To support the requirements for each part of the Schedule there is associated

formal guidance, approved by the Secretary of State, known as the Approved Documents. These are guidance, not statutory requirements, and they state quite explicitly that it is quite legitimate to demonstrate compliance with the statutory requirements by another method or approach.

For Part L, there are four Approved Documents, L1A for new homes, L2A for domestic refurbishment, L2B for non-domestic refurbishment. In addition, there are two 'compliance guides' (the clue is in the name, *guides*) for domestic and non-domestic building services. Contrary to popular usage, there is no such thing as 'Part L1', it's Part L or ADL1A (or B).

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P-Sensor

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to Code are overseen by planners, not building control. So we have two regimes regulating technical requirements for new homes. That creates avoidable risk, uncertainty and cost. The second is that additional requirements are subject to local discretion. So, what is required in Balham, Bracknell, Basildon or Bolton could be different, leading to more uncertainty, cost and risk, which renders uneconomic some developments at the margin of viability.

The future

Unfortunately, the preferred approach appears to be to scrap anything beyond bare minimum compliance with Building Regulations, and prevent anyone asking for more. A more rational approach might be to give responsibility for all technical requirements to those best placed to oversee them – building control – and allow them to specify any extra requirements from a national menu. This plays to the skill set of building control and planners and reduces risk, uncertainty and cost for housebuilders. Come May, we may be consulted again. We may have changes to Part L. We shall know once ministers decide.

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

PART L TIMELINE

In April 2011, the Department of Communities and Local Government established a series of working parties to advise it on the 2013 Building Regulations consultation. CIBSE was asked to convene the working group on non-domestic buildings. The other three working parties covered domestic, compliance and enforcement, and consequential improvements, the last being run in conjunction with the Ministerial Forum on maximising the Green Deal, as, at the time, consequential improvements were seen as a fundamental means of driving Green Deal uptake.

These groups met several times through May and June, and reported at the end of June. The subsequent public consultation was then published in January 2012 and closed at the end of April 2012 (but the consultation on consequential improvements closed at the end of March to allow legislation to be introduced on 1 October). Subsequently, government decided not to introduce new requirements for consequential improvements, a decision which is now being challenged at judicial review.

Since April 2012, when the main consultation closed, there has been a dearth of information about progress, but DCLG has constantly assured CIBSE that changes to Part L will be introduced as planned in October 2013.



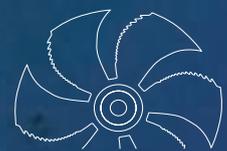
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THE WRONG TOOLS FOR THE JOB



The government's choice of asset rating tools is misguided and causing confusion among property owners who face the reality of 'operational' bills, says Deloitte's **Andrew Cooper**

The UK faces some real and pressing problems when it comes to reducing energy and carbon. Unfortunately, its solution has been to create an unreal world of energy use that could sabotage its achievements.

Some of the real problems we face include an international commitment to reduce carbon emissions by 80% in fewer than 40 years (based on a 1990 baseline) and a reduction in energy supply to a capacity margin of around 4% within three years.

Expert opinion varies, but there are some who suggest we face an immediate future of power cuts at times of peak demand. Managing that demand is seen as vital to 'keeping the lights on'. The problem is that managing demand and increasing energy efficiency is just as much about behavioural change as technological change; a low energy light bulb still uses energy if left on when not needed.

Among many engineers, it has long been understood that placing energy modelling at the heart of government policy to help manage energy efficiency is a mistake. The importance now placed on the National Calculation Method (NCM) and on NCM-compliant tools, such as SBEM, is worrying. Outputs of SBEM include Energy Performance Certificates (EPCs) and Building Regulation UK Part L Compliance Certificates.

EPCs are required to comply with the Energy Performance of Buildings Directive, they are needed to gain the higher Feed in Tariff (FiT) level, and are now proposed to form a tool to implement the Energy Act 2011 requirement for Minimum Energy Performance Standards. To deal with real energy problems we are required to live our life in a model, where, on a good day, a model might almost replicate actual consumption.

To compound the problem, the NCM only deals with emissions from so-called



CIBSE Guide F tells us that in a standard air conditioned office, unregulated uses from small power and lifts can account for 55% of carbon emissions

'regulated' uses associated with HVAC, lighting and hot water – yet *CIBSE Guide F* tells us that, in a standard air conditioned office, unregulated uses from small power and lifts can account for 55% of carbon emissions.

This virtual world of energy and carbon leads to complacency and market confusion. Complacency as landlords pass off buildings as energy efficient because of a good EPC, and occupiers, who often have other things to worry about, take this at face value.

Confusion because the EPC rating is variable – dependent upon the skills, knowledge and aptitude of the assessor – and dynamic through its link to targets under Building Regulations Part L.

The built estate is responsible for about 40% of energy consumption. To help meet the 2050 CO₂ targets, new and existing buildings will have to become, operationally, as close as possible to zero carbon. By this I mean real carbon emitted from real energy, with real action at an asset level, supported by the development and improvement of building technologies.

It is frequently claimed that SBEM is not a design tool. I disagree. SBEM, together with other NCM-compliant tools, promote mediocrity in design and

act as a disincentive for innovation.

Developers wish to dispose of their investment as soon as possible and if a property cannot obtain planning or pass Building Regulations, then it cannot be built. SBEM is an integral part of the design process because a technology or design solution that cannot be modelled under the NCM will almost certainly be discounted in favour of one that is.

The government has, to date, championed modelled asset ratings over operational ratings, in spite of clear advice from industry to the contrary.

This is leading to further fragmentation of benchmarks as a disillusioned and confused property industry tries to develop its own systems, such as the Landlords Energy Rating that is being developed by the Better Buildings Partnership.

Our carbon targets are real, our energy security problem is real, the cost of energy is increasing and this leads to real costs. Logically, the system that determines the basis of a building's efficiency should also be, operationally speaking, real – and the process must be supported and adopted by government.

ANDREW COOPER is a senior consultant at Deloitte Real Estate



HOW NEAR IS NEARLY ZERO?

Vast numbers of buildings are missing energy targets by up to 250%. To hit nearly zero carbon targets by 2019, clients need to provide low carbon briefings within a year, says **Ian Taylor**

 We are heading inexorably towards zero energy buildings. Article 9 of the recast Energy Performance of Buildings Directive (EPBD) introduced 'nearly Zero-Energy Buildings' (nZEB) to be implemented from 2019 onwards for public buildings, and from 2021 onwards for all new buildings. The advised CO₂ emissions from a new building to meet the long-term EU climate targets are recommended to be below 3kg CO₂/(m² yr).

This initiative raises significant challenges. In Europe, more than one quarter of the building stock that will exist in 2050 is still to be built. The energy consumption of these new buildings will need to be close to zero to reach the EU's highly ambitious carbon targets, while the existing 75% will need significant upgrade.

Is there an appetite for such a radical shift in our building procurement? How many buildings might actually be able to achieve such low targets?

Society's expectations are mixed, with a desire to do the right thing for the world becoming worryingly overridden by concern over short-term damage to regional economies and personal wealth. A longer-term view of the typical lifespan of the buildings we are designing – it is only 37 years to 2050 – demands our immediate action.

The evidence

The performance gap between design expectations and the reality of operation is becoming better understood. Clients and design teams are beginning to share building performance-in-use data. Standardisation of analysis tools is enabling comparative studies and data sets to be established to benchmark performance. Technology Strategy Board (TSB)-funded



Architect Feilden Clegg Bradley Studios is carrying out a post-occupancy evaluation for Brighton Aldridge Community Academy

research projects, including post-occupancy evaluations and Carbon Buzz, are providing valuable insights into how far our new buildings are from meeting ambitious targets. Indeed, they show how far we are from our own design targets now.

A review of data currently uploaded to the Carbon Buzz dataset demonstrates that current operational carbon impacts from offices, schools and university buildings all miss their design targets by between 50 and 250%:

- Schools have an average designed target of 30kg CO₂/(m² yr), yet operate at above 50.
- University buildings have an average designed target of 40kg CO₂/(m² yr) but operate at above 100.
- Offices have an average designed

target of 50kg CO₂/(m² yr) and operate at above 75.

And yet the Buildings Performance Institute Europe (BPIE) is targeting nearly zero – 3kg CO₂/(m² yr). This is 13 times lower than the university design target, which is already being missed by 250%.

It is the scale of mismatch that is worrying between a) what our planet can accommodate and what our clients aspire to; and b) what building users need and what industry can deliver. This is after we have taken into account 'in use' reported figures that may lie outside the nearly zero target parameters, for example plug loads, unregulated energy and operational hours.

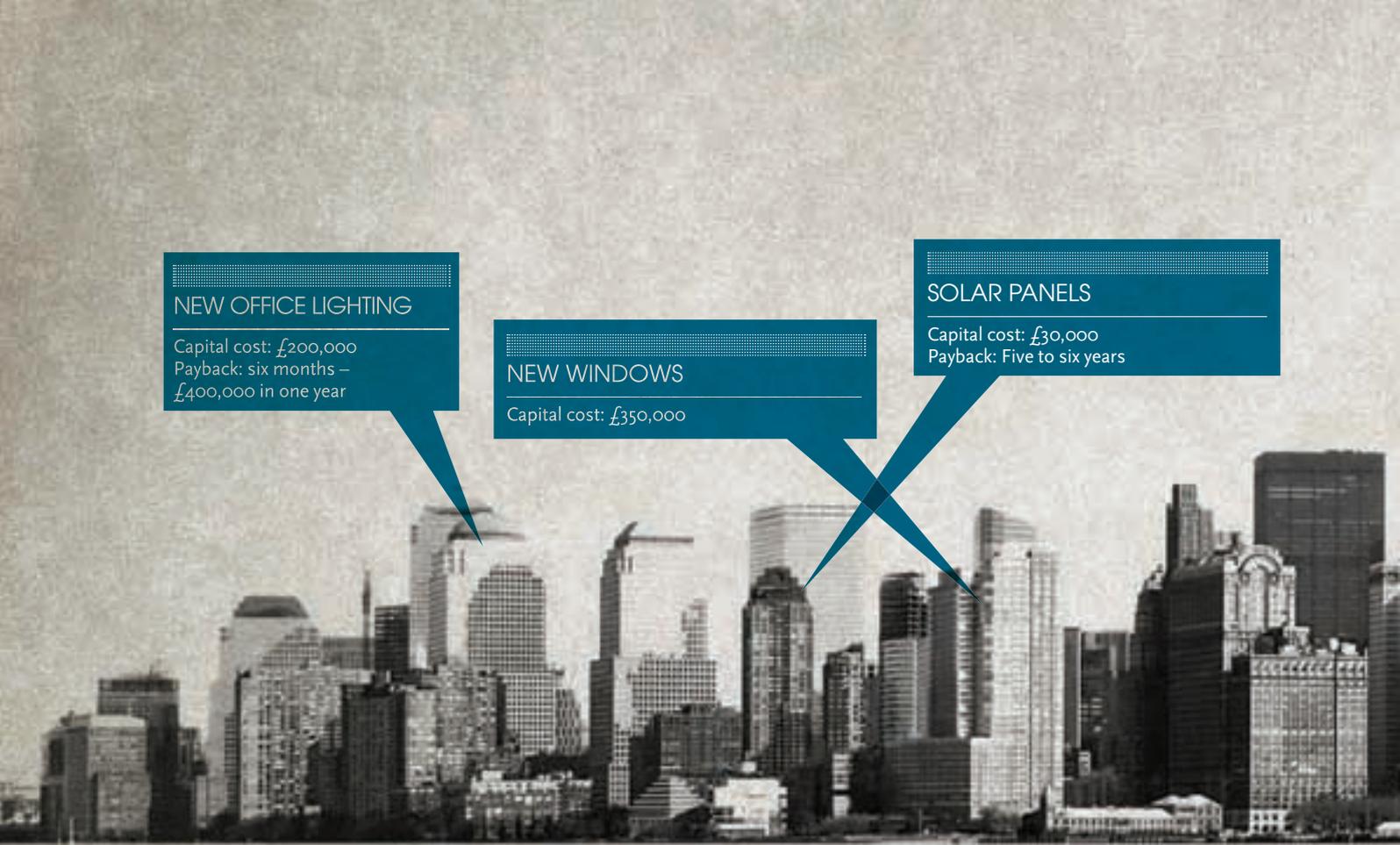
The action needed

Client engagement is critical, and building owners need to be ahead of demand and policy. To achieve lower operational carbon performance targets, clients need to provide low carbon building briefings at least five years in advance. It takes this length of time to design and construct the building, and optimise performance after a period of operational monitoring. It means targets for 2020 would require a change in building briefs by 2015.

Successful buildings come from working innovatively with committed clients. Building management systems need to become simpler. We must target low energy use, while becoming more aware of increasing occupant small-power energy use, with potential increases in cooling loads exacerbated by climate change temperature increases. It is not a small tweak to our designs that is needed, but a wholesale jump to get anywhere near bridging the gap.

 It is not a small tweak to our designs that is needed, but a wholesale jump to get anywhere near bridging the gap

● **IAN TAYLOR** is partner studio leader at Feilden Clegg Bradley Studios



NEW OFFICE LIGHTING

Capital cost: £200,000
Payback: six months –
£400,000 in one year

NEW WINDOWS

Capital cost: £350,000

SOLAR PANELS

Capital cost: £30,000
Payback: Five to six years

DONE DEAL?

As the first surveys are completed for the non-domestic Green Deal, **Carina Bailey** looks at the opportunities for building engineers and the barriers that could prevent property owners taking advantage of the government's flagship scheme

The non-domestic Green Deal – the coalition's flagship policy – was launched in January, but are property owners aware of how it works? Richard Hipkiss, the first of two Green Deal advisers to be certified as competent through the CIBSE Certification Approval of Prior Experiential and Learning (APEL) route, suggests firms need to be educated about how the Green Deal can improve buildings and cut energy bills.

Anecdotal evidence from Hipkiss, director of digitalenergy, suggests that many businesses think the Green Deal is just a quick route to getting solar panels or ground source heat pumps, rather than improving the energy efficiency of their buildings. A lack of specific marketing to the non-domestic market by the Department of Energy and Climate Change (DECC) is just one of a number of challenges facing the policy.

Hipkiss has a novel idea to overcome the lack of promotion: make CIBSE the non-domestic Green Deal champion. 'If it's going

to be a success, it needs a champion. DECC has its hands too full with the domestic market to be able to devote the attention the non-domestic scheme needs. If that champion is not going to be DECC it needs to be CIBSE.'

Hipkiss and his colleague, Adrian Sweetman, an adviser at digitalenergy, are now both registered as Green Deal advisers after completing the CIBSE Certification APEL route. Between them they have conducted more than 30 assessments for property owners in the government's Pioneer Places scheme, which offers funding for Green Deal surveys across a number of UK regions.

Andrew Geens, who is the head of CIBSE Certification, believes that the policy could double the value of refurbishment and energy efficiency projects for some CIBSE members.

'Helping clients source more funding should logically give them more work,' explains Geens. 'Small jobs will become bigger projects, or projects that wouldn't have happened, could now go ahead.'

NEW COOLING SYSTEM

Capital cost: £400,000
Payback: Seven to eight years

NEW HEATING SYSTEM

Capital cost: £70,000
Payback: four years

‘On bigger buildings the Green Deal could be used to convert £200,000 projects into £400,000 projects. But it really does depend on the sort of project you’re involved with. It will make projects that would normally be beyond the normal payback criteria viable, too.’

The non-domestic Green Deal will enable property owners to install measures that have a payback period of up to 25 years. It could also be a good option for clients who can’t otherwise afford to install some Green Deal measures.

For example, says Geens, replacing the lighting system in an office block has a healthy payback period and could halve future electricity bills but, in the past, clients may have been unable to raise the initial capital to proceed. Now, he says, they have a solution to that problem.

‘[Before the Green Deal] you could have something with a six-month payback but have to spend £200,000 to install it to save £400,000 in a year,’ explains Geens. ‘In that case, it doesn’t matter how short the payback is, you just couldn’t do it if you couldn’t afford it.’

‘It’s not just about payback, it’s about how much it costs to do in the first place.’

Since being accredited, Sweetman has lodged the first non-domestic Green Deal assessment on the national register, while Hipkiss has conducted a number of assessments for premises such as schools, community buildings, shops and offices, which are still waiting to be lodged. But Hipkiss’ experience in conducting these

assessments has made him question whether people are actually aware of what the initiative is trying to achieve.

‘The level of interest is perhaps not what it should be; people don’t seem to be appreciating the value of the Green Deal assessment,’ says Hipkiss.

‘A lot of occupiers don’t seem to know what they have agreed to. For example, at a typical community building, the site contact was the maintenance man. My introduction was: “I’m here to do the Green Deal survey and could we review your energy bills?” The reply was: “I don’t know anything about the bills.” I told him that we couldn’t complete the survey without the bills, explaining then how the Green Deal worked. He found some in the end, but it was far from plain sailing.

‘On a survey for an industrial unit it was quite clear that the occupier wanted solar panels on the roof. I would say that, in that instance, solar panels were a good option, but there were plenty of other options more viable for the occupier than solar panels.’

A further complication to the success of the non-domestic Green Deal, warns Hipkiss, is the fact that there is no finance available yet, which is fundamental to the operation of the Green Deal (see box, ‘DECC responds’, right). He added ‘There may be a big issue there. I think it will hold the scheme back.’

Couple this with the lack of promotion of the non-domestic Green Deal by the Department of Energy and Climate Change (DECC) and it paints a confused picture



DECC RESPONDS

Addressing the points raised by Richard Hipkiss about the apparent lack of finance and marketing for the commercial Green Deal, a spokesman for DECC said: ‘We anticipate that there will be a number of financing offers available to non-domestic Green Deal customers over time. The Green Deal is market-led and Green Deal providers are responsible for developing their own financing offers (outside the Green Deal Finance Company offer for domestic customers), and as such we expect offers to vary from provider to provider in both price and availability.’

‘The timing of the availability of these offers will be a commercial decision for Green Deal providers operating in this market.’

‘The government is committed to improving energy efficiency and reducing carbon emissions. The Green Deal is one of the key tools to deliver this. It is a market-based scheme and we expect businesses to be driven by both the economic benefits of energy efficiency improvements, and by its impact on company brand and reputation.’

The spokesman added that guidance is available at www.gov.uk/green-deal-energy-saving-measures and www.greendealorb.co.uk



The non-domestic Green Deal will open up new routes of finance for factories, schools, warehouses, and offices



GREEN DEAL: IN-DEPTH

The Green Deal was first launched in the UK on October 1 2012 and went live on January 28 2013.

It aims to reduce UK carbon emission output and reduce the national demand for imported gas supplies by offering consumers funding for property improvements.

The Green Deal is a key government policy to enable building owners and operators to install energy efficient improvements to buildings at no upfront cost to the owner or operator. Instead a finance package will be offered to the building operator and will be repaid by being charged to the operator's energy bill over a specific period.

As the costs of the installation is added to the electricity bill, the estimated savings on the total energy bill will always equal or exceed the cost of the work; otherwise the improvements will not qualify for Green Deal finance. (Also known as the Golden Rule of the Green Deal plan).

However under the Green Deal plan, the liability for the payments remains with the building, and does not follow the owner or occupier after they leave the building.

for non-domestic property owners.

'There's a lot of explaining to people that needs to be done about what the Green Deal is and how it works,' says Hipkiss. 'Unfortunately, most of DECC's communications have been about the domestic Green Deal, so there's not a great deal of information that goes into the complexities of non-domestic buildings.'

Non-domestic buildings are much more complex than homes because of their ownership structure and maintenance requirements, and the scale of the engineering systems that they may contain.

Another barrier, cautions Hipkiss, is the amount of disruption some energy efficiency measures could cause to a non-domestic building occupier. He recently completed a survey for one office that had been merged with two others, so it was effectively using three heating systems. The recommendation was to merge those systems and put one system in its place, at much disruption to that business. This is why, says Hipkiss, it's vital that the non-domestic Green Deal is not sold as a quick fix: 'It needs to be recognised that this is a good option, but not a quick option.'

'There needs to be more effort in communication around the non-domestic Green Deal to make it work; it's not just a quick route to get heat pumps or solar panels.'

And, despite Hipkiss suspecting that property owners who pay for their survey will take it more seriously, he also recognises that the fee itself could act as a barrier, with surveys for non-domestic buildings costing anything from £500 to £2,000. However, Geens pointed out that one of the differences between the domestic and non-domestic sectors is that commercial clients are more accustomed to paying for professional consultancy advice

when refurbishing their buildings.

Patrick Bellew, founding director of Atelier Ten, agrees that the principal barrier to take up by small- and medium-sized enterprises (SMEs) will be the initial survey fee – something he heard has already been a problem in the domestic sector.

He suggests that the consultant could take a punt and pay for the assessment to be done, but adds: 'The cost of sales to us is very high if somebody doesn't proceed.'

Bellew, who is currently sitting on the All Party Parliamentary Group inquiry into sustainability and the Green Deal, says that of the 9,268 assessments conducted to the end of March – in both the domestic and non-domestic sectors – none have yet translated into a loan. 'It's going to take time.'

Bellew added that, from a consulting engineer's point of view, opportunities are out there, but he questions whether it will be worth a large firm's time pursuing them.

He explains: 'The design and build sector will be scrapping over the relatively limited market that exists at the moment. And it's whether one would want to pursue opportunities on existing buildings. It's difficult to imagine a large professional firm trying to hunt down this work because the cost to us would be quite high.'

'To find a Green Deal project we have to go and search for clients who want to do something to their building, persuade that client they want to hire us to carry out the assessment or get an assessor in, and try to extract fees for designing the system. Then they have to get the Green Deal loan.'

He also stresses that its success and ultimate appeal to property owners will depend on whether Energy Performance Certificates (EPCs) are used as a driver for building value.



'Unless they want to improve the value of their premises or reduce carbon emissions, it's difficult to see where the market drivers are because, in the end, it's not going to impact on people's pockets for some years. It's hard to generate the business for it – that is a professional design consultant's view.'

There will be much business to be had for consultants who work for large organisations, such as supermarkets and professional landlords like British Land, says Bellew, but adds: 'None of our clients are paying for this.'

There are two elements to the Green Deal assessment. The first looks fundamentally at the physical measures that can be carried out to improve a building. The second looks at energy management to find out how regularly meter readings are taken, for example, to determine whether someone is responsible for energy management in that building.

Hipkiss adds: 'That's an area that needs commitment. But surveys are not having the impact that I think they were intended to have. It's about getting people to think about energy.'

He believes that, if CIBSE were the champion of the non-domestic Green Deal, it could produce the guidance and documentation that DECC has not provided. Once this is in place he believes it will help businesses realise the importance of creating a post responsible for energy management.

However, the picture is not all gloomy; Hipkiss now has another 60 or so assessments to carry out over the next few weeks, while CIBSE has so far received expressions of interest from 250 EPC assessors keen to be accredited as Green Deal advisers. And, if reports of a severe shortage of advisers are accurate, there is quite a market out there to pursue. **CJ**

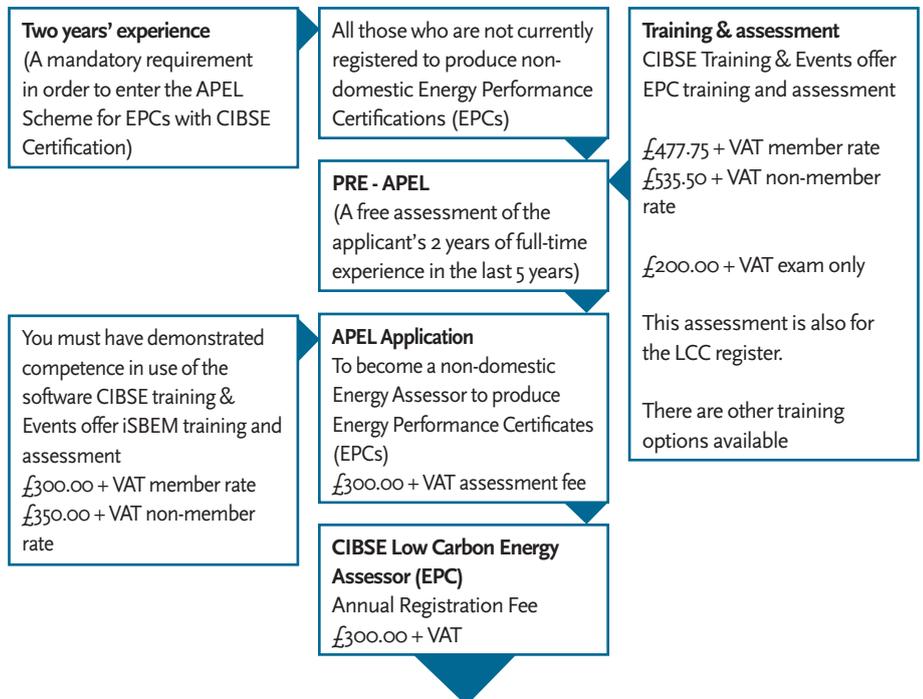
The APEL route

CIBSE Certification's Approval of Prior Experiential and Learning (APEL) route into the Green Deal for advisers is now live. It certifies both firms to become Green Deal assessor organisations, and individuals to become Green Deal advisers. Each

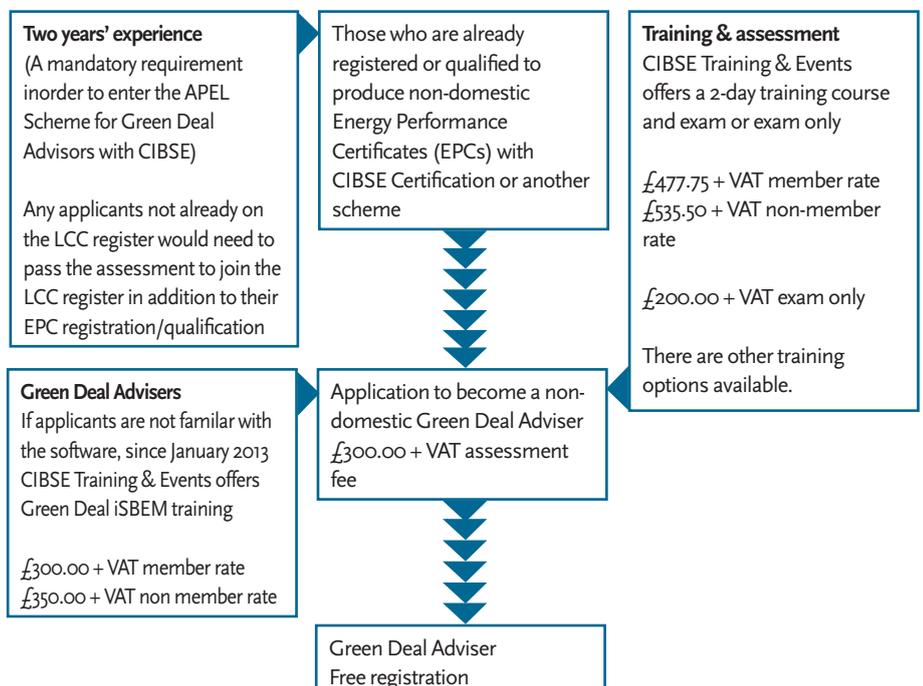
adviser has to be affiliated with an assessor, which means that, ultimately, a company has got to take responsibility for each report produced.

There are two routes of entry into the new CIBSE certification route, outlined below:

Entry route 1



Entry route 2



DOING MORE WITH LESS

There is a huge opportunity to use resources more efficiently in the building services industry. A groundbreaking initiative led by WRAP and CIBSE will look at how industry can minimise the use of precious materials and resources, cut waste from procurement and encourage recycling

Building services represent around 35% of the capital cost of a typical city office building and 40-50% of lifecycle expenditure over a 30-year period. Aecom estimates that building services represent 2%-12% of the total embodied carbon of a typical building, with highly serviced areas such as trading floors and hospital surgical departments representing the higher end of this range.

Finding ways to use fewer precious materials and resources – and reducing waste when repairing and replacing them – could generate considerable cost savings, as well as reduce the impact on the planet.

CIBSE has formed a partnership with WRAP (Waste & Resources Action Programme) to increase awareness of the opportunities and business benefits of resource efficiency. WRAP has appointed Aecom to consult with the building services industry to identify the challenges and opportunities of resource efficiency, and to then prepare CIBSE guidance on the topic.

Building services contain resource-intensive, valuable materials including



TAKING STEPS TO ENERGY EFFICIENCY

Five key areas offering opportunities for improved resource efficiency

LIGHTING

Now: Compact fluorescent lamps contain mercury rare-earth phosphors as do LEDs.

The future: Organic LEDs containing no rare-earth materials?



LIFTS

Now: A typical lift includes stainless steel, copper, aluminium, plastic and glass.

The future: What are the opportunities for lifts to use alternative materials?



VENTILATION

Now: Galvanised steel is often used in ductwork; it has a high embodied energy and also requires zinc.

The future: Can we design using less ductwork, or use alternative materials?



COOLING

Now: Efficient chillers with magnetic bearings use less energy. However they use rare-earth magnets.

The future: Can this be achieved without using rare elements?





copper and aluminium. Rare-earth materials are increasingly used in components. Once installed, building services components and equipment are frequently replaced and often disposed of at end-of-life, rather than being reclaimed, reused or recycled.

Some resources – particularly precious metals – are becoming increasingly scarce and expensive. This includes silver, zinc, copper and terbium (used to make green phosphors in fluorescent lamps).

Copper is widely used in building services, for both pipework and for electrical wiring. It has been widely reclaimed and recycled for many years as it is so valuable. However, only about 40%¹ of new copper is from recycled material, and there are estimates² that around 26% of all extractable copper in the earth's crust has been lost as waste, rather than being recycled. Mining copper has significant environmental and social impacts and is a fast-depleting resource.

Rare-earth elements are used in building services equipment including fluorescent and LED lamps, LCD panels, fuel cells, wind turbines, heat pumps, lift motors and chillers. China controls around 90%³ of the world's rare-earth element production, resulting in pricing and supply challenges for the West. The high prices fetched for copper, gold and rare-earth minerals are leading to a surge in interest in mining the ocean. The implications of this could prove catastrophic for seabed ecology.

Industry opportunities

There are opportunities for designers, contractors, manufacturers and end users to radically improve the resource efficiency of the ➤



(Left and above) Balfour Beatty Services Engineering cranes prefabricated services into position at HMP Oakwood

Resource efficiency is, essentially, about doing more with less. It covers the use of materials, recycled content, embodied carbon, water use, resource scarcity and security, life span and end-of-life potential (eg. reuse and recyclability)
Hywel Davies



Opportunities for resource efficiency

- Designing out the need for plant and equipment by aiming to do more through natural means, relaxing design criteria, rationalising designs and working closely with prospective occupiers to provide the appropriate level of servicing. This would require a new incentive for designers to design out services.
- Changing designs to be more resource efficient. For example, using exposed soffits with circular ductwork would reduce the amount of material required for ductwork, but this would impact on floor-to-ceiling heights and building look and feel.
- Standardising products and systems for ease of maintenance, part replacement, full replacement and reuse. For example, cable trays are relatively standard products that could easily be reused.
- Product labelling that give details of the constituent materials and how to reuse or recycle them.
- Leasing equipment rather than purchasing it. Manufacturers would retain ownership and responsibility for their equipment and provide a heating or cooling 'service' rather than selling equipment. This would encourage manufacturers to design efficient equipment that is simple to maintain and easy to disassemble at end of life. Leasing would allow the product to be upgraded without cost to the user and removes the responsibility of what to do with the de-commissioned product and the cost of disposal.
- Formalising the market for reusing or reconditioning equipment with testing regimes, labelling and re-selling through the same channels as new products.

Now: Systems use metals such as aluminium and steel in boilers and heat exchangers.
The future: Can modular plant rooms be used to reduce embodied energy and materials use?

HEATING





Bingham Canyon copper mine in Utah (above) is one of the biggest man-made excavations on earth

6 Finding ways to use fewer precious materials and resources in systems – and reducing waste when repairing and replacing them – could generate considerable cost savings



➤ building services sector by working together. This goes beyond simply substituting one component for another or specifying a different product. It would require a step change in the way that building services are delivered. (See box, Opportunities for resource efficiency, page 39).

Questions for industry

A key aim of this project is to engage with the industry to identify the barriers, challenges and opportunities for resource efficiency. The project is focused on lighting, heating, cooling, ventilation, lifts and escalators (see table on page 26).

As we embark on this project, a series of questions have been raised in this article for the industry to consider and for subsequent research to address. The aim would be to answer these questions and others that will arise and to develop the findings into a CIBSE guidance document.

Lighting

It is widely known that fluorescent lamps contain mercury, but perhaps not so well known that they use rare-earth phosphors. LEDs also contain rare-earth phosphors as well as gold, silver, aluminium and copper.

Can we design-out the need for rare-earth elements in lamps? Ideally, we should be able

to dismantle products that contain precious materials at the end of life and reclaim the materials in their pure form. But lamps are complex products with a wide range of materials that are hard to reclaim at the end of life.

Some manufacturers are now working to reduce their reliance on rare-earth minerals in LEDs and are developing new products, such as organic LEDs (OLEDs), which have the potential to use no rare-earth elements⁴.

So does this mean we are going to have a stock-pile of used lamps, and what happens to these lamps at the end of life?

Cooling

There is an opportunity to drive down heat gains in buildings to reduce the need for cooling, and therefore to reduce the resources required to generate that cooling. From a resource efficiency perspective, larger chillers mean using more materials, rare metals, and so on.

Can the installed capacity of cooling be further reduced by challenging design assumptions? High efficiency chillers with magnetic bearings use less energy in operation and do not require oil for lubrication, which then has to be disposed of or treated. However, magnetic bearings use rare-earth magnets such as neodymium iron boride.

Can these high efficiencies be achieved without using these rare-earth elements?

Ventilation

Materials, furniture and surface finishes emit pollutants such as formaldehyde and VOCs, and equipment such as photocopiers emit ozone and other potentially harmful pollutants. If these pollutants were more tightly controlled, then perhaps ventilation rates could also be reduced. This would then mean less ductwork, fans and other equipment.

Can ventilation rates be reduced if indoor pollutants are reduced or removed? Galvanised steel is typically used in ductwork, which both has a high embodied energy and requires zinc, a fast-depleting resource. Reducing the amount of ductwork required, or using alternative materials, will cut costs as well as reduce the environmental impact.

Can we design systems to use considerably less ductwork, and use ductwork made from alternative materials?

Heating

Heating demand in many types of commercial building has been driven down by improved fabric performance. ➤



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6 Around 26% of all extractable copper in the Earth's crust has been lost as waste, rather than being recycled

NG Bailey delivering prefabricated pipework at the Arla dairy in Aylesbury



Can the installed capacity of heating be further reduced by challenging design assumptions? Distribution pipework is typically steel or copper. There are alternative materials used in some buildings, such as polyethylene pipework, which has a lower environmental impact.

Can alternative pipework materials be used in place of copper and steel? Heating systems use metals such as aluminium, steel and copper in boilers and heat exchangers. Modular plant rooms comprising boilers, pump sets and pipework are available. This should allow manufacturers to improve quality, reduce materials wastage, and to refine their designs to reduce pipe runs, and so on.

Can modular plant rooms be used to reduce the embodied energy use?

Lifts and escalators

A typical lift is made up of many materials including stainless steel, copper, aluminium, plastic and glass. Stainless steel can make up over 50% of the embodied energy content. This is mainly driven by the landing lift doors, so more floors means there will be more steel.

Stainless steel has a high embodied energy and contains chromium, which is a major contributor to the embodied energy and

is a fast-depleting natural resource.

What are the opportunities for lifts to use alternative materials for doors and cars? The motors for lifts and escalators can contain copper and rare-earth magnets. There are opportunities to reclaim materials and components and to re-condition motors.

Can these motors be made without using these rare-earth elements?

Barriers and challenges

There are significant challenges presented by this agenda. Particularly with the more radical suggestions of designing out the need for services, standardising products, encouraging reuse, and leasing services. These fundamental changes would require all parts of the industry to work together and there would have to be a cultural shift in the way the industry works with its clients.

There are technical barriers to overcome for even the simpler resource efficiency ideas. Not least of which is the trade-off between the increased operational efficiencies of high-efficiency equipment (for example, using rare-earth magnets in compressors and motors) versus the environmental and social impact of mining these materials.

There are also technical barriers to using alternative materials and products, and questions as to whether they will perform to the same standard in terms of efficiency, performance, maintenance and reliability. These questions need to be addressed to ensure that robust alternatives can be proposed.

Engaging with the industry

The aim is to work with industry to identify the barriers and technical risks and to do the research to find potential, practical design solutions.

WRAP and CIBSE are running a series of workshops during May and early June to consult with industry and discuss these issues.

A project email address has been set up to allow people to provide comments on the project and to volunteer to become involved in the consultation process. To take part email resource-efficiency@cibse.org CJ

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HEAT

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CIBSE BUILDING PERFORMANCE AWARDS 2013 WINNER
RECOGNISING EXCELLENCE IN MAKING BUILDINGS WORK

To achieve Passivhaus status, the design team at Bushbury Hill Primary School had to target unregulated energy use in the kitchen and produce a super-airtight, insulated envelope that wouldn't overheat. **Andy Pearson** explains how Architype and E3 stepped up to the challenge

Having successfully completed a series of low-energy school designs for Wolverhampton City Council, the architect-engineer design team of Architype and E3 Consulting Engineers set out to raise the bar with their next project: Bushbury Hill Primary School. The team set out to design the new school to Passivhaus standards.

In addition to meeting the rigorous technical demands of the Passivhaus Institute, the client insisted that a Passivhaus scheme would have to be completed within the established project timescale and within the existing £4.2m local authority budget allocated to the new school.

To their credit, the team excelled in the task. The Passivhaus solution developed by the team is a handsome timber and brick-clad school where the building works had to ensure a comfortable learning environment without expensive energy saving additions. This pragmatic, low energy solution was recognised at the CIBSE Building Performance Awards, where the scheme won the New Build Project of the Year (value up to £5m) category. The judges said the scheme demonstrated 'Good energy performance without green bling'.

To design a low energy Passivhaus standard school capable of being constructed within the confines of a conventional building budget required an extremely efficient and cost-effective design solution. Unsurprisingly,

the low energy strategy has informed and influenced every decision about the building's form and servicing strategies. 'As architects, what we like about Passivhaus is that we work more closely with the engineers from early in the design to ensure the building does all the hard work in creating occupant comfort and saving energy without the need for a lot of complicated add-on stuff later in the design,' says Jonathan Hines, director of architect Architype.

A low energy solution was developed using Passivhaus Planning Package (PHPP) analysis software. The school's two-storey form, for example, is the result of PHPP. Two rows of classrooms are arranged at angles to create a wedge-shaped double height activity street at the heart of the school. To the East of the street is a double-height school hall. 'The two-storey, timber-framed solution is more compact and hence more energy efficient because the ratio of external area to floor area is better,' Hines explains.

In addition, the wedge-shaped building has been designed to take advantage of solar gain in the winter by orientating the school's main elevation to face south. Most of the classrooms are on this elevation. Brise soleil and an overhanging roof limit solar gains and prevent these rooms overheating in summer. East and west facing glazing is kept to a minimum because of the difficulty in controlling solar gain on these elevations.

The building's low energy credentials are

“The caterers were persuaded to use electric induction cooking, which means there are no combustion gases to be removed and waste heat from around the pans is minimised”



PROJECT TEAM

Client: Wolverhampton City Council
Architect: Architype
Passivhaus consultants: Elemental Solutions
Building services engineers: E3 Consulting Engineers
Structure: Price & Myers
QS: Smith Thomas Consult
Contractor: Thomas Vale Construction
Certifier: Warm Low Energy

► further enhanced by the exceptionally high levels of insulation present in the building's fabric. All elements exceed minimum Building Regulations requirements: exterior walls have a U-value of $0.13\text{W/m}^2/^{\circ}\text{C}$, the roof $0.10\text{W/m}^2/^{\circ}\text{C}$, and the U-value for the ground floor is $0.06\text{W/m}^2/^{\circ}\text{C}$. The windows and doors are triple glazed with U values of $0.9\text{W/m}^2/^{\circ}\text{C}$ and $1.0\text{W/m}^2/^{\circ}\text{C}$, respectively. In addition, careful detailing has eliminated unwanted heat loss from thermal bridges.

The scheme is also exceptionally airtight. Design workshops were used to develop robust details early in design development, which were continued through the construction phase with the contractor, Thomas Vale. With intelligent detailing and careful construction, the air leakage is limited to an incredible $0.53\text{m}^3/\text{hr}$ at 50Pa , a 2,000% improvement on Building Regulations.

Knowing they had an airtight, energy-efficient building envelope enabled the team to develop an elegant, simple ventilation strategy. There are two ventilation modes: winter and summer. In winter, a mechanical heat recovery ventilation (MHVR) system supplies $5,400\text{m}^3/\text{h}$ of pre-warmed fresh air to the classrooms at the rate of $18\text{m}^3/\text{h}$ per person. This fresh air is then drawn through the classrooms and out to the street through acoustic transfer grilles. From the street, air is returned to the MHVR unit where up to 80% of its heat energy is removed before it is exhausted.

In summer, the MHVR unit is turned off and natural ventilation alone can keep the building comfortable. In the street, high level windows and grilles open to allow warmed air to escape to outside. The escaping air pulls in fresh air from the classrooms through the transfer grilles. Manually openable windows

and room-height ventilation grilles in the classrooms ensure sufficient ventilation to maintain comfortable conditions.

The ventilation grilles are unusual in that they are effectively louvres set into the wall with a door behind that can be opened or closed by the teacher using an electronic actuator to control ventilation. This interconnected system of grilles and louvres allows secure ventilation and enables the system to be used at night to pre-cool the building in hot weather. This solution eliminates the need for mechanical cooling, while providing high levels of fresh air.

The exception to the natural ventilation strategy is the building's main assembly hall. Because this is occupied intermittently and the occupancy can vary from one class of 30 to all 230 pupils for school assembly, this room is fitted with a CO_2 sensor and a supply and extract fan. When the CO_2 sensor calls for fresh air, the fan draws air into the room from the street. When the sensor detects the hall is empty, the fans turn off to stop the system supplying fresh air to an empty room.

This simple strategy enables fresh air to follow the pupils as they move out into the street or to the hall. If the children are not in the classroom, then all the fresh air will still be available when it is drawn into the street. Likewise, if the children are all eating lunch in the hall, then the fresh air in the street will be drawn into the hall. 'Because the building fabric is so airtight, this solution enabled us to keep the plant size and distribution ductwork to a minimum,' says Andy Jarvis, a partner at E3 Consulting Engineers.

Modelling and analysis of the occupied spaces demonstrated that the scheme complied with the overheating recommendation in Building Bulletin 101:

The wedge-shaped design takes advantage of solar gain in the winter by orientating the main elevation to face south





Ventilation of School Buildings that the air temperature in occupied spaces should not exceed 28°C for more than 120 occupied hours a year. In fact, modelling predicted that the maximum time any space would exceed 28°C was 35 hours a year, well within target. The ventilation solution is very much appreciated by the school's head teacher Leigh Smith: 'We can see the benefit of the building's ventilation design, the spaces are so comfortable and the pupils just love it,' she enthuses.

Like the ventilation system, the ventilation plant is simple. A single MVHR unit consisting of a supply and extract fan and a heat-wheel, for heat recovery, supplies all the fresh air. The unit does not have a heater battery; instead the fresh air heating requirement is offset using a simple room-based, LPHW radiator system fed from a pair of condensing boilers.

To meet the heat demand the school is fitted with conventional radiators run at low temperature, rather than expensive low surface temperature units. These warm the



Turning off the gas

As energy use is driven down elsewhere in the Passivhaus school, the power consumed in the kitchen becomes increasingly significant. A major challenge at Bushbury Hill was to design a low energy catering kitchen.

Even the relatively small kitchen at Bushbury is full of energy consuming, heat generating equipment, including a freezer, fridge and cooking ranges and ovens. In addition to the energy consumed by this equipment, the heat it generates can be substantial, particularly in a well-insulated kitchen.

Heat is usually removed from a kitchen by the kitchen hood. This performs a multiple role: in addition to removing heat from the cooking equipment, it removes vapour and other particulates and where gas is used for cooking. The hood also removes the products of combustion and helps keep the kitchen at a lower pressure relative to the rest of the building to stop the spread of smells.

Based on the proposed equipment, a conventional kitchen design would have required a cooker hood to extract 3,600 m³/h from the kitchen. It would also require the same amount of replacement air supplied to the kitchen; this would need to be heated to a minimum of 12°C in winter to ensure it does not cause discomfort to the caterers. Put simply, the energy demand for a conventional kitchen ventilation would have been 10kWh/m²/year, two thirds of the Passivhaus Institute's 15kWh/m²/year total heat demand target for the school.

At Bushbury, Passivhaus consultant Nick

6 The interconnected system of grilles and louvres allows secure ventilation and enables the system to be used at night to pre-cool the building in hot weather

Grant, principal of Elemental Solutions, working with building services engineer Alan Clarke, set out to design a catering kitchen suitable for a

Passivhaus school. The first step in developing a low energy kitchen was to select low energy fridges and freezers to minimise their heat outputs. Next, Grant and Clarke set about minimising the heat output of the cooking equipment with an all-electric solution based on induction hobs. These only lose about 25% heat to the kitchen, whereas gas hobs lose almost 100%.

The all-electric strategy enabled the total ventilation rate to be reduced by a third, to 2,400m³/h. In addition, the heat produced in the kitchen was used to preheat the incoming fresh air using an easy to clean run-around coil system. The supply air system also includes a heater coil from the school heating system for times when the heat output from the kitchen is too low to bring the supply air up to temperature.

The solution worked well. In fact, the catering company is so impressed with the comfortable conditions in the kitchen that they are looking at using a similar system in other kitchens they operate.

Alan Clarke presented a paper to the on Passivhaus School Kitchens at the 16th International Passivhaus Conference, to download a copy go to: www.elementalsolutions.co.uk/books-and-free-downloads/building-and-energy/





The Passivhaus solution is a handsome timber and brick-clad school where the building works had to ensure a comfortable learning environment without expensive energy saving add-ons



MEASURED PERFORMANCE

Thermal energy: 15kWh/m² (gas)
Hot water: 12kWh/m² (gas)
Lighting: 14kWh/m² (Electric)
Power and plant: 14kWh/m² (electric)
Kitchen: 7kWh/m² (electric)
Sprinklers: 17kWh/m² (electric)

classrooms while enabling the boilers to run in full condensing mode. The heating circuit has a high temperature differential, typically 50°C flow 30°C return, to keep flow rates to a minimum. All heating pipework is highly insulated to prevent uncontrolled heat loss.

A separate, dedicated supply and extract system is used to ventilate the kitchen. Because unregulated energy use is included in a Passivhaus design, it was important to minimise the kitchen's energy consumption. School kitchens typically use gas-fired cooking appliances. However, for this project the caterers were persuaded to use electric induction cooking, which means there are no combustion gases to be removed and waste heat from around the pans is minimised (see box: Turning off the gas). 'The caterers were not too keen on the idea at first, but it has turned out to be a huge success both in terms of energy use and comfort for the catering staff,' explains Hines.

In addition to reducing energy consumption in the kitchen, the designers also set about minimising lighting and ICT loads. The form of the building ensures that most spaces have high residual light levels to minimise the need for artificial lighting. When light is needed it is supplied

predominantly from linear fluorescent lamps. These are switched on and off manually; presence detection ensures lights will turn off when rooms are empty. The team also worked closely with the ICT consultant to ensure low energy use equipment was selected for the school.

One area of unexpected energy consumption that was a particular challenge was in the sprinkler room. Wolverhampton City Council has a policy that all buildings have sprinklers fitted for life safety. Bushbury Hill's sprinkler water-storage tank and diesel pump are located in a standalone building situated near the perimeter of the site.

'The amount of energy needed just to frost protect the sprinkler system caught us out,' admits Jarvis. He says that on subsequent schemes, fabric insulation for the sprinkler room will be improved and that improvements to Bushbury Hill, too, are being considered.

When the building was handed over to the teaching staff in October 2011, the architect and contractor spent time explaining the principles behind the design and how to operate the building to its new occupants. They also issued staff with this information in a booklet. However, some users have struggled to understand the control strategy. 'We're trying to use the same design team to address the issues of over-complication for the users,' explains Jarvis

Equally importantly in ensuring the success of the scheme is the design team's access to the building's sophisticated Trend BMS system. This enables them to continue to monitor the building in use throughout the year. The team is still tweaking systems to optimise performance; the controls, for example, had to be reconfigured after the 2012 spring heatwave led to some spaces becoming uncomfortably warm because of the high solar gain from the low-angled sun.

Teething problems aside, this highly successful design received full Passivhaus accreditation. More importantly from the council's perspective, the low energy solution has resulted in minimal energy bills, cushioning them from the impact of future energy price hikes. Not bad for a school that cost £1,768/m² to build.

If further endorsement were needed for this award-winning, low-energy, low-cost school, the client has engaged the same team to work on its next school project – and this time the client has specified a Passivhaus solution. 'This solution has the making of a potential low energy model for school buildings,' says Jarvis. **CJ**



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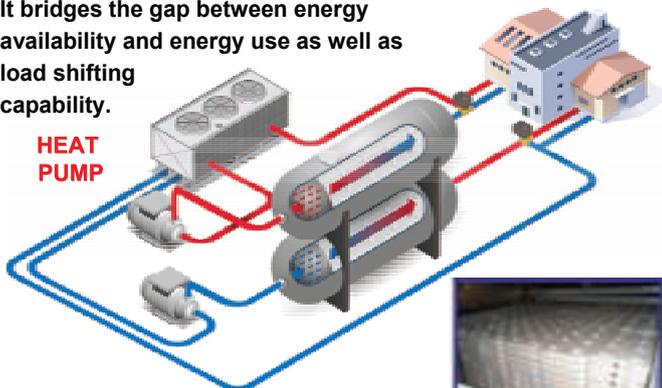
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HOW DO raised temperatures, AFFECT PERFORMANCE?

Indoor environment experts **David P Wyon** and **Pawel Wargocki** answer 30 key questions on indoor air quality and its effect on a person's mental and physical capacity

As experienced researchers in the effects of thermal comfort and indoor air quality (IAQ) on performance, we are often asked to give our best estimate of how, and to what extent, performance is affected by different aspects of indoor climate. Here we answer 30 frequently asked questions on the topic. Our answers are based on the results of behavioural experiments conducted to date.

Q Why should we be interested in thermal and air quality effects on performance?

There are four main reasons:

- It is the added value of occupant performance that pays for indoor environmental quality¹
- Performance is affected in the short-term by the combined effects of all indoor environmental factors, while subjective and physiological responses are usually selected because they are a function of one specific factor
- It turns out that thermal and air quality effects on performance can be observed even when there are no observable effects on comfort or on health-related symptom intensity^{2,3,4}
- The primary purpose of factory, office and school buildings is to provide an optimal indoor environment for work and for learning to work

WHAT EFFECT DOES
**poor air
quality**
HAVE ON OCCUPANT
PERFORMANCE?

Effects

Q What effects do raised temperatures and poor air quality have on performance?

We have found that they usually reduce the rate of working, with little or no effect on accuracy.^{3,4}

Q Why is that?

In our experience, people tend to reduce their rate of work until they are again able to achieve an acceptable error rate.

Q What aspects of mental work are affected?

In general, tasks that require concentration (clear thinking and symbolic manipulation), memory and original thought.^{3,5,6}

Q Are all kinds of performance affected to the same extent?

Most mental work involves concentration and is likely to be similarly affected.

Q What are the exceptions?

Excessive concentration can impair recognition memory and creative thinking, so as moderate warmth leads to lowered arousal, it can paradoxically improve the performance of work that includes such tasks.

Mechanisms

Q How do raised temperatures affect performance?

Raised temperatures have been found to increase end-tidal CO₂ (ETCO₂). This is an indicator of mild 'acidosis', which is an increase in the concentration of CO₂ in the blood and decreases oxygen saturation in blood (SpO₂), both of which are likely to be detrimental for mental work.⁶

Q How does poor air quality affect performance?

Poor air quality may lead to mild acidosis, exactly as raised temperature does, because

it has been found to reduce CO₂ emissions from occupants.⁸ If so, this may be why both factors have such similar effects. Satish et al⁹ have recently shown that increasing the ambient CO₂ concentration artificially can decrease performance, suggesting that ambient CO₂ may have to be regarded as a pollutant instead of as an indicator of a low outdoor air supply rate.

Magnitude

Q What is the magnitude of the negative effects of the indoor environment on performance?

For adults, up to 5% in the laboratory³ and up to 10% in the field.² For schoolchildren, it's more than 20%.⁴

Q Is work in transportation environments similarly affected?

It would seem so. Driver vigilance was found to be reduced by up to 30% by warmth in field intervention experiments lasting only one hour.¹⁰

Q What are the estimated costs of allowing poor indoor environmental quality (IEQ) to reduce performance?

As staff costs per unit of floor area exceed operating costs by 100:1, the effects observed are seldom negligible.¹

Q Surely, children are less affected than adults because they are young and healthy?

We have found that their performance is more affected, not less. We believe that this is because children in school, by definition, are doing work that is new to them, while adult workers are usually very familiar with the work they do and are better able to cope with environmental effects that make their work more difficult.

Q Is factory work likely to be less affected by thermal and IAQ effects than office work?

We believe not, as most workers in modern factories have to interact with computers, just as office workers do.

Methodology

Q Does laboratory research really predict what happens in practice?

Many field studies have found that the negative effects of poor working conditions are greater in real workplaces than would have been predicted from

ARE CHILDREN LESS AFFECTED THAN ADULTS BECAUSE THEY ARE YOUNG AND HEALTHY?

children adults

laboratory experiments.^{2,5} This may be because laboratory experiments use paid subjects, who tend to exert more effort in the course of a necessarily brief laboratory exposure to poor IEQ than they would routinely experience in their workplace.

Q Why do some laboratory experiments show no effects on performance?

If subjects are highly motivated they can sometimes maintain performance during short exposures to poor IEQ. Negative effects on fatigue may then be found instead. Additionally, some studies may have missed the subtle changes in performance that are caused by slightly suboptimal indoor environmental conditions.

Q Do performance tests really predict productivity?

Logically, yes. Although environmental effects on component skills have yet to be validated as predictors of overall productivity, call-center results use 'bottom-line' measures of the call volume achieved in practice,^{2,5} and schoolwork is what children do in school.^{4,11,12}

Q Does a decrease in the performance of schoolwork indicate reduced learning?

Not proven. But surely schoolwork is assumed by teachers to promote learning? Test scores used by teachers and regulators to observe progress in learning have been

DOES airborne dust AFFECT PERFORMANCE?

dust

► found to correlate with spot measurements of ventilation.¹¹

Q Are research findings on performance from Northern Europe valid in warmer climates?

Yes. Very similar results were obtained when the same experiments were repeated in Singapore.⁵

Indicators

Q What seems to be the most reliable indicator of IAQ effects on productivity?

Until we know which pollutants are causing the negative effects on people, the outdoor air supply rate per person seems to be the most reliable indicator.¹³

Q Can subjective assessments of IAQ by occupants be used to predict performance effects?

No. Sensory habituation ensures that increasingly poor air quality may be underestimated, except by visitors.³

Q Can occupants reliably assess their own productivity?

So far there is no reliable evidence that they can. Self-estimated productivity may simply indicate the effort they are aware of exerting,³ and/or wishful thinking and a desire to placate management.

Q What is the most reliable indicator of thermal effects on performance?

Air temperature is not a reliable indicator in any absolute sense, because performance is a function of the heat balance of the body,

which is affected by clothing, metabolic rate, air velocity, and so on. But in a given work situation it is a very useful basis for comparison. In the cold, manual dexterity is progressively impaired as the body actively reduces finger temperature to conserve heat, while in slightly warm conditions, mental performance has been found to decrease when finger temperatures approach their maximum value of about 36°C and sweating must be initiated to maintain the body's heat balance. Finger temperatures in the 30°C to 34°C range are, therefore, a reliable indicator that thermal conditions are optimal for most kinds of performance.

Q Do occupants' assessments of thermal discomfort predict effects on performance?

Not always. They may be able to avoid discomfort by working less. This implies that the adaptive model of thermal comfort should *not* be used in isolation to justify energy conservation measures, because that could lead to conditions that cause suboptimal performance and productivity.⁶

Q Can we use sick building syndrome symptoms to predict effects on productivity?

Yes, in theory, because they do co-vary. But the data is still too meager to create a robust relationship.⁵

Q Is absenteeism a useful indicator of effects on productivity?

Poor ventilation does increase absenteeism,¹⁴ but so do many other factors.

Mitigation

Q Could openable windows, giving children access to fresh air, provide an alternative to going outside?

No. They will not be opened spontaneously unless it is also warm. Also, opening windows will often be seen as a waste of heating or cooling energy.

Q Does increased outdoor airflow always improve performance?

No. It can even have the reverse effect if it passes through particulate filters that are full of dust.⁴

Q Does airborne dust affect performance?

There is no evidence that it does, even though dust is expected to have negative effects on chronic health problems. ►



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CAN WE ALLOW INDOOR temperatures TO DRIFT upwards TO CONSERVE ENERGY IN BUILDINGS?

► Short-term effects of poor air quality on the performance of schoolwork remained after airborne dust had been removed, so the negative effects observed were attributed to gas-phase air pollutants.¹⁵

Going forward

Q What are the most commercially important questions for future research?

We have identified the following 10 high priority research topics:

- Are the combined effects of temperature and IAQ additive?
- How does performance vary with self-estimated performance?
- Which component skills are affected by indoor temperature and air quality effects?
- Is high-level work involving decision-making and creative thinking similarly affected?
- Are leisure activities negatively affected by poor IEQ?
- Is sleep affected by temperature and IAQ, and if so, does this affect next-day performance?
- What is the economic impact of all these effects on different kinds of productivity?
- What is the most cost-effective way to reduce the negative effects of poor IEQ?
- How can energy be conserved without affecting performance?
- How do energy certification schemes affect productivity?

Q Which underlying mechanisms are worth investigating?

We believe that that the following four topics should be addressed by future research:

Do thermal and IAQ effects on acidosis decrease performance?

Is acidosis caused by shallow breathing or by decreased gas exchange in the lungs?

Which gas-phase indoor air pollutants have this effect, and can it be prevented?

Are any other mechanisms involved? **CJ**

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As louvres are an integral part of the building envelope, aesthetics are an important part of the specification process. However, it is very important that performance criteria are not compromised. For example, louvres can be hidden behind features or perforated panels but this can increase resistance to air flow

LOUVRES IN THE AIR

Louvre systems are an effective way of improving a building's energy efficiency but, to ensure best performance and protection from the weather, building designers and engineers must consider a wide range of factors, says **Simon Hunter**

It is estimated that around 45% of the UK's CO₂ emissions come from buildings. As successive governments have committed to reducing greenhouse gas emissions by at least 80% by 2050, the way in which buildings are designed and built is changing.

The Building Regulations – particularly Part L, which sets carbon emission targets for new buildings – are expected to be the regulatory vehicle for meeting these goals, and are expected to introduce further carbon reduction targets later this year.

To meet the tougher requirements designers are increasingly turning to 'fabric first' solutions. This means consultants are using high levels of natural light and ventilation and insulation, combined with more energy-efficient building systems, such as climate control and lighting.

Louvre systems can have an important part to play in improving buildings' energy performance. Needed on most buildings, these systems allow airflow – both intake and exhaust – to heating, ventilation and air conditioning (HVAC) and other building systems, while protecting these openings against rain ingress.

As well as allowing natural ventilation, an efficient louvre system can improve airflow to building systems, which means less power is needed to move the volumes of air required.

In the case of HVAC systems, the improvement in energy efficiency can mean a smaller and less powerful system is required for space heating and cooling.

There are three main types of louvres: screening louvres, standard drainable louvres and storm-resistant (or performance) louvres. Screening louvres have the simplest designs, suitable for locations where water penetration will not cause significant problems and economy is the primary consideration, such as screening rooftop plant or in car parks.

Screening louvres typically have simple blade shapes, which allow good airflow but give limited defence against rain. Standard drainable blades give good airflow and some rain defence, but do not perform so well with wind-driven rain. They are used when occasional ingress is not a major concern and where some drainage of water is required.

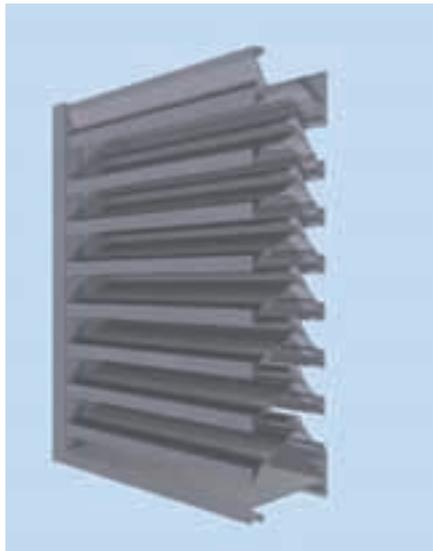
Storm-resistant, or performance, louvres, on the other hand, provide moderate to good airflow with excellent defence against wind-driven rain. These are typically used when high levels of ventilation and maximum protection from the rain is needed.

Performance louvres have blades with complex profiles and use the 'tangential separation effect' to force air entering the louvre to change direction rapidly. The complex blade profile creates low vortex

Louvre systems can have an important part to play in improving buildings' energy performance



Construction Specialties A4080 system
Standard drainable louvres give good air flow and some rain defence but do not perform so well with wind-driven rain



Construction Specialties RSH-5700
This type of louvre is used when high levels of ventilation and maximum protection from the rain are needed

As louvre design has changed in response to demand for better water protection, performance characteristics have also changed

turbulence with areas of low and high pressure. As the turbulence gives water droplets greater momentum, the droplets are thrown out into areas of low pressure and drain away.

To get the best possible results from a louvre system, it is crucial that it is correctly specified.

Specifying louvres

Specifying a louvre is always a compromise between airflow and water ingress.

Traditionally, louvres are specified based on free area (typically 50%), calculated by measuring the clear distance between the blades and multiplying it by the width of the louvre panel (or height, if the blades are arranged vertically).

Clearly, free area is dictated by the size of the louvre. Industry commonly uses a 1m by 1m louvre when quoting free area but, in reality, louvres are never precisely this size. In fact, the smaller the louvre, the lower the proportion of free area, as it is affected by the space taken up by the head, cill, jambs or mullions, which stay the same size. Free area is affected by other factors, such as additional structural support, or if bird screens or insect meshes are fitted.

Finally, and perhaps most importantly, free area alone does not take into account how the air flows through a louvre, with too high a resistance to air flow not enough air will pass through, which can cause a rapid temperature rise inside a building, in turn causing problems with plant.

As louvre design has changed in response to demand for better water protection, performance characteristics have also changed. As a result, engineers and architects should consider a number of factors, including site

location, prevailing weather conditions (in particular wind direction) and the location and exposure of the louvres.

These should then be balanced with the required air flow, the maximum acceptable pressure drop, the degree and depth of acceptable water penetration and, finally, the building's exterior design, which can dictate where louvres can be placed.

By considering these factors, designs can help to improve building energy efficiency. Conversely, poor specification can lead to rainwater ingress, not enough ventilation, wasted energy and poor performance.

The aesthetics of louvre design

As louvres are an integral part of the building envelope, aesthetics are an important part of the specification process.

Louvres come in a wide range of designs and colours to suit any application. A louvre system that uses hidden mullions gives clean, architectural lines because the support system is behind the blades, making the mullions almost invisible. Mullions can be spaced about every 1 to 2m and blades are typically 3 to 4m long, dictated by transport restrictions and the weight of the blades. Hidden mullion systems are used to provide screening and protection to buildings with multiple openings.

Louvres with visible mullions, on the other hand, can be used as a design feature, to line up with curtain wall panels or windows. Again spaced every 1 to 2m, visible mullions bring additional benefits, as they are designed to be part of the drainage system.

Most performance louvres can be shaped. However, it is important to realise that performance can be reduced, particularly if horizontal louvres are being used on circular shapes, as the drainage characteristics of their complex blade profiles can be affected. Many louvres can be shaped on plan to give curves or the impression of a curve.

In summary

Louvres can play an important role in improving energy efficiency of buildings.

However, design has responded to demand for better rain protection and more efficient ventilation. As a result, performance characteristics have also changed and traditional methods of louvre selection purely on free area are no longer valid. Assessment of contributing factors is needed to ensure louvre systems supply a balance between ventilation, water protection, efficiency and aesthetics. **CH**

SIMON HUNTER is product manager of louvres at Construction Specialties

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Professional development



The CIBSE Journal CPD Programme

Members of the Chartered Institution of Building Services Engineers (CIBSE) and other professional bodies are required to maintain their professional competence throughout their careers.

Continuing professional development (CPD) means the systematic maintenance, improvement and broadening of your knowledge and skills, and is therefore a long-term commitment to enhancing your competence. CPD is a requirement of both CIBSE and the Register of the Engineering Council (UK).

CIBSE Journal is pleased to offer this module in its CPD programme. The programme is free and can be used by any reader. This module will help you to meet CIBSE's requirement for CPD. It will equally assist members of other institutions, who should record CPD activities in accordance with their institution's guidance.

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You can also complete the questionnaire online, and receive your results by return email.

Textile-based ductwork distribution systems

This module considers the design and application of textile-based air distribution systems

Examples of the application of fabric- or textile-based air distribution stretch back into the mid-20th century, where simple, inflating cotton bags (or 'socks') were attached to the end of metal spigots to provide a means of supplying large amounts of ventilation air. Although, originally, applications tended towards industrial locations where the lightweight, machine-washable ducts were particularly attractive, such as food preparation areas, slaughterhouses and laboratories (see Figure 1), they have since seen wider adoption in commercial and industrial installations, such as offices, workshops, schools, shops and showrooms.

Despite their increasingly widespread use, there is little design guidance from CIBSE or ASHRAE. However, several manufacturers – many of whom evolved in Europe – have developed respectable design and installation guides as part of their sales offering, with each system requiring individual design, dependent on the room characteristics, supply air volumes and temperatures.

The cotton used in the early applications was quickly found to absorb water and, owing to its organic nature, potentially harbour bacteria and moulds, so it was quickly replaced by polyester and oil-based synthetic fibre that became widely available in the 1950s. The polyester employed is a UV and crease-resistant material that can be coloured, providing a robust, flexible fabric



Figure 1: Example of a laboratory using a low impulse permeable textile half circular ('D'-shaped) ventilation system

that, when woven with other specific yarns, make it fire retardant. At the end of the useful life, the fibres can also be re-processed into recycled polyester materials.

Textile ducting is applied using both permeable and non-permeable materials. Permeable materials may be categorised by their dust-holding capacity. This is not to infer that the ducts should be used as a filter – textile-based systems require filtration in the air handling unit like more traditional metal duct systems. However, some particulate matter will pass into the supply air – the fabric's dust-holding capacity and the quality of the centralised filtration will influence the frequency of cleaning. High dust capacity (HDC) materials are made of staple fibre yarns capable of carrying a large amount of dust without blocking

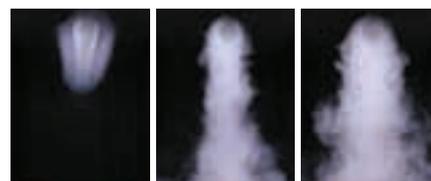


Figure 2: Circular permeable textile 'low impulse' supply – cooling ΔT of 0K, >5K, <3K

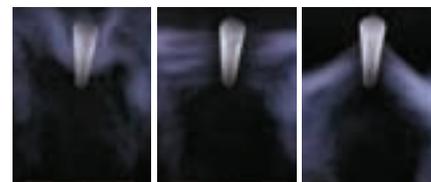


Figure 3: Circular non-permeable fabric 'high impulse' supply ducts with directed nozzles

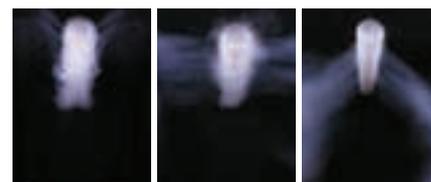


Figure 4: Circular permeable textile ducts with the addition of directed nozzles for diffusion and projection

the airflow through the material. Low dust capacity (LDC) materials are typically woven of multifilament warp yarns. These fibres are plain and smooth, with a small surface compared to that of the staple yarns. In weft direction (crosswise), the same staple yarns are used as for the HDC fabric; however, the



Figure 5: Example of a swimming pool using a high impulse non-permeable circular ventilation system with 4.5 mm holes

weaving-method is a more simple cotton bond, with a much smaller surface than that of the HDC fabric. HDC materials will hold more dust and increase the period between washing intervals, along with helping to minimise any increase in pressure loss.

Air distribution with textile-based ventilation systems

The air distribution principle used for a simple textile-based ventilation system is fundamentally different from that of a conventional ventilation system equipped with metal ducting and discreet diffusers. Uncoated textile-based systems use permeable fabrics to distribute the air into the room, diffusing through the surface area of the material, enabling air to enter the room at a low velocity (as in Figure 2) – sometimes termed ‘low impulse’ systems. Directed systems use non-permeable fabric materials (coated in a self-extinguishing and flame-retardant plastic coating), with the addition of nozzles and/or laser cut holes to project and distribute the air supply to the room at higher velocities, sometimes termed ‘high impulse’ systems (Figure 3). There are also hybrid systems that use a mix of the permeable material for diffusion and additional openings for projection and further distribution of the air (Figure 4).

‘Low impulse’ supply systems

The air distribution principle for these systems is often based on displacement ventilation principles, where the air is supplied at a slightly lower temperature than the room air. Because of the difference in density, the cooled supply air being heavier than the warmer room air, the supply air continues moving towards the floor. As

with other displacement systems, heat from sources – such as people, equipment and solar gain – generates convection currents, resulting in the air being displaced, so moving heat and pollutants away from the occupied zone to be extracted at high level. Supplying air at a low velocity is suitable for cooling or for distributing large volumes of air at a temperature similar to that of the room air. High air-change rates (and associated cooling) can be achieved with low terminal velocities in the occupied area, owing to the air being discharged over the entire surface of the ducting. For example, each metre run can provide about 700 watts-cooling using a room/supply ΔT of 3K in an office-type application (approximately 200 W cooling per m^2 floor area) – the diameter of the duct being determined by its capacity to convey the total flowrate for that particular branch (using manufacturers’ data sheets).



Figure 6: Olympic temporary portal at Heathrow Airport, using a high impulse non-permeable circular ventilation system with nozzle diffusers



Figure 7: Nozzles added to the textile ducting during the manufacturing process

In permeable low impulse supply systems, the textile surface is effectively a fine mesh, allowing the supply air to pass through the surface at a low, uniform discharge velocity (normally less than $0.1 m \cdot s^{-1}$). The discharge velocity should be kept below (approximately) $0.40-0.50 m \cdot s^{-1}$, as beyond this the room air will start to entrain and mix with the low temperature supply airflow. The noise generated by this low-velocity supply is commensurately low and, when appropriately designed and installed, can be used where noise levels down to 20 dBA are required. Since the surface of the material is continuously ‘washed’ through by the diffusing supply air, the surface of the material does not exhibit condensation, so allowing supply air at a temperature below the dew point of the room air.

Such low-velocity systems are unsuitable for heating applications, as warmer supply air will settle at high level and is likely to ‘short circuit’ back into the extract system.

‘High impulse’ supply systems

These rely on purpose-made openings in the non-permeable duct material to provide jets of supply air. These may be in the form of small holes or slots (factory cut and finished), arranged in specific locations and groupings in the textile duct, or by using nozzles fixed into the fabric that allow both area and direction of the air jet to be more closely controlled.

Ducts with many small holes (jets) in the textile result in large induction of room air, so the velocity is reduced more quickly (and the throw reduced) compared to nozzle systems (Figure 5). Adding nozzles to the duct increases the supply options, so that systems may be manufactured to meet very

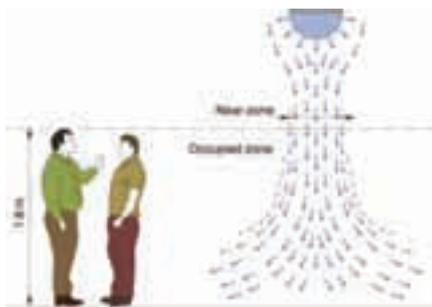


Figure 8: The near zone for a horizontal low impulse supply system – the volume that is not suitable for occupied use

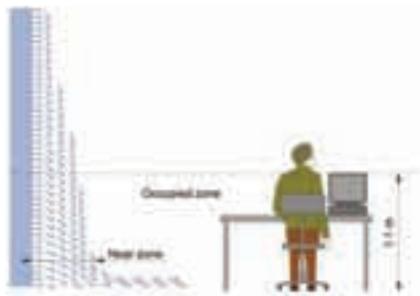


Figure 9: The near zone for a vertical low impulse supply system – the volume that is not suitable for occupied use

specific air distribution needs (Figure 6). So, for example, systems may be produced for industrial areas that have nozzles to 'air wash' the soffit to remove condensation, while other nozzles are oriented to satisfy the comfort needs of the occupants below. The air may be directed along adjacent surfaces, employing the 'coanda effect' to increase the effective throw.

These systems will provide mixing ventilation, with the air being delivered outside the occupied zone at high velocity. So, for example, using plain holes of approximately 4.5 mm diameter will deliver air at $6 \text{ m} \cdot \text{s}^{-1}$ with an internal duct static pressure of 50 Pa, and $16 \text{ m} \cdot \text{s}^{-1}$ at 200 Pa duct pressure. The distribution pattern of the holes will determine the throw and spread. To provide more control of the design of the supply air pattern, nozzles (typically 12-60 mm diameter) may be selectively factory fitted (Figure 7) according to the application, giving velocities of around $8 \text{ m} \cdot \text{s}^{-1}$ (at 50 Pa) to $16 \text{ m} \cdot \text{s}^{-1}$ (at 200 Pa) (nozzle size being determined by duct mounting height and the throws required for the room). Throws would typically be from a few metres, using 12 mm nozzles, to 25 m-plus with larger 60 mm nozzles, for both heating and cooling.

The velocity of the air moving through the room will reduce the local air static pressure and entrain air from the room volume (where there is a higher static pressure). As

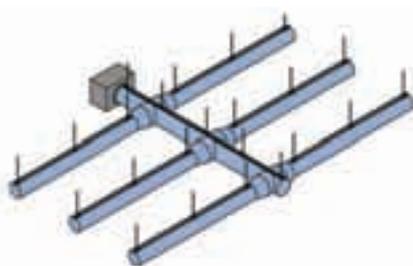


Figure 10: Example of a duct system layout

the jet draws in more room air, just as with 'traditional' air diffusion devices, the velocity of the air will reduce and, if appropriately sized, the supply air will be completely mixed with the room air before it reaches the occupied zone and the air velocity has dropped to a reasonable value.

A textile-based high impulse supply system may be used for cooling systems, tempered ventilation and heating applications, since the supply air is delivered with sufficient velocity to allow the air to mix with the room air independent of the temperature difference between the supply and the room air. Just as with 'traditional' diffusers, these systems may be characterised by 'throw' and 'spread'. Unlike low impulse supply systems, the location of the exhaust has only a minor influence on room air distribution.

Air travelling through the coated, non-permeable flexible ductwork must be above the dew point of adjacent room air, otherwise condensation will form on the duct's surface.

Occupied zone

The occupied zone is the target volume where the system aims to maintain the required conditions. It is by no means fixed but will vary from one project to another, depending on use of the space. Typically, the occupied zone is defined as the zone from the floor up to a height of 1.8 m where occupants are in a standing position, and up to 1.1 m for people who are seated. The term 'near zone' may be used in the case of horizontal low velocity supply systems (Figure 8), to indicate the zone under the textile ducting where there is an appreciable risk of a 'cold downdraught'.

For vertically-mounted systems, the near

zone is taken to be the local zone around the duct where the air velocity is greater than that required for occupant comfort (Figure 9).

Installation

The duct (Figure 10) is typically suspended using aluminium track or point systems, designed to allow speedy installation and removal (for cleaning), as well as ensuring that the system maintains its shape and appearance (Figure 11). Since textile ductwork relies on the pressure of the air inside the duct to maintain its consistent shape, specific care should be taken to ensure that there are appropriate pressures – not only to move the air from the duct into the conditioned space but also to minimise the effect of pressure perturbations (or 'fluttering').

The sections of duct are connected with 'zip'-style fasteners, allowing easily manageable sections for installation and ready access. Abrupt changes in direction and interference from framework can cause mis-shaping, vibration and noise in the fabric. However, radial bends, angled sections, dog-legs, and complicated shapes can be made in textile ducting – it is not restricted to straight runs.

As the air travels through the constant diameter of the duct, its velocity will drop as the air is diffused into the space. By virtue of static regain, the static pressure will tend to rise (in spite of the frictional pressure drop), and this should be considered when designing systems.

The noise produced by textile ducting is very low in comparison to metal systems, and so higher duct velocities of 6-7 m/s are possible while still achieving low noise ratings. It is important to note that there is little sound absorption in the material, so attenuation will still be needed to remove noise from the central distribution system and air handling, as with a metal-ducted system.

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● This article was produced with the input of Mark Bailey, with reference material and all images supplied by KE Fibertec UK.

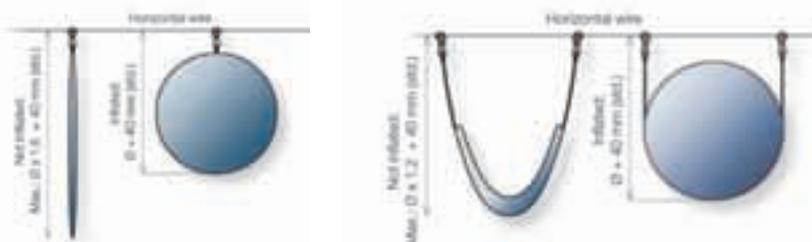


Figure 11: Example of single and double suspension, and how the duct will look with and without air flow

Module 52

May 2013



1. Which decade saw the adoption of polyester as a material for textile-based ducting?

- A 1940s
- B 1950s
- C 1960s
- D 1970s
- E 1980s

2. Which of these statements is most likely to be true?

- A Compared to LDC, HDC fabric ductwork provides good dust-holding capacity and extends the period required between washes
- B LDC textile-based ducting is ideal where the supply air is poorly filtered when supplying a cleanroom
- C Textile-based ductwork is only suitable for straight sections of ducted air distribution
- D Systems employing fabric-based air distribution may only be used for heating applications
- E Fabric-based air distribution cannot be applied where there is a predominant heating load

3. In an office application, what is the cooling load per metre-squared floor area that may be achievable with a ceiling mounted permeable fabric-based air distribution system with a room-supply ΔT of 3K?

- A 25 W.m²
- B 50 W.m²
- C 100 W.m²
- D 150 W.m²
- E 200 W.m²

4. How are the sections of fabric ductwork typically connected?

- A Lightweight aluminium flanges and non-ferrous bolts
- B 'Velcro'-style fasteners
- C 'Zip'-style fasteners
- D Sewn together as complete system in factory
- E Connected using lacing with brass eyelets and polyester cord

5. According to the article, what throws are achievable when using 60 mm nozzles?

- A 10 m
- B 15 m
- C 20 m
- D 25 m
- E 30 m

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SE Controls' smoke ventilation provides safe environment at flagship research laboratory

The Medical Research Council's new £200m Laboratory of Molecular Biology (LMB) is using an advanced smoke ventilation solution from smoke and natural ventilation systems specialist, SE Controls, to provide smoke-free escape routes for scientist, staff and visitors at the recently completed facility in Cambridge. Designed by RMJM architects and constructed by BAM construction, the LMB provides 27,000 m² of usable space and is located adjacent

to Addenbrooke's Hospital as part of the expanding Cambridge Biomedical Campus, a renowned global centre for excellence in biomedical research. Within its construction, the LMB uses a number of energy saving technologies and innovative solutions to provide heating, ventilation and solar shading, as well as cooling through a deep bore closed-loop geothermal system to meet the laboratory's 1600 kW peak cooling demand. Within the extensive smoke ventilation system, SE Controls supplied 197 chain actuators with a 603 mm stroke length to operate smoke vents located throughout the building, together with controls for eight staircase smoke hatches.

● Visit www.secontrols.com or call 01543 443060

Wieland connects Cannon Place

Wieland Electric has supplied its Metalynx armoured, structured wiring system to enable fast connection of lighting, small power and fan coil units at Cannon Place, a 389,000 sq ft landmark commercial complex above the Cannon Street major transport interchange in the City of London. The new eight-storey development has been constructed over and around Network Rail and London Underground lines, and incorporates upgraded facilities for both stations. The Cannon Place scheme has been carried out by developer Hines, working in close partnership with Network Rail and London Underground.

● Email sales@wieland.co.uk

Knauf Aquapanel delivers school for living

dRMM, the award-winning studio of architects and designers, has employed Knauf Aquapanel Exterior to deliver an eye-catching but functional design detail in its design for the newly-rebuilt Four Dwellings Primary School, a £4.5m Building Schools for the Future project in Quinton, Birmingham. The designer wanted external toilet pods that were tightly curved, echoing the ovoid footprint of the overall building, and tiled in bright colours – a demanding brief for which Knauf Aquapanel Exterior was ideal.

● Email kd@web-response.co.uk or visit www.knaufdrywall.co.uk



Knauf Drywall systems protect waste plant from fire

Two lightweight construction systems developed by Knauf Drywall are being employed to build one of the country's latest energy-from-waste (EfW) plants, accelerating construction and reducing costs while meeting the strictest standards of fire protection. The contract to design, build and operate the EfW facility at North Hykeham was awarded to WRG by Lincolnshire County Council after a detailed procurement process and is now being built by main contractor Clugston Construction.

● Email kd@web-response.co.uk or visit www.knaufdrywall.co.uk



Smedegaard's local authority success

Over the last 30 years, Smedegaard Pumps has developed long-standing relationships with many local authorities, being specified to provide pumps, pressurisation sets and cold water booster sets for many boiler house refurbishments throughout the UK. Doncaster Council is an example of this relationship and this year, as part of its programme of refurbishment, two schools – Armthorpe and Hatfield Sheepdip Primary – had their heating system upgraded. Both boiler house refurbishments included the installation of Smedegaard glanded Omega EcoFlex pumps fitted with integral inverters.

● Visit www.smedegaard.co.uk, email info@smedegaard.co.uk or call 01278 458686

Saint-Gobain PAM UK in Snow Hill development

Iron technology leader Saint-Gobain PAM UK, part of materials company Saint-Gobain, has secured its second phase of orders for its industry-leading Ensign soil and rainwater system for installation at the prestigious new 96,000 m² Snow Hill mixed-use development in the heart of the city of Birmingham. The development, by Ballymore, has been on site for more than three years, with the orders for the first three buildings on Snow Hill 1 being supplied by Saint-Gobain PAM UK in 2009.

● Visit www.saint-gobain-pam.co.uk





New BBS biomass boiler from Potterton Commercial launches

New from Potterton Commercial, the Biomass Boiler System (BBS) is a totally new technology being incorporated into the portfolio of low/zero carbon solutions offered by the Baxi Commercial Division 'one-stop-shop'. The new Potterton Commercial BBS is constructed from high-grade steel and includes fully integrated controls that allow remote access and monitoring of the system via a web-based portal. This boiler system can be configured for both wood pellet and wood chip fuels, depending on the site application.

● Visit www.pottertoncommercial.co.uk, email rebecca.johnson@baxigroup.com or call 0845 070 1055

More plaudits for Elta

For the second year in a row, Elta Fans has been included on the shortlist for the *HqV News Awards*. The 2013 submission, a product from its box fan range, offers a potential reduction in annual energy operating costs of more than 90%.

Available in eight standard sizes, from 100 mm to 710 mm, the Quietflow SQS DCV features the BAT (best available technology) Vpro backward-curved impeller, with three dimensional profiled blades. The impeller is powered by the Ziehl-Abegg EC external motor, offering high energy efficiency and excellent reliability.

● Visit www.eltafans.com, email mailbox@eltafans.co.uk or call 01384 275800



Hitachi Air Conditioning Europe launches CPD course for European directive

Hitachi Air Conditioning Europe is running a new CPD-approved training course from its academy training centres in Maidenhead and Berkshire, and Dublin in Ireland. The course is completely free of charge and covers the Eco Design Directive for Energy Related Products (ErP), which came into effect at the start of the year. It applies to all air conditioning units under 12 kW, so it's important installers, contractors and specifiers of HVAC products fully understand the requirements of the new EU legislation.

● Email aircon.training@hitachi-eu.com or call 01628 585394



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 new, 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.

● Call 01293 871751 or visit www.castlinesystems.com



Devonport High School refurbishment includes Smedegaard pumps

The Devonport High School for boys is a grammar school and academy, for boys aged 11 to 18, in Plymouth, Devon. Totus Engineering, of Exeter, carried out a refurbishment project at the school, selecting Smedegaard pumps and pressurisation sets to replace older existing equipment. Smedegaard Omega ECOFlex glanded pumps with integral inverter drives were installed, giving cost savings thanks to improved energy efficiency and reduced power, as well as ensuring compliance with the new European Legislation ErP directive. A number of pressurisation units were installed during the refurbishment.

● Visit www.smedegaard.co.uk, email info@smedegaard.co.uk or call 01278 458686



Specialist sustainable care home developer chooses Remeha boilers

When you need to provide reliable, energy-efficient heating and hot water 24 hours a day, 365 days a year for a 60-bed care home, Remeha boilers are the number one choice. The Castleoak Group, leaders in sustainable development within the care sector, first approached Remeha Commercial three years ago. Since then, Remeha's energy saving, low NOx and carbon condensing boilers have been installed in various Castleoak care homes across the country, including Hurstwood View near Uckfield, where three Remeha Quinta Pro 115 boilers fitted in a space-saving cascade package create a continuously warm, comfortable environment and instantaneous hot water for residents.

● Visit www.remeha.co.uk, email boilers@remeha.co.uk or call 0118 978 3434

SD150 exhibited at Firex 2013 by Triple P Projects

The SD150 offers an ideal solution for OH1 automatic fire sprinkler systems in schools. The SD150 connects directly onto the town's water mains. It is well suited to the current economic climate as it reduces installation and running costs, with no dedicated pump house or storage tank required. Environmentally friendly, space saving, lower power consumption and no water wastage. View the whole SD range at Firex 2013, Hall 3, stand F44.

● Visit www.triplepprojects.com or email info@triplepprojects.com



Dundee home scheme warmly recognised

District heating schemes are pretty rare in this country but can deliver exceptional results, as has been proved by the recent refurbishment work undertaken on a 336-home scheme in Dundee – the Dallfield Community Energy Saving Project. The four multi-storey buildings that comprise this development

underwent a comprehensive refurbishment, which saw them benefit from – among other upgrades – a new energy efficient heating system. Dundee City Council appointed McGill as the principal contractor to undertake this work and it, in turn, selected various partners, including Grundfos Pumps, to work closely with the team to deliver the best solution. The project has since won two prestigious awards for the excellent results the redevelopment subsequently delivered. Grundfos was delighted to play its role in the scheme, providing the energy centre with five Grundfos energy efficient TPED Series 1000 circulator pumps, which operate at the very heart of the system and are the ideal choice for this type of application.

● Email uk-sales@grundfos.com, call 01525 850000 or visit www.grundfos.co.uk

Big Foot Systems offers safe access solutions

Big Foot Systems now offers a comprehensive range of Safe Access products, which are ideal for a wide range of applications, from schools to shopping centres. The Safe Access series completes Big Foot's product portfolio of freestanding systems to support plant equipment and installed services on flat roofs. Designed and manufactured by the company, Big Foot's products provide simple, safe and secure non-penetrative, prefabricated roof support systems. Big Foot's Safe Access systems provide standard site-assembled, safe access walkways, platforms and step-over solutions.

● Call 01323 844355 or email enquiry@bigfootsupport.com



Toshiba launches new business tools

Toshiba Air Conditioning has introduced a comprehensive new suite of business tools to help contractors design, quote for and secure orders for new projects. David Dunn, commercial director, said: 'It enables installers to provide fast and accurate technical, design and cost information to clients on air conditioning projects. The tools can be applied equally to small and large projects, and speeds up the whole process of responding to enquiries – giving customers timely, high quality information they can base decisions upon with confidence.'

● Visit www.toshiba-aircon.co.uk, email general.enquiries@toshiba-ac.com or call 0870 843 0333



Mira confers bathroom style on Oxford boutique hotel

The owners of Oxford's latest boutique hotel have ensured that the bathrooms meet the highest aesthetic standards by installing showering equipment from Mira Showers, the UK's leading manufacturer of showering products and accessories, and its commercial division, Rada. The Bocardo, named after the city's medieval prison, will be a 10-room hotel above Jamie Oliver's restaurant in George Street. It is being developed by city hotelier Rajinder Pal, who also owns The Tree Hotel in Iffley and the Marlborough House Hotel in Oxford.

● Email kohlermira@linney.com or visit www.mirashowers.co.uk

Remeha Commercial announces new appointments

A leading heating manufacturer and supplier, Remeha Commercial, welcomes new members to its team to continue its growth path and unrivalled quality of service. Mike Hefford joins as head of renewable technologies, tasked with expanding Remeha Commercial's renewable offering in the commercial sector. Other new faces to the Remeha Commercial sales team are Andrew Dawson, area sales manager (ASM) for the north of England, Richard Brown, ASM for the south east, and Mike Loveluck, who is responsible for the Home Counties region. David Fry has relocated from the South to Yorkshire to become the new area sales manager for the north east.

● Visit www.remeha.co.uk, email boilers@remeha.co.uk or call 0118 978 3434



Mike Hefford



Titan Products launches TPZ-Net Zigbee wireless range

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

● Visit www.titanproducts.com or call 0161 406 6480



Heat pump sizing calculator from Dimplex

Dimplex is making life easier for installers with a new online calculator to help determine the heating requirements of a building and select the most appropriate heat pump and ancillary equipment. The heat pump sizing tool allows users to input details about the project they are working on, generating a report that can be used to give homeowners a useful estimate of costs before they decide to proceed to a full quotation, saving valuable time and allowing more initial enquiries to be handled quickly and efficiently.

● Visit www.dimplexheatpumpcalculator.co.uk or call 0844 879 3587

Gas interlock with integral fan controller installed at 'Cookline'

The Safeguard Group has installed S&S Northern's Merlin 1400 gas interlock in its new state-of-the-art 'Cookline' demonstration kitchen. The Merlin 1400, with its integral fan control system, is easier and quicker to install because it requires less wiring and is therefore more cost-effective. Because the fan is integral, less wall space is required, making it ideal for smaller kitchens. The Merlin 1400, which is also highly reliable and energy efficient, meets the requirements of BS6173:2009 for all new and refurbished kitchens.

● Visit www.snsnorthern.com, email info@snsnorthern.com or call 01257 470983



The Multi V Water II from LG offers a green energy solution

LG's Multi V Water II geothermal-ready product is an advanced VRF water cooled system specifically designed for use in high-rise buildings. It allows connection of up to 64 indoor units to provide heating and cooling – it also features an instant water heating function. The LG VRF water system is extremely flexible and can seamlessly integrate into existing building condenser water loops. It can be applied to multiple applications – geothermal, boiler/cooling tower or a hybrid of both.

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



Waterloo helps deliver 80% energy savings at Scottish retail centre

As part of a major refurbishment programme for one of Aberdeen's major shopping destinations, Waterloo Air Products has supplied a wide range of air diffusers, including customised designs for the eating areas, and helped contribute towards an overall 80% reduction in energy use. Air terminal devices have been used throughout the Bon Accord shopping centre, where there was a need to design an efficient air distribution system to help reduce emissions and carbon footprints.

● Visit www.waterloo.co.uk or call 01622 717861



MHS Boilers are a beacon of success at Staffordshire University

MHS Boilers has supplied two 905 kW ADI-NOx HT floor-standing boilers to the Beacon Building on the Stafford campus at Staffordshire University. Replacing two inefficient and ageing units, the new boilers supply heating and hot water to a variety of areas in the building, including a café, two restaurants, general teaching and lecturing rooms, offices and the student shop. The consulting engineers were Stoke-based Burgess Design Associates.

● Visit www.mhsboilers.com

HygroMatik's Low Pressure Adiabatic System pumps for increased efficiency

The Low Pressure Adiabatic System range from HygroMatik's has been extended to include different classes of humidification performances at 45, 72 and 110 l/h, thanks to performance-optimised pumps that reduce energy usage. The LPS provides low-pressure adiabatic humidification and exhaust air-cooling in air conditioning systems, using between 0.15 kW and 0.18 kW compared to the previous 0.37 kW. The electrical energy requirement is particularly low. With the HygroMatik Vortex-turbulence generating modules, the system is able to achieve optimum efficiency.



● Visit www.hygromatik.com or call 02380 443127



LG training courses 2013 dates announced

LG has announced some new dates for training courses in 2013. The courses are aimed at contractors, consultants and service engineers, offering the opportunity to develop both practical and theoretical knowledge of the company's products, including VRF and split systems at its academies. The company has invested significantly in state-of-the-art training facilities in both Slough and Dean & Wood in Leeds. The location of these centres ensures easy accessibility for customers from around the country.

● Email aircon.training@lge.com



PMI Software participates in Maintec 2013 Exhibition at NEC

PMI Software had a stand at the Maintec 2013 Exhibition at the NEC Birmingham. Maintec is the UK's leading event for companies and individuals involved in maintenance, plant and asset management. PMI displayed its full range of software solutions, including the PEMAC computerised maintenance management system, the FORMS paperless workflow tool, the CARE permit to work and contractor management solution, and the '5-WHY' root cause analysis tool.

● Visit www.pmisoftware.com, email info@pmisoftware.com or call +353 21 491 5232

Top engineering firm keeps its cool with Ambirad

For a company with a global reputation for engineering and delivering high performance technologies to a diverse range of industries, Cosworth is a world leader in its field. It turned to AmbiRad for an energy efficient and better value way of cooling internal air in its Northampton factories. The solution was found in the evaporative cooling system ColdAIR, which cools the air using a natural principle and is, on average, 75% cheaper to install than air conditioning.

● Email marketing@ambirad.co.uk or call 01384 489738



New CO₂ monitoring system from Medem

Announcing the new Medem inair – believed to be the only CO₂ monitoring system capable of displaying the minimum, maximum and average CO₂ levels in a classroom (patent applied for). The Inair can also control ventilation rates based on CO₂ levels via relay or 0-10 volt terminals, either direct or through a BMS system.

● www.medem.co.uk/inair or call 0161 233 0600



Triple P Projects displays SD range at Firex 2013

The SD range offers a solution for designers and installers of automatic fire sprinkler systems, combatting the problem of a town's low mains pressure. Avoiding the large costly water storage tanks of conventional systems, the SD

pumpset connects directly to the town's mains and has a remarkably small footprint. The range covers sprinkler categories OH3 to OH1, residential and domestic to BS9251.

● Visit www.tripleprojects.com, call 07774 935222 or email info@tripleprojects.com



Prestige Holborn project for Space Air

330 Holborn Gate is a landmark building in central London within easy reach of the West End and the City of London. The impressive nine-storey, glass-fronted office building is in a prime business location that has been associated with the legal profession since medieval times. Space Airconditioning, the Guildford-based Daikin distributor, was specified to supply what is probably the UK's largest installation of Daikin's R22 replacement VRVQ air conditioning systems as part of a recently completed major refurbishment. Space Airconditioning had supplied, and been closely involved with, the building's original R22-based Daikin VRV systems and held comprehensive data on the original installation. This information greatly assisted M&E consultants BWS of Epsom, acting on behalf of the client Land Securities, when it came to considering replacement air conditioning system designs.

● Call 01483 504 883 or visit www.spaceair.co.uk



Some products are new, some revolutionising – like the Gold version E air handling unit

The arrival of Gold air handling units from Swegon revolutionised the market 20 years ago. The integration of physical product and controls was the first step of Gold's way to fame, a tradition of innovation that has never stopped. Now it's time for Gold version E, another revolution in the way the industry looks at air handling units. Over the years, the hardware, controls and functions of the Gold have been constantly improved and the air handling unit capabilities expanded into today's powerful product.

● Visit www.swegon.co.uk or call 01992 450400

Simmtronic's lighting system delivers savings for Network Rail

Network Rail has installed an advanced SPECS3 Lighting Controls System from Simmtronic to gain the maximum energy saving and lighting management flexibility at its recently opened national centre in Milton Keynes. Known as The Quadrant: MK, the 400,000 sq ft building brings more than 3,000 people under one glazed roof, creating a new centre for Britain's railway operations. Simmtronic has helped the organisation to create one of the UK's most innovative and stimulating working environments.

● Visit www.simmtronic.com, email sales@simmtronic.com or call 01992 456126



Energy Assets augments multi-utility infrastructure offer

Energy Assets, a provider of industrial and commercial (I&C) gas metering services in the UK, has entered into a partnership with Flexenergy that strengthens its position in the multi-utility infrastructure market. Flexenergy is a leading provider of pre-insulated pipe solutions for a wide variety of energy technologies, including solar, biomass CHP, geothermal, district and community heating schemes and cooling and chilled water networks. The partnership enables Energy Assets to augment its existing GIRS-accredited siteworks gas service.

● Visit www.energyassets.co.uk, email sales@energyassets.co.uk or call 01506 405 405



Optimix from Fläkt Woods

Leading manufacturer of ventilation solutions
Fläkt Woods

has introduced Optimix – a pioneering 'active' room diffuser that improves the performance of demand controlled ventilation systems considerably, maintains excellent comfort levels for occupants and can also achieve a cooling effect greater than 100 W/m². Officially launched at Ecobuild 2013, the unit features an integral motorised regulating plate, which adjusts vertically to control the flow rate and ensure a constant air throw. This is easily set using the LCD display on the purpose-designed Fläkt Woods actuator.

● Visit www.flaktwoods.co.uk

PRODUCTS & SERVICES

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Martindale Electric launches its professional cable testing solution

Martindale Electric has announced the arrival of its new Professional CD1000 general purpose cable detector. The CD1000 is designed to quickly and accurately trace cables in walls and underground, locate fuses/breakers on live or dead circuits and locate interruptions and open circuits in cables and electrical floor heating systems. The CD1000 can also be used to trace metallic water and heating pipes. The CD1000, which includes a transmitter and a receiver, negates the need for any other electrical equipment when detecting cables.

● Email sales@martindale-electric.co.uk



New chiller unit from Fläkt Woods

Fläkt Woods has added a new chiller unit to its range of air climate solutions – Climaflakt KCCJ. Delivering a seasonal energy efficiency ratio (SEER) of up to 5.65, the new air-cooled chiller is available in 10 models with outputs from 200 kW to 650 kW, making it perfect for a range of commercial, industrial and residential applications. To meet the new EU regulations and F-Gas Directive, the Climaflakt KCCJ encompasses new features, including a multi-scroll compressor for enhanced part-load efficiencies, an increased heat exchanger surface to reduce compressor consumption and a non-ozone depleting refrigerant.

● Visit www.flaktwoods.co.uk

Indoor innovations from GE Lighting

GE Lighting has launched a new Indoor Solutions catalogue presenting the company's key LED and CMH innovations suitable for office, retail, education and healthcare environments. The wide range of luminaires and downlights has been designed to deliver a variety of aesthetic, performance and environmental advantages based on GE Lighting's expertise and understanding of the needs of different indoor applications. GE Lighting offers specifiers high-quality, multiple lighting solutions that are fit-for-purpose, versatile and effective.

● Visit www.gelighting.com/eu



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See: Taking Control - CIBSE Journal Dec 2011

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M&E Design Manager | North London
£55,000 - £60,000 Plus Package

A well-established building services contractor, with a first class reputation within the industry, are currently on the look-out for a Design Manager who will lead the successful M&E design department. You will be a technically competent engineer, being able to develop more junior engineers and act as a point of QA for design work. The role will be client facing, therefore strong commercial acumen, along with good verbal and written skills are essential. Candidates for this role will be from a Building Services Design Contractor/ Consultancy background, having worked on a range of project types.

Mechanical Design Engineers | Bath
£30,000 - £42,000 Plus Package

We are looking for a mechanical building services engineer to join a well renowned building services consultancy in Bath. The successful candidate should have a minimum of 4 years post degree experience. This position will help the team to develop their low energy building services work, and will involve designing innovative mechanical services for residential dwellings, healthcare, education and commercial buildings. This is a fantastic career opportunity, with the possibility of growing with the company and climbing the promotional ladder.

Principal Mechanical Design Engineer | Oxford
£50,000 - £55,000 Plus Package

We are currently working on behalf of a medium/large M&E consultancy, who are seeking a principal level Mechanical Engineer to form part of their expansion plans. They require a candidate who can 'hit the ground running,' and who will assist them with their increased work-load after consecutive project wins. The successful candidate will come from a building services design consultancy background, and be able to produce design specifications and have the ability to lead projects and engineers and attend site meetings. In return this consultancy will offer you the chance to develop your career within building services, whilst working with some of the most enviable international projects, with the support of the experienced team of partners. The applicant must have: Completed a degree in building services engineer or equivalent; Minimum of 10 years' experience within a UK based building services consultancy; Experience working on critical systems and data centres is essential.

Contact: george@conradconsulting.co.uk | 0203 159 5387
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For further information and to apply visit
www.jobs.salford.ac.uk/
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Lead M&E Engineers
Dubai & Doha, £8k-£10k PM tax free

All prospective candidates for these positions must be degree qualified in either Electrical/Mechanical or Building Services Engineering, have design experience and a proven track record of working on retail, commercial and mixed use development projects. These roles offer TAX FREE SALARIES + benefits packages. Please contact Michael Gonzague for information

Senior M&E
Oxford/Cambs, £30k - £45k

Design Engineers required to meet a growing workload and further strengthen my clients Oxford and Cambridge offices. A key player in the building services industry, they are looking for technically well rounded engineers, responsible for delivering designs for a range of project types and sizes.

Senior M&E Design Engineers
Contract £28-£33ph

My client is a Consultancy based in London. Due to an increase in workload, and internal transfers in the business, they are looking to appoint both Senior Mechanical/ Electrical Design Engineers to strengthen the Building Services Team. The team works on a wide range of UK based projects. For this position you will ideally have a Building Services qualification and a broad experience working on commercial related projects. 6 months, contact Stephen Tiigah for more information.

For more information or to apply please call
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Mechanical, Electrical and Environmental Water / Public Health Engineers

Foster + Partners has an integrated approach to design, in which engineers work alongside architects from the beginning of the design process. In doing so, we believe that we can learn from one another and combine our knowledge to devise fully integrated design solutions.

Our current team of around 70 engineers are engaged in designing buildings and master plans with particular emphasis on sustainability. We are involved in a range of prestigious international projects at all design stages, from concept to construction.

As a result of our increasing workload, we are expanding the team in London at a variety of levels of experience. Successful candidates will join a dynamic group, with opportunities for career progression, to work on some of the most exciting projects in the world.

The following positions are available.

Mechanical Engineers

(Ref: LME0413)

Successful candidates for the Mechanical Engineer position will be involved in all aspects of environmental design including passive and active techniques, system optimization and delivery and the use of models and full scale mock-ups to develop and prove out the engineering and integration.

Environmental Water / Public Health Engineers

(Ref: LEW/PHE0413)

Environmental Water/Public Health Engineering candidates should have a keen interest in developing their skills in sustainable water technologies both within buildings and across large sites.

Electrical Engineers

(Ref: LEE0413)

Electrical Engineering candidates should have a keen interest in developing their lighting design and vertical transportation skills as well as other electrical systems.

Candidates applying for the above positions must be progressing towards Chartership or be a recently Chartered Engineer (or equivalent).

More information about Foster + Partners and the job descriptions can be found at: www.fosterandpartners.com

To apply please send a covering letter and CV stating the reference number to: careers@fosterandpartners.com

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We are looking to reinforce our professional team for the long term future with people who are able to demonstrate sound technical ability and enthusiasm for engineering and construction excellence. Successful applicants will join our engineering team to work on an exciting and varied portfolio of work.

Senior Mechanical Design Engineer

You should be a Chartered Engineer and corporate Member of CIBSE with at least 10 years relevant post qualification building services design experience within the construction industry, ideally including strong experience in hospital and healthcare engineering, and low carbon design.

Experience and the ability to plan, organise, direct, undertake and control the technical, financial and commercial aspects of projects from beginning to end is essential. The successful applicant will be required to demonstrate the ability to carry out design, co-ordination, management and construction supervision on a number of projects running concurrently.

Candidates should be able to demonstrate project management experience, and the ability to promote good personal and team working relationships.

This is an excellent opportunity with good future career progression prospects.

Energy Assessor & Mechanical Design Engineer (Combined Role)

You are required to be degree qualified with a minimum of three years post qualification design experience in the construction industry, which ideally includes use of energy modelling software. Experience in the use of IES Virtual Environment software would be an advantage.

The successful applicant will have a balanced role split between mechanical design and energy modeling work on a variety of different projects. The energy modeling will include environmental performance analysis, Building Regulations compliance checks and generation of EPC's for commercial projects.

During the first two years of the appointment, the role will include undertaking training, study and examinations leading to qualification as a Level 5 Energy Assessor and Low Carbon Consultant. For applicants who are not yet MEng or MSc qualified, support on a suitable distance learning course may also be offered.



If you are interested in one of the above vacancies, please reply by email with a clear statement identifying which post you are applying for, and why you think you would be suited to the position. Please enclose full CV including all education, qualification and experience details.

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Johnson Controls Global WorkPlace Solutions is a leading global provider of integrated facilities and corporate real estate management. We are recruiting a Critical Services Technical Lead for one of our clients in the Technology Sector. This senior leadership position will provide overall direction and subject matter expertise for all Technical services and solutions for the customer account which covers 14 countries in the Europe, Middle East and Africa (EMEA) region. This will involve establishing and operating standardised processes and procedures for Data Centre SLA's, managing engineering teams, ensuring compliance to legislation and client relationship management.

The successful candidate will have proven leadership experience managing teams across multiple locations and have proven in depth understanding of engineering disciplines with a specific focus on data centres. A background in managing critical data centres for a large corporate organisation is preferred along with Chartered Engineer status.

If you are interested in the above vacancy please visit our website www.johnsoncontrols.co.uk/careers and apply online, or email your CV to ukcareers@jci.com quoting the vacancy reference number 096342.

8153a0413



Mech Resident Engineer | Belgium | to £310LTD + benefits | ref: 3489

An International M&E consultant requires a lead mechanical engineer to be site based on a major data centre project. Candidates will have a strong track record within the mission critical sector. Long term contract!

Mech & Elec Design Engineers | Southampton | to £45K++ | ref: 3386

An established M&E consultant is looking for degree qualified engineers with experience leading their own projects. Current schemes include residential, commercial and education.

Intermediate M&E Design Engineers | London | to £38K | ref: 3274

We are looking for client facing degree qualified engineers. Projects include commercial, overseas, education and infrastructure. Revit MEP experience beneficial, but not essential.

Senior Public Health Engineer | Kent | to £45K | ref: 3548

Ideal candidates will have above and below ground drainage experience and be client facing. Projects include high-end residential, commercial and schools.

Int & Snr Mech Design Engineers | London & Oxford | to £45K+ | ref: 3541

An award-winning M&E consultant requires degree qualified engineers with a background in data centre design. Candidates will gain invaluable site based experience and run their own projects.

Senior Electrical Design Engineer | Surrey | to £45K | ref: 3544

An established and busy M&E consultant requires a senior engineer who can undertake site surveys and is comfortable dealing with clients. Current projects include retail and commercial.

Int Mechanical Design Engineer | Bristol | to £35K | ref: 3521

A large contractor requires a mechanical engineer to work on large retail projects. Ideal candidates will be degree qualified and have 5-10 years industry experience. Consultancy background welcomed.

t: 02392 603030

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Diamond Light Source is the UK's national synchrotron science facility. Located at Harwell Science and Innovation Campus in Oxfordshire, we enable world-leading research across a wide range of scientific disciplines and industrial applications.

Construction Managers Assistant Ref: DIA0829/SB

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The position requires the candidate to assist the Beamline Installation Manager in managing the projects. The candidate shall possess building services construction and installation experience, preferably within a research type facility. Significant commercial knowledge is essential with experience in setting up/monitoring cost control spreadsheets. Knowledge of working under CDM is also essential with the candidate possessing skills to develop and enhance current working practices and procedures and in so doing reduce construction costs. Knowledge of NEC3 form of contract is highly desirable. The ability to work closely with technical and scientific staff to drive the project forward is essential. The candidate must be computer literate (Word, Excel, MS Project). Building services design experience would be an advantage as would be the use of Autocad.

Diamond is committed to equality of opportunities for all, and offer a competitive salary (dependent upon skills, qualifications and experience), comprehensive benefits, an index-linked pension scheme and flexible working hours.

For an application form and further information including work permit and visa requirements for non-EU nationals please visit our website at www.diamond.ac.uk telephone our recruitment line on 01235 778218 or write to us at the address below, quoting the appropriate reference number.

For further information about this role please visit: www.diamond.ac.uk

Closing date: 31st May 2013.



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- Project Managers
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The work will be varied depending upon the nature of the projects, however the candidates should possess a knowledge of all elements of Building Services. Key areas you will be involved in are Site Surveys, Concept Designs, Detailed Designs, Coordination of Services, Commissioning and Validation.

The successful candidates will be enthusiastic, hardworking engineers, keen to develop and advance within a dynamic and expanding company.

If you are interested in this opportunity, please forward your CV and an introductory letter to james.beasley@tslprojects.com



Torbay Development Agency is seeking a hard working and motivated Mechanical Building Services Engineer to join our Property Services Team. The key purpose of this post is to provide effective and efficient professional support; also the design, construction and maintenance of services in both private and public sectors.

Mechanical Building Services Engineer

£28,636-£30,851 per annum

To apply or to find out more please visit: www.torbaydevelopmentagency.co.uk/tda-jobvacancies or alternatively contact Nick Clemens on 01803 207377 or email nicholas.clemens@tedcltd.com Please note, CV's will not be accepted. All applications must be submitted using the official application form. Closing date: 31/05/13. Interview date: 21/06/13. Ref: TBE2019.



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The positions offer a strong path for career development and progression within the firm and will be based at our head office in Gaborone.

We are offering an initial two year contract which will be renewable by mutual consent and will include an attractive salary package, relocation costs and the benefit of low tax rates in Botswana.

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Electrical Design Engineers

Kent, Surrey & Sussex | £40/50k + Benefits | Refs: 12327/309/397

Various Building Services Consultants based outside of London are seeking to recruit Electrical Design Engineers to work typically on Residential, Commercial and Healthcare Projects. Working closely with Associates/Directors you will be able to work unaided and offer support to Junior members of the Design teams. Contact paul.bartlett@bsvrecruitment.co.uk

HVAC Design Engineers

Surrey & Sussex | £ 38/48k + Excellent Package | Refs: 13393/94

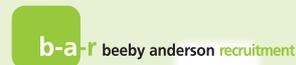
Established multi-disciplined Consultant seeking HVAC Design Engineers to work on traditional Design Projects for their West Sussex office. Also an Engineer to work on small works projects including Chiller/Boiler/Plant Replacements in Surrey. Both positions offer great opportunities for career progression. Contact: paul.bartlett@bsvrecruitment.co.uk

Mechanical Design Engineer

Southampton | £40k - £45k | Ref: 13396

An established consultancy requires a Mechanical engineer to provide full design services including feasibility, design, management and handover. An engineer who can cover tasks from Hevacomp design, co-ordinated design through to monitoring of works, witness of commissioning and snagging of completed works. Contact: darren.warmington@bsvrecruitment.co.uk For more vacancies please visit www.bsvrecruitment.co.uk or call today.

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Senior Public Health Engineer Dubai, UAE, 30,000-35,000 AED PCM

We have a fantastic opportunity for a Senior Public Health Engineer to join a leading international multi-disciplinary consultancy in Dubai. Our client has a solid reputation and is well established in the region. Additional resources are required within the team as this company continues to secure landmark developments across a range of sectors. BAR1015/PA

Mechanical Building Services Design Engineer

North London, £32k - £36k + benefits

This is a career changing opportunity to join a medium sized building services practice that operate within the residential, mixed-use, and estate regeneration sectors. The organisation strongly supports training and professional development and will provide successful candidates with the opportunity to lead projects and gain greater exposure to clients. BAR1031/JA

Principal Mechanical Engineer Oxfordshire, Circa £55k + benefits

As a result of increasing workload, our client, an award winning Building Services consultancy seeks a Principal Mechanical Engineer to work in their data centre division. This group have arguably designed the most energy efficient data centre in the world and require an engineer with 4-5 years' experience in data centres or critical systems design to take a lead role on projects and manage a small team. BAR886/TA

For further information and to apply, please call us on +44 (0)203 176 2666 or email cv@b-a-r.com

Thinking of your future

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Events & training

NATIONAL EVENTS AND CONFERENCES

Greenbuild Expo
8-9 May, Manchester

A free exhibition with a programme of seminars, including speakers from the UK Green Building Council, and DECC.
www.greenbuildexpo.co.uk

CIBSE AGM
9 May, London

CIBSE annual general meeting, with inauguration of new CIBSE president George Adams and his presidential address.
www.cibse.org

ACE Annual Conference 2013: Building for the UK's future

22 May, London
Exploring the key challenges and opportunities for infrastructure development and delivery. CIBSE members are entitled to a 50% discount on the delegate rate.
www.cibse.org/events
www.acenet.co.uk

Society of Light and Lighting Masterclass

23 May, Dublin
The Lighting Masterclass continues its tour – this time at the Guinness Storehouse, Dublin.
www.sll.org.uk

Society of Light and Lighting AGM and president's address
28 May, London

Incoming president Kevin Kelly will deliver his presidential address.
www.sll.org.uk

IDHEE annual conference and exhibition
29 May, Loughborough

Focusing on the rapidly changing systems, technologies and regulations that the industry has to understand to succeed.
www.idhee.org.uk

ThinkFM 2013
10 June, London

Facilities management event. This year's focus is 'the leadership challenge'.
www.thinkfm.com

CIBSE GROUPS AND SOCIETIES

For more information visit www.cibse.org/events

Daylight Group AGM and technical meeting: Rights to light

8 May, London
A joint meeting with the SLL, RIBA and The Law Commission.
graham.phillips220@nitworld.com

Maintaining our competitiveness/creativity edge

9 May, London
A Home Counties North West region half-day conference, with

presentations from Andy Ford, CIBSE immediate past president and technical director from Mott MacDonald Fulcrum.
millham.orchard@tiscali.co.uk

Data centre cooling/Part L update

13 May, Coryton
A South Wales regional event.
www.cibse.org/events

Sprinkler installation guidance

14 May, London
With a presentation from Grundfos.
steve.vaughan@aecom.com

Specifying thermostatic water controls

15 May, Manchester
With speakers Graeme Matier and Richard Braid from Bristan-Gummers Showers.
m.atherton@dssr.co.uk

CIBSE West Midlands May Ball

17 May, Birmingham
Three-course meal with live band and dancing.
www.cibse.org/events

ILEVE AGM

21 May, Overton
AGM held at National Coal Mining Museum for England – with tour of underground in the afternoon.
www.cibse.org/events

Site visit to the BBC studios at Roath Dock

3 June, Cardiff
A South Wales region event.
www.cibse.org/events

CPD TRAINING

For more information, visit www.cibsetraining.co.uk or call the events team on 020 8772 3660

Electrical services explained

4-6 June, Birmingham

Fans for a greener future – the obligations of specifiers, manufacturers and users

5 June, London

Introduction to biomass heating systems

5 June, London

Biomass heating systems operation and maintenance

6 June, London

EPC conventions

7 May, Birmingham

Cooling and refrigeration

8 May, London

Unvented and other types of efficient hot water system

9 May, London

Part L Building Regulations

9 May, London

Building Electrics 3: physical distribution within buildings

10 May, London

Air conditioning inspection for buildings

13 May, London

Air Con 2: the air conditioning process
14 May, London

Energy surveys
15 May, London

Rainwater harvesting and greywater recycling in the sustainable environment
15 May, London

Design of heating and chilled water pipe systems
16 May, London

EPC training – two days
20-21 May, Leeds

Sanitary and rainwater design using BS EN12056:2000
21 May, London

Effective maintenance management
21 May, London

Energy efficient heating – upgrading and operating heating systems in buildings
22 May, London

Power system harmonics
23 May, London

Fire safety engineering design: module 2 (two days) compartmentation and structural fire behaviour
28 May, London

Gas Safety regulations
28 May, London

Mechanical services explained (three days)
28 May, Manchester

Introduction to building services
29 May, London



Panelists discuss the issues at last year's conference

ACE Annual Conference 2013
22 May, London

Infrastructure is not just critical to the UK's economy today, it is the bedrock for our future prosperity. That's why the theme for the ACE 2013 Annual Conference this year is 'Building for the UK's future'.

The conference explores the key challenges and opportunities for infrastructure development and delivery. Top topics for discussion include the National Infrastructure Plan, how to reinvigorate house-building and prospects for sustainable investment. There will also be a *Dragon's Den*-style discussion looking at the key issues in procurement and commissioning.

Keynote speakers include: chief secretary

to the treasury, Rt Hon Danny Alexander MP; Darryl Murphy, partner corporate finance, KPMG; and Ian Nolan, chief investment officer, UK Green Investment Bank. CIBSE is one of the event's official partners and is offering its members 50% discount on the delegate rate.

The conference is being staged at Grange St Paul's Hotel, London, on 22 May. To find out more about the conference and to book your place, visit www.cibse.org/events or www.acenet.co.uk

ACE represents the business interests of its members and the consultancy and engineering industry in the UK. To find out more, visit www.acenet.co.uk

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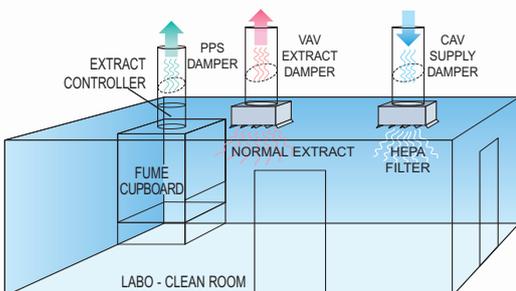


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