

CIBSE

JOURNAL



The official magazine of the Chartered Institution of Building Services Engineers

September 2013

Safe

HARBOUR

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TM54 launch and overheating seminar

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Lighting the way

The performance gap may not be quite the chasm that inflated energy bills led us to believe. New CIBSE guidance has revealed that the large discrepancy between the energy use predicted at the design stage and that recorded in the operation of the building is, in part, due to interpretation of calculation methods.

TM54 *Evaluating operational energy performance of buildings at the design stage* offers guidance on providing accurate predictions of energy use at the design stage. It accounts for variables such as small power usage and occupancy hours, and uses dynamic simulation modelling to give more accurate estimates. TM54 also provides a range of values that acknowledge the uncertainty around predicting energy use – which will help eradicate nasty surprises for those responsible for paying bills.

TM54 co-author David Cheshire says part of the issue behind the performance gap is that energy models – based on the National Calculation Methodology used in Part L – are being used as an estimate of energy use, rather than as a way of demonstrating compliance with Building Regulations (which they are perfectly suited to). Part L doesn't take account of small power usage and occupancy hours.

The guidance, will allow designers to focus on the remaining performance shortfall. According to CIBSE's technical director, Hywel Davies, it will help designers focus their attention on where 'energy is really being used and wasted'.

TM54 says that for more accurate forecasts, designers must sit down with occupants, and building operators to discuss operating hours and maintenance regimes. This chimes with the call by CIBSE Facilities Management Group chairman, Geoff Prudence, to involve FMs at an early design stage (page 20).

TM54 may enable better, energy use predictions, but we must not be complacent. There are clearly issues with the way buildings are built and operated, and the growing complexity of today's technical solutions means engineers will continue to be pushed to their limits.

A report by research body Calebre has revealed how important air tightness is to the successful retrofit of MVHR in housing (page 50). The monitoring of new technology is essential to give designers certainty, and it's good to see an impartial report on the effectiveness of heat pumps by the Energy Saving Trust – and even more gratifying to see that lessons have been learnt in getting the best out of the technology.

Alex Smith, Editor

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All the latest news from around the building industry



LIVING WALL BREATHES LIFE INTO VICTORIA

A six-storey living wall has been retrofitted onto a hotel in London's Victoria. The 350 m² vertical garden, featuring buttercups, strawberries and crocuses, has been installed on the end wall of the Rubens at The Palace Hotel by urban greening specialist, Treebox.

The company says the 10,000 plants will improve air quality by

absorbing microscopic pollutants known as particulate matter (PM10s).

The wall features irrigation tanks to store rainwater. It will be programmed to respond to heavy rain by slowly distributing water across the wall, increasing storage capacity in the tanks, taking the pressure off drains and helping to reduce the risk of surface water flooding.

Part L changes show lack of ambition, say experts

After a long delay, the government has finally released details for Part L of the Building Regulations 2013, which will be implemented next April.

The building services sector has been left generally underwhelmed, with many condemning the watered down revisions as the minimum the government could have delivered. In general, carbon reduction targets have been increased by 6% for new residential buildings and 9% for commercial.

There is a greater focus on improving building fabric standards, which were welcomed as a step towards greater use of passive design solutions and reducing reliance on renewables.

However, the relatively low level of improvements have left many doubtful about the likelihood of new builds achieving zero carbon targets by 2016 for residential, and 2019 for commercial, which has long been the government's stated aim.

A number of consulting practices said they would be urging clients to aim higher than Part L's new basic standards, to improve building performance and reduce running costs.

Hilson Moran's director of sustainability, Chris Birch, said the targets were a step forward, but left the industry with 'a very steep learning curve'.

'We are disappointed with the lack of ambition in the new regulations, particularly in relation to the lack of new standards for refurbishments and existing homes, which

represent the majority of UK emissions,' he said.

He added that the government was gaining a reputation for 'setting headline-grabbing green targets, then watering down definitions when actions are needed'.

The revisions – which were the subject of heated arguments and even legal action over the decision to remove consequential improvements – were condemned as a 'missed opportunity' by Hoare Lea's Ashley Bateson. Speaking on behalf of the CIBSE Homes for the Future Group, he said the step changes in carbon reduction were much less than expected.

'The proposed implementation of the fabric efficiency standard for new homes is probably the most important change, as it will drive fabric specifications towards a more passive approach,' he said. 'But we still need to know more about how new homes will actually become zero carbon in practice.'

He welcomed the new consultation on 'allowable solutions', which will allow industry to 'review and influence how carbon off-set measures might be implemented.'

The Heat Pump Association said it was 'puzzled' by a set of revisions that seem to contradict the government's stated objectives of lowering running costs for new homes.

'The government is gaining a reputation for setting headline-grabbing green targets, then watering down definitions'

Miliband backs women apprentices

A group of female building services engineers have been selected to spearhead a campaign to attract more women into the industry. The Apprentice Ambassador Initiative was launched by training charity, JTL, and has received backing from a number of MPs, including Labour leader Ed Miliband.

The ambassadors will act as 'real-life role models', going into schools and speaking at local events to inspire another generation of young female engineers.

The 10 inaugural apprentice ambassadors were chosen from across England and Wales and are all current and former JTL apprentices, selected because of their personal success and passion for apprenticeships. They will also act as mentors to any young woman who signs up for a JTL apprenticeship.

'We have helped more than 40,000 apprentices train over the last 24 years, but only a small percentage have been female,' said JTL chairman Dr Ian Livesey.

According to statistics from the department of Business, Innovation & Skills, women make up just 2% of apprentices in the construction sector.

Balfour Beatty sells FM business

Balfour Beatty has sold its facilities management arm to GDF Suez Energy Services for £190m. The business recorded a profit of £21m last year on turnover of £482m – it currently employs more than 9,000 people.

Balfour Beatty earlier sold off its share of four private finance initiative (PFI) schools projects and a 50% interest in Tameside Hospital PFI. It has also divested itself of a 50% stake in Salford Hospital PFI for £22m, and of its stake in Exeter Airport, following a £50m profit warning in April.

A company statement said that the proceeds of the FM sale would be used to reduce borrowings 'and over time to fund investments consistent with Balfour Beatty's strategy'.

Balfour Beatty chief executive Andrew McNaughton said: 'The sale of the UK FM business represents an important step in our evolution as we intensify our focus on infrastructure.'

Savings in Eden

The Eden Project in Cornwall has significantly reduced its carbon footprint and achieved cost savings of £457,000 in three years, following a change to its controls strategy.

The site, which was previously managed by 49 separate systems, upgraded to an intelligent BMS supplied by Priva, which was used to integrate all aspects of the horticultural and building control systems. This cut gas and electricity consumption and saved 781.4 tonnes of CO₂, the Eden Project reported.

Late payments: Fallon under fire for 'vague' response

Campaigning MP Debbie Abrahams, whose All Party Parliamentary Group recently produced a report condemning the construction industry's late payment habits, has reportedly received a 'non-committal and vague' response from the Minister for Business and Enterprise, Michael Fallon.

She is calling for 'more effective public sector procurement – including ensuring fair payment terms for supply chains' – and made her concerns public on Radio 4's *Today* programme, where she condemned the government's lack of urgency on the issue.

It has become common for tier two and three contractors to have to wait beyond 120 days for payment



Michael Fallon

and this has pushed many to the brink of insolvency. Abrahams fears this could have a serious impact on the speed of economic recovery across the UK.

The Specialist Engineering Contractors' (SEC) Group said Abrahams' *All Party Report on*

Payment Malpractices should be regarded as 'a catalyst for action'. Chief executive Rudi Klein claimed that 'payment abuse kills growth'.

Klein added: 'The backbone of the UK economy comprises small businesses where potential for growth is destroyed by a combination of lengthy payment periods and late payment'

He insisted that suppliers should not be eligible for public sector contracts unless they committed to pay their supply chain within 30 days of the due payment dates. The use of project bank accounts, which ensure payments are made directly to the supply chain, should also be made mandatory on all public sector construction.

BISCOM/UK

Contractors and clients are not ready for BIM, says NFB survey

A lack of understanding about building information modelling (BIM) is holding back development, according to a survey of clients undertaken by the National Federation of Builders (NFB). It found that 'neither contractors nor clients are prepared or ready enough for the advent of BIM'.

There is high awareness of the potential benefits of BIM, but very slow take up.

The *NFB Client Survey*, which was launched at the beginning of 2013, concluded that progress towards a BIM-ready industry was slow, but 'the challenges and therefore opportunities for construction clients and the supply chain are vast'.

Researchers believed there was not much difference between the contracting sector and the client sector in terms of readiness or current use of BIM, but over half of

clients reported that they expected potential businesses they worked with to have BIM as a core competency.

'The overwhelming majority of clients responding to the survey said that they had not yet asked about BIM experience when procuring suppliers,' said the NFB. 'When asked when they planned to adopt BIM processes on their projects, 30% were looking at the next three months; 40% within six months; and almost 50% in the coming year.'

Overall, the majority – 62% – said they would be adopting BIM within two years, according to the survey.

The NFB said its *Client Survey* was still open and a final report will be published in the autumn. Clients who wish to take part are asked to contact the training team on 0845 057 0041. The full interim report is available at www.nfbtraining.co.uk

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Consultation seeks end to housing 'mishmash'

● Number of local standards to be slashed

A review of housebuilding standards plans to cut the number of separate locally enforced measures from more than 100 to just 10. It also aims to slash guidance from more than 1,500 pages to 80.

Launching a public consultation about the plans, Communities Minister Don Foster said local councils had created a 'patchwork' of different standards that hindered quality construction and added unnecessary cost. He promised to take off the 'bureaucratic handbrake'.

'I'm proposing to cut needless red tape to let housebuilders get on with the real job of building the high-quality new homes that people need.' However, he said there would be no changes to planning rules.

The consultation, which ends on October 22, follows a comprehensive review of housebuilding standards that looked into the rules applied to: accessibility; space; security; water efficiency; energy; indoor environmental standards; materials; process and compliance.

It particularly wants to remove anomalies like requirements for rainwater harvesting in places that



CORBON BALL LIPS / SHUTTERSTOCK

don't suffer from water shortages; demands for solar and wind energy sources that can't physically fit onto the roofs of apartment buildings; and requirements to build accessible flats on floors that can't be reached by disabled people.

'The current mishmash of housing standards means that from Allerdale in Cumbria to Zoar in Cornwall no same set of rules always applies – it's confusing, bureaucratic and cannot be allowed to continue,' added Foster.

No changes are being made to Building Regulations, although the consultation will consider if some standards should eventually go into the regulations.

Government Code for Sustainable Homes could be scrapped

One consequence of the Government's review of housebuilding standards could be the scrapping of the Code for Sustainable Homes.

Communities Minister Don Foster said it was essential the number of measures that confront housebuilders was reduced from more than 100 to just 10 to speed up construction and reduce cost.

One potential victim of this 'bonfire of the standards' is the code, which has been used to drive changes to the Building Regulations and move the industry towards zero carbon standards for new homes by 2016.

The housing standards review

consultation, which was launched in August and concludes on October 22, includes the statement: 'The government proposes to wind down the role of the Code. We will put in place transitional arrangements to ensure that contractual commitments under the code can be properly covered.'

However Paul King, chief executive of UK Green Building Council, said scrapping the code risked losing the 'momentum that has transformed the way homes have been built over the last seven years'.

Homeowners, on the other hand, may struggle to see the value of the code, according to David

Frise, head of sustainability at the Building & Engineering Services Association (B&ES). He said the code, in its current format, was so flawed it would not be missed.

'From a customer's perspective, it is worthless. I apparently live in a code level 3 building, but have been told by DCLG and BRE that I am not entitled to see evidence of how that level was achieved. Only the developer has access to the information, as he paid for the accreditation, and he is not prepared to release it to me.'

'You have to make these mechanisms useful and transparent if you want people to support them.'

ASHRAE funds occupant behaviour probe

How much energy occupants use in offices and how that influences their personal comfort is to be the subject of a research programme backed by ASHRAE.

The programme hopes to develop better design tools for quantifying the links between comfort and behaviour of building occupants. It will be developed by Jared Langevin from Drexel University, through his project: 'Human Behaviour and Low Energy Architecture: Linking Environmental Adaptation, Personal Comfort and Energy Use in the Built Environment'.

Langevin is one of 21 students who will receive a grant through the ASHRAE Graduate Student Grant-In-Aid Award programme, which is designed to encourage students to continue their education in fields related to building services engineering. The grants, totalling US\$210,000, are awarded to full-time graduate students.

'It has been suggested that discrepancies between actual and expected energy use in office buildings can be attributed to a single source of uncertainty – the building occupant, said Langevin. 'While traditional design-stage engineering calculations for office buildings have assumed occupants contribute no more than an added heat gain, in practice real office employees interact with and adapt to their surrounding environments in much more deliberate and meaningful ways.'

He added that there are currently no comprehensive tools that architects and engineers can use early in the design process to weigh various scenarios of occupant behaviour against key aspects of office building design and expected comfort, productivity and energy use.

'As a result, building designers are typically left in the dark about how real people might use and perceive their spaces, so they must achieve energy efficient strategies in spite of the uncertainties surrounding occupant behaviour,' said Langevin.

In brief

GREEN LEASE TOOLKIT UPDATED

The Better Building Partnership (BBP) has updated its guidance on the use of green leases for commercial property.

BBP is a collaboration between 17 of the UK's leading commercial property owners. It sees green leases as a powerful mechanism to improve the environmental performance of commercial property, drive CO₂ savings and foster greater collaboration between landlords and tenants'.

Their importance is likely to grow as a result of an increasing amount of environmental legislation aimed at encouraging everyone involved with property to reduce the environmental impacts of their operations, a statement said.

The first toolkit was produced in 2009 but changes in the marketplace and more practical experiences of BBP members, industry feedback and advice from legal advisers, has prompted the production of an update.

'Green leases do not automatically result in more environmentally efficient or sustainable buildings if filed away with the deeds to the property, never to be seen again,' said Keith Bugden, BBP executive programme director. The new toolkit is free to download from www.betterbuildingspartnership.co.uk

TEAMBUILD TAKES ON EDINBURGH SITE

Teams are now being invited to enter the Teambuild 2013 competition.

Held in November, the event brings together young professionals, including architects, engineers and surveyors, and challenges them to improve communications and working relationships. Participants learn from each other while tackling a number of design, procurement and construction tasks.

This year, Teambuild will be working with Balfour Beatty and the University of Edinburgh on the Holyrood Student Accommodation project. To enter go to www.teambuilduk.com

Heat pumps get field study boost

● Performance has improved since 2010 review

A second round of field trials carried out by the Energy Saving Trust (EST) has concluded that heat pump performance is improving.

Researchers returning to a number of installations that were at the heart of a damning trial in 2010 discovered that many of the problems were being addressed and that installers and users were getting to grips with the technology.

It concluded that homes best suited for heat pump installations 'could expect to earn savings and income of around £1,350 a year on air source heat pumps and around £3,000 a year on ground source heat pumps'.

Eighty per cent of participants in the trial said they were satisfied with their pump's performance, while 77% said they would recommend one to a friend.

The EST said the new trial had built upon the first study, which 'identified recommendations for the industry and end-users to achieve better performance from the technology'.

In the 2010 study, just 13% of installations met performance targets. In the second round, 32 of those were revisited and 20 of



CALEX / SHUTTERSTOCK

those 'achieved improvements in performance, with the remainder achieving similar or slightly lower performance'. Forty-four installations were studied overall.

Jaryn Bradford, the EST's senior technical manager, said: 'Based on the results of the study, we are convinced that heat pumps can play a significant role in providing an effective heating solution for homes and reducing carbon emissions.'

'From the study, it is clear that heat pumps are sensitive to design, commissioning and how the householder uses the system. However, the

performance monitoring trials have provided early indications that the introduction of improved installation standards, among other things, will lead to improved performance.'

The EST added that the interventions carried out during the study were an early indication of the successes that 'robust standards' could achieve.

'If heat pumps were installed today under the current installer guidelines, alongside further customer guidance on operating the system, they would achieve even better performances than indicated in the study.'

Report reveals chilled beams potential

The Chilled Beam and Ceiling Association (CBCA) has commissioned an independent study that shows a major energy benefit for chilled beam technology over fan coil systems.

The study, carried out by consultant Environmental Design Solutions (EDSL) using its government-approved Thermal Analysis Software (Tas), revealed the potential for energy savings of 17-22% with chilled beam technology against VAV fan coil systems.

The study simulated the dynamic thermal performance of four differently-sized office buildings, and compared the energy consumption, CO₂ emissions and the running costs for three different HVAC systems: VAV fan coil with EC motors; passive chilled beams and active chilled beams.

Results showed that for both the passive (17%) and active (22%) beams, energy consumption was



lower than that of the VAV fan coil system.

CBCA chairman Andrew Jackson said: 'As an industry it's important we share knowledge to help get buildings to perform more efficiently, and chilled beam technology offers a solution for offices and other property.'

Following publication of the report, HEVAC's Fan Coil Group has announced that it is to issue its own paper defining the advantages that it believes a fan coil system can offer.

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

Mixed signals as market picks up

● Private housebuilding up during second quarter

The most recent Construction Trade Survey shows that market conditions during the second quarter of the year improved across all construction sectors, thanks partly to a leap in private house building. Small and medium-sized businesses reported their first rise in activity since 2007.

Seventy-two percent of contractors reported a rise in workload following a severely depressed first quarter. Forty-two per cent of contractors working on private housing developments, and 40% of those engaged on public housing projects, reported rises in output year-on-year.

However, tender prices fell during the quarter, according to 26% of specialist contractors; and 31% of companies said their profit margins also declined due to rising costs, compared with the first three months of the year.

Job prospects for the sector are also improving, according to the Reed Job Index, which covers 150,000 employment vacancies across the UK.

Opportunities in the construction and property sector were up by 92% on the same period last year, hugely outperforming the rest of the job market, which has grown by 17% since July 2012.

'The jobs market is one of the first indicators of the health of the economy and it has shown continued growth during 2013. We

are now seeing wider signs that the UK is on the road to recovery and these numbers underline that,' said James Reed, chairman of reed.co.uk.

However, he said it was a serious concern that growth had not yet translated into salary increases.

'Salaries have continued to decline – year on year they are down 1.5% – so household spending will be impacted. Once workers are more generally experiencing improvements in their standard of living, it will be a recovery worth celebrating,' added Reed.



ANT CLAUSEN / SHUTTERSTOCK

US engineers get top pay

Salaries paid to graduate engineers in the US are rising steadily. Seven of the top 10 highest-paid college degrees are in engineering, according to a National Association of Colleges and Employers report.

Topping the list is petroleum engineering, with an average starting salary of US\$93,500. Other top degrees include computer, chemical and aerospace engineering, which offer starting salaries ranging from US\$64,400 to US\$71,700.

Engineers are rewarded with high salaries because of the great demand for qualified, skilled professionals in these fields, the report says.

Engineering jobs, as a whole, are expected to climb by 11% up to 2018, according to the US Department of Labor.

'We're seeing the largest, most diverse demand for engineers,' said Vita Como, senior director of professional development at the University of Houston's Cullen College of Engineering Career Center.



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New training programme announced

Mid Career College has announced a new programme of training for the autumn and through to July 2014, with a number of new courses added, including Construction Project Management for building services professionals. You can find details of the programme in the handy brochure enclosed in this edition of the *CIBSE Journal*. You can also view the courses at www.cibsetraining.co.uk

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Summer programme attracts hundreds of young engineers



Rokia Roslan



Greig Paterson

Pictures: Holly Wright

● Big names speak at Young Energy Performance Group series at UCL

Hundreds of young engineers attended a series of lectures on energy performance at UCL last month.

The six presentations in the *Rethinking Energy Performance* series featured leading experts from academia and industry, including Bill Bordass of the Usable Building Trust, Debbie Hobbs, sustainability manager at Legal and General Property, and Rokia Raslan, lecturer in environmental design and engineering at UCL.

The talks, organised by the CIBSE Young Energy Performance Group (YEPG), tackled subjects such as the performance gap, retrofits and FM.

Zack Gill, organiser and committee member of YEPG, said: 'The aim of the series is to spread information on topics that people may not know too

much about, and open people's eyes to new areas.

'We were a bit nervous about the lectures, but we were pleasantly surprised. They worked really well. There were a good range of speakers and good debates that stimulated ideas for further debate.'

The simulation lecture asked whether engineers were using software to tick boxes, rather than optimising building design. Raslan and Roger Smith, senior engineer at Parsons Brinckerhoff, flagged up current issues with simulation tools such as the proliferation of software, the importance of intelligent application and the moral obligation on engineers to design low-energy buildings.

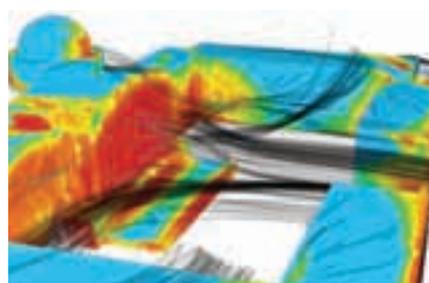
Greig Paterson, doctoral candidate at Bartlett UCL/Aedas, discussed his app, which offers a 'sanity check' for architects by showing energy performance of designs according to different parameters.

For more information, and presentations visit www.cibse-epg.org/yepg

Abstracts invited for BSO14 simulation conference

The second IBPSA-England national conference, organised in association with CIBSE, has been announced and will be hosted by University College London (UCL) next June.

BSO14 will provide a forum for the exchange of knowledge on the development and application of building performance simulation to the optimum design and operation of buildings. The conference will have four broad themes: new performance models and



simulation methods; procedures for optimising design and operation; real-world case studies; and, visualisation in the built environment.

The organisers are inviting submissions of new and original research abstracts that tackle one of the key themes of the conference. Successful authors will be asked to submit a full paper, which will be published at the conference. The deadline for submission is 20 September 2013. For more information, visit www.bso14.org

Peter Madden to deliver CIBSE Annual Lecture

● **New CEO of Future Cities Catapult to speak on climate change**

CIBSE has announced the speaker and programme for the hotly anticipated 2013 Annual Lecture and half-day legislative update seminar.

This year's event will take place 31 October at The Royal Academy of Engineering's Prince Philip House.

Buildings and those who design, manage and operate them continue to produce about 50% of human carbon emissions.

With this in mind, CIBSE President George Adams has invited Peter Madden, the newly appointed chief executive of Future Cities Catapult, to speak on the subject of cities and the impact of climate change. The lecture promises to deliver an informative evening and lively debate and flows on from last year's topic of Britain's energy mix.



Ahead of the event, CIBSE is also running a half-day seminar delivering a legislative technical update to members and others involved in the building services industry. The event will cover European directives and domestic legislation changes. The afternoon will also include case studies highlighting best practice and

innovation in building performance, and will conclude with a presentation by Mark Bew, who leads the Government BIM Task Group, on the latest progress with the Government BIM agenda.

These events continue to develop CIBSE's thought leadership in low-

carbon strategies and building services innovation and knowledge. They have proven to be an unmissable for Building Services Engineers in the built environment.

For more information, visit www.cibse.org/lecture2013

YEN plans new committees

The Young Engineers Network (YEN) is looking to set up new regional committees in a number of areas in the UK and Ireland and would like to hear from members who would like to get involved.

The YEN wants to hear from those who live and work in the following areas and CIBSE regions – London and the Home Counties, Southern, South Wales, Northern Ireland and Ireland. Additional committee members are also needed in the East Midlands, West Midlands and Home Counties South West.

If you would like to get involved in the YEN committees, or find out more about YEN activities, email YEN@cibse.org or visit www.cibse.org/yen

Further dates for RHI training

CIBSE's popular RHI training returns in the autumn with two events running in Manchester in October. The first course will look at the incentive as a whole and is a great introduction for those who are not familiar with the scheme. The second course focuses on metering and will help those involved in installation or providing metering reports. For more information visit

www.cibsetraining.co.uk/rhi

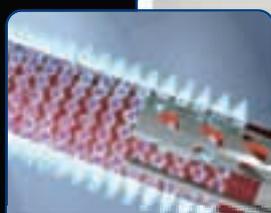
Fancy a polar exploration?



CIBSE is adding two more publications to the *Building in Extreme Environments* series: *Tropical* and *Polar*.

Each is authored by a steering committee, and CIBSE wants members who have expertise and experience of working in

polar building environments, to consider joining the Polar team. You will play an integral role in writing the publications and ensuring information and technical guidance is as accurate and useful as possible. Email sagha@cibse.org with Polar in the subject heading if interested.

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Tech Symposium abstracts deadline



You have until the 12 September 2013 to submit abstracts for the next CIBSE ASHRAE Technical Symposium.

The 2014 event takes place on 3-4 April and is heading to the Dublin Institute of Technology in the heart of the city.

Building on the success of the Liverpool symposium (page 14, *CIBSE Journal*, May 2013), the event will bring together leading academics and industry professionals.

Recognising that system and plant performance is a global issue, the symposium will give a platform to the latest practice and research from around the world in both active and passive building systems, that will shape an effective future for the built environment with minimum resource impact.

Researchers and practitioners are invited to share experiences and submit abstracts. These will be peer reviewed and successful

papers will be posted at the event and published electronically through CIBSE. Selected papers may be developed for publication in BSERT.

For the first time this year, there will be opportunities for the presentation of relevant case studies supported by keynotes as opposed to a formal paper.

The deadline for submission of abstracts is fast approaching; further information is available at www.cibse.org/symposium2014



New members, fellows and associates

FELLOWS

- Claydon, Shaun David**
Sutton, UK
- Hawker, Mark Christopher**
Coventry, UK
- Jayasuriya, Sunimal Fabian**
Dubai, United Arab Emirates
- Laidlaw, Stuart McDonald**
Loughton, UK
- Lum, Tai Sing**
Western District Hong Kong
- Mills, David James**
Westerham, UK
- Mwalimo, Gilbert Mwakazi**
Killimani, Kenya
- Peters, Richard David**
High Wycombe, UK
- Stych, Michael James**
London, UK
- Woods, Paul Stephen**
St. Albans, UK
- MEMBER**
- Arasappan, Vekneswaran**
Kuala Lumpur, Malaysia

- Beattie, Richard Kenneth**
Armagh, UK
- Chan, Kai Lok**
Tsuen Wan, Hong Kong
- Chan, Yu Sum Felix**
Shatin, Hong Kong
- Chan, Chi Nam**
Shatin, Hong Kong
- Cheung, Chi Keung**
Tai Wai, Shatin, New Territories, Hong Kong
- Cheung, Ying Hung Rosemary**
Homantin, Hong Kong
- Chong, Chun Hung**
North Point, Hong Kong
- Chung, Yat Sang**
Shau Kei Wan, Hong Kong
- Fullbrook, David**
Auckland, New Zealand
- Ge, Yunting**
Uxbridge, UK
- Gould, Nathan**
London, UK
- Hung, Tak Wai**
Kowloon, Hong Kong

- Lam, Pik Shan**
Kowloon, Hong Kong
- Lam, Chun Bun**
Shatin, Hong Kong
- Lee, Tommy Shung Chi**
Auckland, New Zealand
- Leung, Hei Yin Tony**
Wan Chai, Hong Kong
- Leung, Kwok Ming**
Tuen Mun, Hong Kong
- Lui, Kwan Ping**
New Territories, Hong Kong
- Mo, Yuen Yee Joey**
Kowloon, Hong Kong
- Munnangi, Srinivas Reddy**
Dubai, United Arab Emirates
- Ng, Ka Lok**
Tsuen Mun, Hong Kong
- Poon, Chou Meng, Mark**
Tai Po, Hong Kong
- So, Yu On**
Fanling, Hong Kong
- Tang, Tak Chi**
Tuen Mun, Hong Kong

- Tate, Aislinn**
Dublin, Republic of Ireland
- Tse, Kam Kwong**
Tsing Yi, Hong Kong
- Yu, Wai Ling**
Kowloon Bay, Hong Kong
- Yung, Kwan Yik**
Kowloon Bay, Hong Kong
- LICENTIATE**
- Boutle, Andrew Simon**
Colchester, UK

- Flaherty, Adrian**
Spalding, UK
- Martin, Nigel**
Lisburn, UK
- Pullen, Tony**
London, UK
- Stacey, Michael Barry**
Dubai, United Arab Emirates
- Williams, Paul Steven**
Weston-Super-Mare, UK
- Wu, Joseph**
London, UK

FELLOWS

Stuart Laidlaw



Stuart Laidlaw joined the industry in 1979 as a mechanical apprentice with the Ministry of Defence. He has 34 years' experience in building services engineering with the last 15 at Capital & Regional as national technical manager. Laidlaw specialises in energy and carbon management, property technical due diligence and building operation. He is a member of the British Council of Shopping Centres Low Carbon Working Group.

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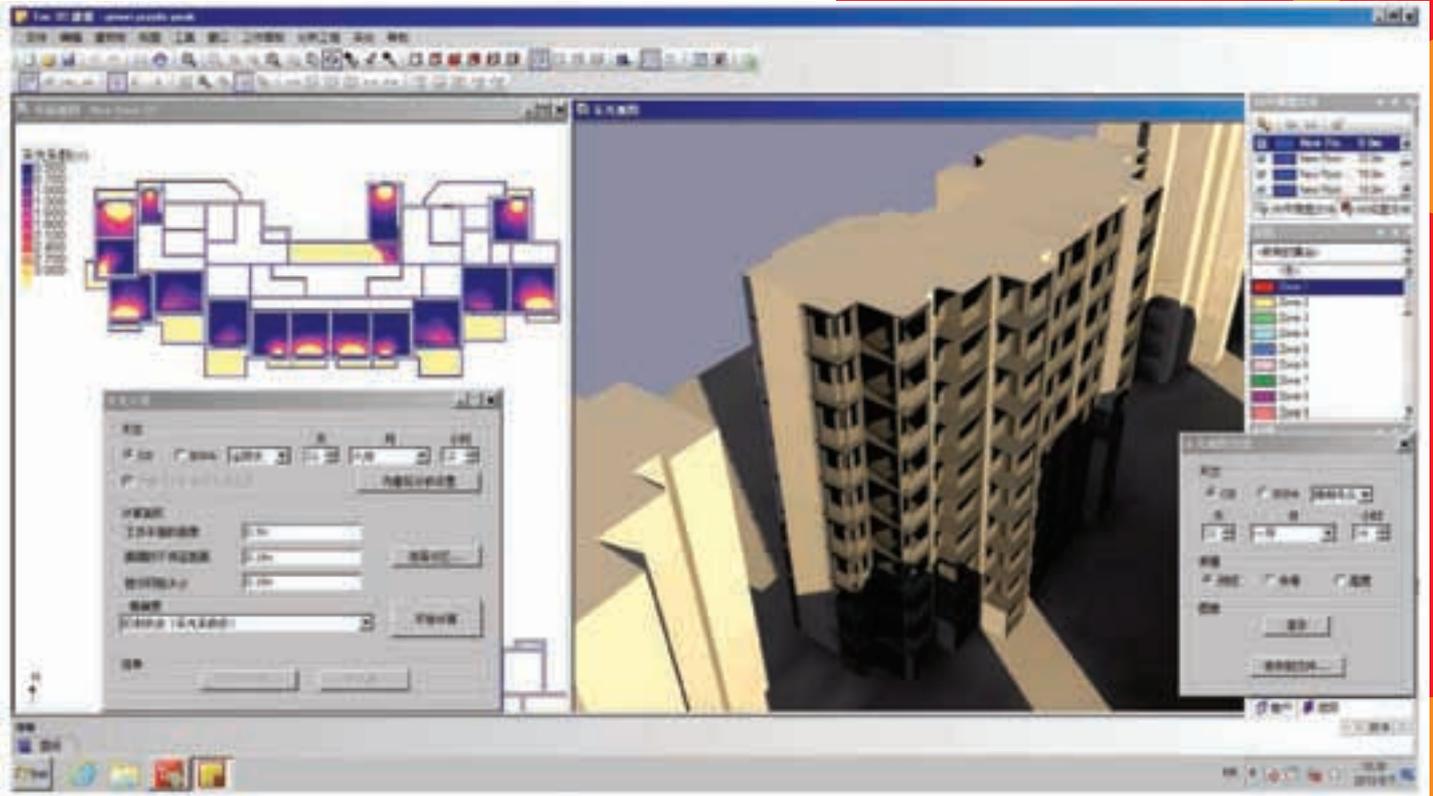
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China adopts EDSL Tas as Building Simulation Standard



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OPPORTUNITY KNOCKS

The government is consulting on the Energy Saving Opportunity Scheme. **Hywel Davies** explores what it could mean for building owners, operators, and energy professionals

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Who will audit Britain's building stock?

Last month I described the Energy Saving Opportunity Scheme (ESOS), which has been proposed by the government to implement the requirement for energy audits contained in Article 8 of the Energy Efficiency Directive.

This sparked a lively debate on both the CIBSE and the Energy Performance Groups' LinkedIn pages about who is going to undertake these audits. There are also some interesting estimates buried in the impact assessment from the Department of Energy and Climate Change (DECC), which merit some further debate. These are about how much energy these audits are expected to save.

The directive itself requires energy audits to be based on up-to-date, measured, traceable operational data on energy consumption and electricity load profiles. They must comprise

a detailed review of the energy consumption profile of buildings or groups of buildings, industrial operations or installations, including transportation, and be proportionate, representative and identify significant energy savings opportunities. They should take a long-term, life cycle view rather than being simple payback calculations.

These are all sensible activities, although the Directive stops short of requiring anyone to implement any of the savings opportunities. However, there are already schemes in place that do similar things, although none of them fully matches the requirements of Article 8. This means that the UK cannot just point to an existing scheme as meeting its obligations under Article 8, but has to introduce a new scheme for that purpose.

Early discussions with DECC

During discussions, CIBSE and others suggested that DECC should try to employ those already accredited

officials emphasised the pre-existing schemes, and section 6.2 of the impact assessment identifies some 16 of them across the buildings, industrial and transport sectors. As a result, the consultation proposes that organisations already within the CRC, or with Display Energy Certificates, or a Green Deal Assessment, may use these in their energy audit.

The consultation also proposes that organisations which have implemented ISO 50001, the international energy management standard, and in some cases ISO 14001, the environmental management standard, may use these for partial or full compliance with Article 8.

Those organisations will already have accredited assessors in place to carry out those assessments. But what about those activities not covered by one of these schemes, or those organisations brought into ESOS that do not complete a CRC return or have DECs or greenhouse gas returns? Who will audit them?

Chapter five of the consultation document considers this. It notes that there are already a number of schemes in place that recognise competence in this field, including the CIBSE Low Carbon Consultants scheme, the Low Carbon Energy Assessors Scheme and the Register of Professional Energy Consultants operated by the Energy Institute.

There are also a good number of chartered engineers who already provide investment-grade energy audits for leading property businesses. Indeed, the consultation suggests that 'there are a large number of individuals who already have the expertise to conduct energy audits'.

During discussions between DECC and various stakeholders, CIBSE and others suggested that DECC should try to employ those already accredited, without imposing significant additional accreditation requirements on them.

The consultation proposes two options for recognition of appropriate



experts: a UKAS scheme with accredited certification bodies that would certify individual assessors; or requiring assessors to belong to a register approved by the scheme administrator. CIBSE operates under both models: the Low Carbon Energy Assessors being approved by the Department for Communities and Local Government; and our Green Deal Assessor scheme is UKAS accredited.

CIBSE is in ongoing discussions with other energy assessor schemes about this, and we welcome input from members. What we are clear about is that, with at least 160,000 buildings covered by ESOS, there is a very definite need for assessors with demonstrable experience of energy use in buildings to be accredited.

CIBSE members, energy assessors and building owners and operators, will all have views on who should be doing ESOS assessments, and CIBSE will be preparing a response on this and other aspects of the consultation ahead of the deadline on 3 October. To tell us your views, email technical@cibse.org or log in to the CIBSE LinkedIn Group.

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

DECC ON DECS

DECC commissioned a qualitative research project on Display Energy Certificates in 2012, with in-depth qualitative interviews and case studies with 23 public sector organisations and 15 private sector organisations. A significant benefit of DECs is the process of data collection. This raises awareness of energy use and encourages monitoring by organisations that have not previously considered energy efficiency. For organisations already trying to improve their energy efficiency, DECs help identify poorly performing buildings, and assist facilities managers to make investment cases.

However, while the advisory report that comes with a new DEC should provide detailed recommendations with a range of timescales, most organisations did not find their advisory report helpful. They wanted information and guidance that was more readily useable and advice tailored to their building and budget, with recommendations that were achievable with the level of investment they were willing to make, and an explicit and accurate discussion of the costs and benefits of the recommended changes.

This research supports the views of many experts since the introduction of DECs, arguing that the current format of the advisory report is a missed opportunity and does little to promote energy savings. CIBSE would be interested in the experience of members with DEC advisory reports via technical@cibse.org or LinkedIn.

@ Feedback

Letters: district heating system standards

Avoiding stress

I read with interest the article on district heating network heat losses (August 2013). While I applaud many of Huw Blackwell's views, as a manufacturer of pre-insulated pipe systems, I'd like to draw your attention to a wider concern regarding the end-to-end standards covering all aspects of a district heating system's design, construction, operation and maintenance.

We are attracting a lot of new entrants and many of them don't have the experience, nor readily available standards from which to draw guidance. Many individual elements are covered, but there's lots of gaps – a dangerous position for us to be in.

Stress analysis is just one of many areas being overlooked, and even if networks are designed correctly, changes can be made on site that can have serious implications to the future integrity of a buried network.

To illustrate this, a 200 metre length of buried DN250 mm pre-insulated steel pipe, heated to 120°C, will expand

by some 150 mm and exert a force equivalent to around 52 tonnes. If not dealt with in the correct manner, this will lead to failures and disrupt supply.

Mr Blackwell's idea of introducing performance criteria for design and build networks is a sound one and could help prevent developers from inadvertently creating a legacy that sees a repeat of the costly failures afflicting district heating schemes in the 1970s and '80s. I'd be keen to engage with any of my industry colleagues who share this view and let's hope that we, as an industry, can put in place sufficient checks and balances before it's too late.

Mark Whettall, managing director, CPV

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

Please send all material for possible publication to: editor@cibsejournal.com, or write to Alex Smith, editor, CIBSE Journal, CPL, 275 Newmarket Road, Cambridge, CB5 8JE, UK. We reserve the right to edit all letters.

CIBSE LinkedIn Group

Edward Palmer asks: the government is consulting on its proposed Energy Savings Opportunity Scheme, which aims to deliver the energy audit requirements of the EU Energy Efficiency Directive. What are your views?

David Melhuish

More legislation – just what we need! Is this just revisiting the same old idea that has been half-heartedly implemented by previous schemes? Sweeping some legislation away or consolidating it would be better.

Tony Johnstone

After the Green Deal debacle I'm absolutely certain I do not want HMG believing it has anything to offer in our field. Remember – in their bid to avoid monopolies and promote fair competition they believe 'accreditation' is a substitute for professional competence and industry experience.

Andrew Wolstenholme

In a great many businesses I visit, building performance and energy just isn't on the business critical path – hence no monitoring and often no idea of consumption. It's one thing to complete and present a quality audit and quite another to take investment away from the core business.

John Collinson

I'm still at a loss to see the logic of not rolling out DECs to the commercial sector. They provide energy ratings based on actual fuel consumptions, floor area and occupancy type. Not theoretical, just facts.

BACKING THE WRONG HORSE



There is a danger that Allowable Solutions will result in the adoption of complex, unproven technology, rather than projects with long-lasting benefits, says Max Fordham's **Bill Watts**

The government has put into place a requirement for all homes built after 2016 to be zero carbon. Having made the statement, it has to define what it means by zero carbon and what constitutes compliance.

The overall goal is clear – new homes will not contribute to the world's carbon emissions – but the way to achieve it is not comprehensive. The carbon in construction is not included, neither is the carbon associated with cooking or plugging in appliances. That leaves the services – heating, ventilation, hot water and fixed lighting – to deliver the 'zero carbon' promise.

In a nutshell, zero carbon compliance broadly consists of three measures:

- Fabric energy efficiency – reduce the energy requirement of the dwelling with good standards of insulation
- Carbon compliance – generate the energy needed on-site using renewable energy
- Allowable Solutions – on the basis that it is not technically feasible to generate enough energy on-site to meet most building's needs, pay someone or do something off-site to save the equivalent carbon emitted from your remaining energy-related carbon emissions

In my view, Allowable Solutions can best be described as a tax on development to save carbon emissions. Finding the right route to spending that money appropriately – without opening it up to fraud, undue administrative overheads or ineffective installation – is a complex task, and one that the current consultation seeks to undertake.

For building services engineers, there are a number of issues. The government argues that it is politically neutral on what types of technology a designer uses to meet their targets, when in fact, it is anything but neutral. Planning, Building Regulations and assessment models have preset performance criteria for various systems – often with little

Allowable Solutions should be biased towards passive systems that will reduce energy consumption rather than active systems that rely on unrealistic levels of performance



Insulation will never be a stranded asset: Max Fordham's strategy to insulate Grade I Listed Trinity College, Cambridge, was granted planning permission in February 2013

bearing on reality – that drive a designer down a particular route.

The presets are often not based on field data but on an idealised theoretical view of engineering. As anyone who has commissioned a building knows, the theoretical view is quite far from reality.

As a result, systems are installed that are often inappropriate, more expensive and energy intensive. Designers should be left to get on with devising a scheme with both the client's and users' current and future interests at heart.

District heating could be seen as the darling of Allowable Solutions, as it is mentioned many times in the consultation. It has successfully evaded evidence-based analysis, despite actual energy usage regularly being higher than models predict, leading to problems if a supply contract is based on those predicted figures.

An energy strategy is led by the services engineer to meet policy requirements, but a services engineer has enough to design without deciding on the best carbon savings off-site.

Without an engaged developer or champion with clearly defined

responsibilities, it seems the Allowable Solutions route taken will be the cheapest option – certainly the easiest – but possibly not the most beneficial.

Fundamentally, it's important to think about the longer term. Allowable Solutions should be biased towards passive systems that will reduce energy use, rather than active systems that rely on unrealistic levels of performance.

Incentivising alternative resources is also premature. The use of biomass or community heating are not well enough defined in a national context, and could lead to stranded assets of inappropriate technology. Investment in reducing energy use can never be a stranded asset but, on paper, may be a more expensive form of carbon reduction. In this model, the savings come in the longer term through efficient use, reliable operation and simple maintenance.

For this policy to be effective, the solutions need to be based on real results, taking account of real consequences.

● **BILL WATTS** is a senior partner at Max Fordham

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GE imagination at work

CARE TACTICS



CIBSE is playing a vital role in providing the growing facilities management sector with effective building maintenance strategies, says **Geoff Prudence**

Over the last few years, the focus on energy use, sustainability and lean business practices has brought the need for operational excellence in buildings to the fore. Successful businesses are driving out unnecessary costs through efficiencies across their portfolios and instilling effective workplace practices. This is enhancing their performance, which in turn helps them to attract and retain the best talent in their field.

Central to this, of course, is the role of building engineering services – from concept design through to maintenance and refurbishment. Partly because of collaborative technologies and processes, such as BIM and Soft Landings, there is now far greater awareness of ‘systems-thinking’ in the design process, which is helping to drive ever-greater efficiencies.

However, this largely applies to new-build developments, and particularly those in the public sector. This leaves a significant amount of existing stock that requires effective building services management to make it work successfully.

Against this backdrop, the facilities management (FM) industry has grown significantly as a service sector, and is predicted to increase further in the UK, Europe and worldwide.

The exact spectrum of support and operational services that constitute FM is still the subject of some debate, but one field is absolutely central to the sector: the effective management of buildings and portfolios to support organisations’ core business.

Through its growing FM section, CIBSE is involved, alongside other industry bodies, with input into standards, design concepts and operational best practice. CIBSE is already well regarded as the expert for design and energy in the built environment, but the real opportunity now is for it to become the obvious



OLIVER SYED / SHUTTERSTOCK.COM

choice for facilities managers looking to engage with a professional institution.

Over the next year, we will see far more joined-up thinking in the sector. In terms of documentation, there is the updated *CIBSE Maintenance Guide M*, the Building & Engineering Services Association’s *SFG20 Maintenance Specification*, the RICS’s *New Rules of Measurement for Maintenance* and *BS 8544 Life Cycle Costing for Maintenance*. These are all complementary and will provide a route towards operational best practice.

I believe the ‘design-operation gap’ is closing and, while there are still pleas for earlier input into design, this documentation will go some way towards building on the good examples we are already seeing.

The updated *CIBSE Guide M* provides a valuable reference point for determining an appropriate strategy for maintenance. The guide states: ‘The growing importance of the need for building services to operate effectively drives cohesion between the design solution and the operation and maintenance of a building.’

All chapters have been updated

I believe the design-operation gap is closing

and, in a number of cases, rewritten. Information for designers includes more guidance to support systems-thinking in the design process, while later chapters on lifecycle and prediction data are far more comprehensive than before.

The legislative guidance has been brought up to date and is usefully collated in a single section, and the chapter on maintenance strategy brings together best practice examples on risk-free implementation.

CIBSE is embracing the opportunity that FM presents, and is considering a number of initiatives both to expand information on the Knowledge Portal for existing members and to attract new members from the FM arena.

● For more on accurately predicting energy use, see *Mind the Gap* on page 34.

If you would like to get involved, contact Geoff Prudence and/or join the CIBSE Facilities Management Group at www.cibse.org/fm

● **GEOFF PRUDENCE** is a Fellow of CIBSE and chair of CIBSE Facilities Management Group



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SHAPE OF THINGS 70 COME

Bill Bahnfleth launched his ASHRAE presidential term at a lively Denver meeting with a call to join him in shaping the next generation of building systems.

Tim Dwyer reports

This year's ASHRAE summer conference was held in Denver, Colorado – the mile-high city (although the rarified atmosphere had no apparent moderating effect on the frenetic meeting). There were nearly 1,900 attendees, making it one of the largest ASHRAE summer gatherings for years.

The meeting is used to launch the new ASHRAE president into his year's tenure – this year, Bill Bahnfleth from Pennsylvania State University. He opened his term with the intriguing theme of 'Shaping the next ...' This was appended by: 'our world' – making buildings safe, healthy, productive, and in harmony with nature; 'ourselves' – relating to the human resource in the professional community; and finally 'our work' – transforming what and how we do our work, and who we do it with.

Bahnfleth is keen to encourage a more divergent, broader and global, but collaborative, approach. This undoubtedly worthy aspiration sets him a tough agenda. He quoted Walt Disney – 'The way to get



ASHRAE President
Bill Bahnfleth



started is to quit talking and begin doing' – and his apparent tenacity may well deliver.

As the new leader takes office, his predecessor, Tom Watson, has an opportunity to reflect on his year as president (see right). Watson has focused on developing ASHRAE's links with the community and, in at least one instance, has demonstrated this by providing a toolkit for those wishing to set up ASHRAE community sustainability projects.

The opening plenary session was more muted than previously as, unusually, an inspirational speaker had not been engaged to galvanise the audience of more than 300. However, ASHRAE chief executive Jeff Littleton's polished 'state of society' address hooked the crowd. He reported on a slew of new publications, including the most recent edition of what many regard as the flagship of ASHRAE publications, the *Fundamentals Handbook* – a mammoth work that combines the input of 24 technical committees. He also announced free online access to the ASHRAE *Indoor Air Quality Guide*, at iaq.ashrae.org.

The sessions ranged from the practical application of heating, ventilation and air conditioning (HVAC) technology to workshops on interpretation and application of building physics, and prophetic sessions exploring cutting-edge developments and research. This year, for the first time, the





programme contained a specifically identified research stream, where a thread of 28 sessions ran across the four days. Areas discussed reflected the broadening scope of subjects represented in ASHRAE's work, and included the human element in the smart grid; heat transfer issues in cooling and heating systems; and developments in simulation.

There were, of course, a number of presentations considering building commissioning for green buildings and the link with Building Information Modelling (BIM) processes. The examples of retro-commissioning, as described by Kyle Knudten of McClure Engineering, were particularly well received. Knudten illustrated – and quantified – a number of field-based modifications and adjustments to systems in healthcare buildings in southern Illinois, ranging from the simple, such as cleaning cooling coils and adjusting time clocks, to more complex adjustments of control loops and damper regimes. In one hospital that had achieved an Energy Star rating for eight of the previous 10 years (and so not regarded as a profligate user of energy), these changes were predicted to save more than 5% of electrical power use and 34% of gas, with a payback of less than six months. However, the resulting operation was not as effective as the prediction – largely the result of poor

communication by those who coordinated with the commissioning consultants to those responsible for operation.

Somewhat more speculative and developmental was the presentation by Wim Zeiler of Eindhoven University of Technology that considered the use of infrared sensing of fingertip temperatures to provide a direct measure of occupant comfort. His research indicated that by monitoring the human body directly and not using a remote secondary predictor of thermal comfort (such as room air temperature) there was potential to save energy by providing more closely controlled environmental conditions.

The sheer magnitude of the evaporative cooling applications – handling more than 1,600m³/s of air – discussed by Pat Graef of Munters Corporation excited interest. The mechanism itself is simple enough – the evaporation of water to reduce the dry-bulb temperature of the air. However, cost and effectiveness will be determined by operational factors. Graef outlined some key areas for longevity of the evaporative media, including ensuring water flow maintained a constantly wetted surface; protecting the surfaces from external environmental damage; and the application of upstream filtration to reduce particulate matter.

As a past director of ASHRAE, my opinion may be partisan but the vast and divergent spectrum of subjects makes the ASHRAE meetings unbeatable in the HVAC&R world. No matter how many meetings one attends, the enthusiasm of the staff and members, across hundreds of committees and technical sessions, remains infectious. **CJ**



VIEW FROM A NEW HORIZON

Tom Watson reflects on his year as ASHRAE president



A fellow ASHRAE officer once advised me that work for your presidential year begins long before your presidential year. ASHRAE's 2012-13 theme, 'Broadening ASHRAE's horizons', focused on how we use technology and applications through the ASHRAE and ASHRAE Associate Society Alliance membership. With the help of very dedicated members – and the benefit of getting an early start – I feel that we accomplished that goal.

Foremost in our work were the Community Sustainability Projects, which urged members and chapters to get involved in their communities in a bid to make the public more aware of the work of engineers. Among the projects completed were everything from upgrading HVAC&R systems at a camp for children with cancer to providing solar-powered lighting to a remote village in India. Even student branches got involved and raised awareness of energy efficiency on their campuses.

Meanwhile, the Grassroots Government Activities Committee (GGAC) is providing education and technical expertise to state, provincial and local government bodies and policymakers on subjects such as energy efficiency and indoor environmental quality. GGAC is helping to develop priorities in line with ASHRAE's technology, allowing chapters within the same province or state to coordinate efforts, as well as supporting our worldwide grassroots government activities.

Finally, there is YEA Leadership International, which gives young members the chance to develop soft skills and network with other young professionals. This began after a conversation with a member of the Pune chapter in India. The first YEA Leadership International took place in Sri Lanka, with more than two dozen participants. A second is planned in Qatar this September. What better example is there of broadening the horizons of our future engineers?

THOMAS WATSON is chief engineer at Daikin McQuay. He served as ASHRAE president in 2012-13

FUEL FOR THOUGHT

Professor **Tony Day**, director of the International Energy Research Centre (IERC), reports on a lively annual conference that raised some bold ideas on energy use and generation in the 21st century

This year's IERC conference was a coming of age. Taking its theme as 'Integrated energy in the 21st century', it brought together speakers, from industry, policy and academia. It also gave us the opportunity to take the temperature of the audience, to encourage frank and lively dialogue, and to gain a greater understanding of energy issues from their perspective.

The conference took place in Dublin and was aligned with the European SET Plan Conference, the focus of which was to help formulate a strategic energy technology plan for the European Union. Speakers included Joan MacNaughton and James Wilde of UK organisations the Energy Institute and the Carbon Trust and, from industry, David Parekh of United Technologies Research Center (UTRC) and Jorge Arinez of General Motors.

In her address, MacNaughton, president of the Energy Institute, called for much stronger action on energy efficiency, describing it as the one policy area that pushed all the buttons for the 'energy trilemma' of security, affordability and emissions reduction. She warned that, policies can have unintended consequences, and options need to be rigorously assessed to ensure the right things are done in the right way. She called on governments to better understand investment requirements.

'What is needed from all energy professionals is a strong narrative both on why we need to drive energy efficiencies and on the best approaches on a general level and, where appropriate, on a detailed level. This needs to be underpinned by a good research base, such as the IERC,' she said.

Parekh, vice-president research and director of UTRC, spoke on the need to drive improvements in the energy use of buildings. He pointed out that, when asked about heavy carbon users, people often focus on transport and aviation. But aviation is only responsible for two per cent of our total world energy use and transport as a whole is at 27%, whereas



IERC member representatives from Alcatel Lucent, Bilfinger, Bord Gais Energy, Bord Gais Networks, General Motors, I2Ez, UTRC



buildings represent nearly 40% – and if factories are included, 67%. Parekh argued that there was realistic potential to achieve 10-20% improvement on energy use in existing buildings through retrofitting, and 50-70% in new-builds. If we achieved that, he added, 'it would be the equivalent of taking every car, bus and train off the road worldwide'.

The key challenge, he said, was not creating an energy-efficient building, but doing so scalably and affordably, so it could be replicated across markets, sectors and the globe.

Parekh stressed the importance of thinking about the life cycle of a building and the value of integrating factors such as the building's operation, weather conditions, utilities, pricing and peak power demands. He said we should reconsider how people were taught to design, and how to ensure that the design intent was preserved. What's built needed to be commissioned properly and the design values needed to persist throughout the life cycle, even through eventual retrofits.

Wilde, director of innovation and policy at the Carbon Trust, whose role it is to help businesses, governments and the public sector to accelerate the move to a low-carbon economy, took a close look at funding. He highlighted the Carbon Trust's approach to new technologies, scrutinising them in terms

of the impact they will have on carbon savings and economic benefit for the UK. Key to its methodology is leveraging the private sector and tailoring interventions to the specific market barriers that each technology faces.

Wilde gave the example of the Carbon Trust's US\$5m partnership with General Electric, in which the trust scouts early-stage technology companies. This reduces the transaction costs for large corporates and helps innovators gain access to large companies. For more cautious start-ups, the trust finds ways to protect their intellectual property to create a mutually beneficial relationship.

The conference concluded with a debate on the relative merits of energy efficiency and renewable technologies. John Killey of CitiGroup and Steven Fawkes of Day One Energy argued for greater focus to be placed on energy efficiency, while Brian Mark of Mott MacDonald and Jim Gannon of RPS Group made the case for supply-side measures.

Both sides' arguments ignited strong participation from the floor. After a vote, the pro-energy-efficiency camp appeared to have carried the day, but right at the end a third option was proposed: that public money should be used for renewable energy, while the private sector should invest more heavily in energy efficiency, which is seen to be more cost-effective. This was strongly supported, and for us it ensured that our most successful conference to date ended on a high. **CJ**

THE INTERNATIONAL ENERGY RESEARCH CENTRE is based in Cork and provides transformative energy research solutions relevant to business needs. Areas of research focus include building energy management, energy efficient lighting, energy harvesting and storage, integrated energy systems, business models for energy efficiency, ICT networks for home, industry and smart grid systems and behaviour change

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HOME *and* DRY

The Mary Rose Museum opened earlier this year, but the painstaking process of drying the warship's ancient timbers goes on. So how did Ramboll achieve a closely controlled environment in one of the UK's busiest tourist attractions?

Andy Pearson reports

It is not often that a museum of medieval history is completed before its star attraction. But that was the case with the new Mary Rose Museum in Portsmouth Historic Dockyard. Designed by Wilkinson Eyre and interior architect Pringle Brandon Perkins + Will, the £27m visitor centre opened to critical acclaim earlier this year.

The problem was that the museum next to *HMS Victory* had to be built around its incredibly delicate centrepiece – a 20m x 13m section of the Tudor warship's starboard hull. This is currently

saturated with timber preservative as part of a conservation process that will not be completed until 2016.

'The hull's precarious condition meant that conservation had to continue, without interruption, while the *Mary Rose's* new home was built around it,' says Tim Lloyd, an associate at building services engineer Ramboll UK. Not only did the services have to be designed to maintain the environment around the hull during construction and the museum's first years as a busy tourist attraction, they also have to be capable of



being entirely reconfigured in 2016, when the building will be converted into a more conventional visitor centre.

Up she rises

To appreciate the challenges that had to be tackled in developing the engineering design for this unique museum, it helps to understand how the hull was salvaged. Having been embalmed in her watery Solent grave for centuries, the *Mary Rose*'s 1982 recovery operation was, and still is, the largest underwater maritime archaeological excavation ever attempted.

In addition to the 280-tonne section of hull, the excavation also produced an astonishing collection of 19,000 16th-century treasures.

After it was retrieved from the seabed, the wooden carcass was placed in No 3 dock at Portsmouth Historic Dockyard, where the painstaking task of conserving its ancient timbers commenced. A tensile fabric enclosure, known as the Wemyss building, was erected over the dock. Suspended inside this was an insulated enclosure of foil-faced insulation – termed the 'hot box' by the

engineers, which was designed to keep the environment around the hull at a constant 25-27°C. Heating was provided by radiant panels placed beneath the steel cage that supported the hull and hot box, while cool air was drawn from within the confines of the dry dock. Inside the insulated box, the timbers were initially sprayed with a fine mist of chilled water to stabilise them, and later with an aqueous solution of polyethylene glycol (PEG) wood preservative solution.

The new museum was built around the tented building to enable the PEG ➤

➤ spraying to continue, uninterrupted, 24 hours a day, seven days a week. The wood-clad building's low, elliptical form was dictated partly by the parabolic geometry of its roof and partly by the need to minimise the space around the hull to make it easier to maintain the strict environmental conditions necessary for its preservation.

The designers set out to evoke the dark claustrophobic atmosphere on board the medieval ship. The salvaged hull, still cocooned within the hot box, is located on one side of the museum. Facing it, a virtual port side has been created, containing three decks of galleries housing the original artefacts in a mirror image of where they would have been found on the starboard side. Walkways divide the hull from its recreated twin, while galleries at the prow and stern of the museum provide a theatre and further displays on the ship's crew – the cook, the carpenter, the surgeon – containing personal possessions and professional tools.

Heat from the artificial lighting is minimal because the galleries are dimly lit; what light there is has been focused on the cabinets housing the salvaged artefacts of everyday Tudor life. These require tight environmental control and are housed in highly controlled display cases (see box opposite). And through windows in the hot box, visitors can glimpse the 500-year-old hull itself.

Gently does it

PEG spraying finished earlier this year and the hull is currently wrapped in a series of textile ducts while its timbers are being dried. Conservationists estimate that between 110 and 130 tonnes of water were trapped in the timbers following the years of PEG spraying. The task was to start drying the timbers as quickly as possible to prevent mould growth. It is expected that most moisture will be drawn out during the first year, but it will take up to four years before the wood is fully dry.

Unless the environment around the ship is controlled to ensure the timbers dry evenly, they could crack and deteriorate. With the hot box now contained within the museum, its heat losses are small. 'If you designed a ventilation system to meet the actual heating load, the volume of air needed would only be around 1-2m³/s', says Lloyd. However, this quantity of air would be insufficient to maintain the close control conditions needed inside the 40m long, 16m wide, 13m high space.



Ramboll's solution has been to significantly increase the volume of the air supply to the box, but to target it onto the hull. Conditions required for successful drying are 19°C +/-1°C, with 54% relative humidity +/-4%. To design the air distribution, the remnants of the ship and its enclosure were laser-scanned to create a precise model. Engineers then used this to test various ventilation and cooling techniques, and to check air velocities, dwell times and shear stresses created by the air movement to find the most effective. 'Using computational fluid dynamics (CFD), we found that the minimum volume of supply air we could use that would maintain the correct conditions around the ship was 25m³/s,' Lloyd explains.

The precise location of the ducts and position and number of holes in the ducts were also arrived at using CFD analysis. The designers were aiming to cloak the ship in conditioned air that had a maximum velocity of 0.25m/s adjacent to the hull. 'The boundary conditions are absolutely critical if



CFD analysis determined the position of the ductwork and the number of holes necessary to dry the timber evenly

Unless the environment around the ship is controlled to ensure the timbers dry evenly, they could crack and deteriorate

Walkways separate the hull from the galleries, which house precious artefacts salvaged from the seabed

the hull is to dry evenly,' says Lloyd.

Ordinary textile ductwork, which allows the air to permeate the walls of the duct, would not provide sufficient control of the supply air. Instead, impermeable ductwork was used, with laser cut holes to control and direct the air supply.

The textile ducts are attached to a stainless steel and titanium suspension system, which was installed while the hull was still being sprayed. The ducts were then attached to the suspension system during the switchover phase and plugged into pre-installed ventilation plant. 'It was important that, as far as practicable, everything was ready for the changeover from spraying to drying to ensure it happened in the shortest possible time.'

Three air-handling units (AHUs), hidden in the dry dock, supply 8.3m³/s of air each. The air is distributed via two 1,200mm-diameter ducts that run the length of the hull; these drop down to supply 14 smaller ducts that weave in and out of the timbers like giant worms. The air system

is fully recirculating, with extract air dried and returned to the hot box at boundary conditions.

Lloyd describes these AHUs as 'a bit of a work of art'. To build in robustness, the AHUs make use of fan wall technology, so instead of a single fan there is a wall containing six inverter speed-controlled fans. Each unit will operate at 80% peak demand so that, if one fan fails, the speed of the other five can be ramped up to make good the loss. In addition, each heating and cooling coil is split into three sections, with two of the sections capable of supplying the duty required. The three AHUs feed a common air supply header.

Heating and cooling plant is located in a plant room at the north of the building. There is no gas supply so the two heating boilers are oil-fired. There is, however, a dock steam main so the plant room includes a heat exchanger, which is the primary source of heat for the building in winter.

Cooling is from three packaged air-cooled chillers, which circulate water

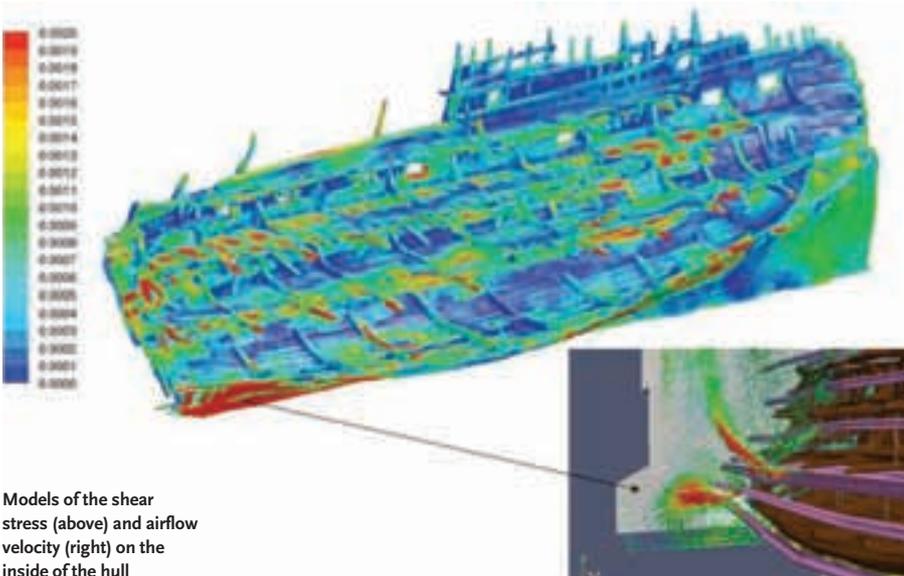


A CASE-BY-CASE BASIS

Many of the display cases manufactured by Reier feature a micro-air conditioning system to help preserve the delicate leather and wooden artefacts on display. Conventional museum cases usually control only the humidity of the cabinet; they do not have temperature control but instead rely on the temperature of the room in which they are housed to be kept constant. However, the small size of the galleries and the large numbers of expected visitors meant that this was not possible at the museum. Instead units are fitted with a thermoelectric Peltier heat pump unit, to filter and humidify the air and provide heating, cooling and dehumidification. Each cabinet has its own electrical supply and chilled water connections.



Three chillers provide cooling



Models of the shear stress (above) and airflow velocity (right) on the inside of the hull



PROJECT TEAM

- **Client:** The Mary Rose Trust
- **Architect:** Wilkinson Eyre Architects
- **Interior architect:** Pringle Brandon Perkins+Will
- **Consulting engineer:** Ramboll UK
- **Cost consultant/CDM Coordinator:** Davis Langdon (Aecom)
- **Exhibition design:** Land Design
- **Main contractor:** Warings

around a primary loop. Two secondary circuits connect to this, one to feed the hull AHUs and the other to feed all other services within the building. To maximise the AHUs' ability to dehumidify the air, the chilled water is supplied at 2°C (with a 6°C rise); for the chilled water circuit serving the main part of the building, the chilled water is mixed to bring it up to a 6°C supply temperature. However, to save energy the chillers operate at the raised temperature of 6°C when dehumidification loads are minimal.

A small AHU located in the first-floor plant room supplies fresh air for the visitors and pressurises the space. To ensure no more outside air is supplied to the system than is necessary, the AHU has a variable speed fan, with the extract rate balanced

to maintain the museum at a positive pressure. 'Sensors in the extract duct will monitor humidity levels so that on a rainy day, when visitors enter with wet clothes, we can ramp up both supply and extract rates to capture the moisture at source,' explains Lloyd. In addition to the fresh air supply, the galleries are fitted with two fan-coil units on each floor to provide additional cooling for peak loads.

All the ductwork and headers for the system are already in place to allow a swift changeover between the drying and final display modes.

Ready for its public

In 2016, when the timbers are dry, the hot box will be dismantled and the fabric ducts removed, allowing visitors to gaze directly at the hull from the galleries. 'From an environmental perspective, that means there could be 150 people present at any one time in what is, effectively, a giant display case containing the hull,' Lloyd explains.

The system has been designed to enable the changeover to be completed swiftly and with minimum disturbance. 'All the design work has been done so that at the flick of a switch, and by moving a few dampers, the environmental systems will be transformed from hull-drying to hull-display mode,' says Lloyd.

To develop the final display solution, the engineers returned to the digital model of the ship to examine conditions around the hull with the hot box removed. Correct air movement is critical, even when the hull has dried, to maintain stability of the timber. The CFD analysis showed that the best way to avoid areas of stagnant air was to supply conditioned air at a number of levels using directional air-jets.

As part of the changeover, the visitor walkways used by the visitors will be fitted with air locks between the galleries and the ship hall. The same three AHUs currently used to dry the hull will be reused to maintain the environment within the ship hall. The units will be configured to run in recirculation mode with two operating and one on standby.

When the works are completed, the *Mary Rose* hull will be on display a short distance from the mudflats where Tudor craftsmen first assembled the vessel hundreds of years ago. The museum will be a fitting tribute to their work, to the years of careful restoration and to a cleverly designed ventilation system that will enable the hull to be preserved for generations to come. **CJ**



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The performance gap often stems from unrealistic estimates during the design stage. *TM54* provides the key to better evaluations, says **David Cheshire**

It is well documented that new low-carbon buildings do not always perform as well as anticipated. This can be because the design intent has not been delivered in the completed building, or because the buildings are not operated in the way they were intended to be. Often however, the gap between design prediction and operational performance is exaggerated simply because there was no proper estimate of operational energy use when the building was being designed.

CIBSE's new guidance, *TM54: Evaluating operational energy performance of buildings at the design stage*, aims to tackle this issue. In so doing, it will also help designers to focus their attention on where energy is really being used and wasted. 'The aim is to turn low-energy designs into low-energy buildings that achieve the design energy targets,' says Hywel Davies, technical director at CIBSE.

Why TM54 can help

Design-stage energy models based on the National Calculation Methodology (NCM) templates provide an excellent way to compare different design options and to demonstrate compliance with Building Regulations, planning policy and so on. However, they should not be taken as an estimate of operational energy performance.

Figure 1 illustrates the differences between the calculations in Approved

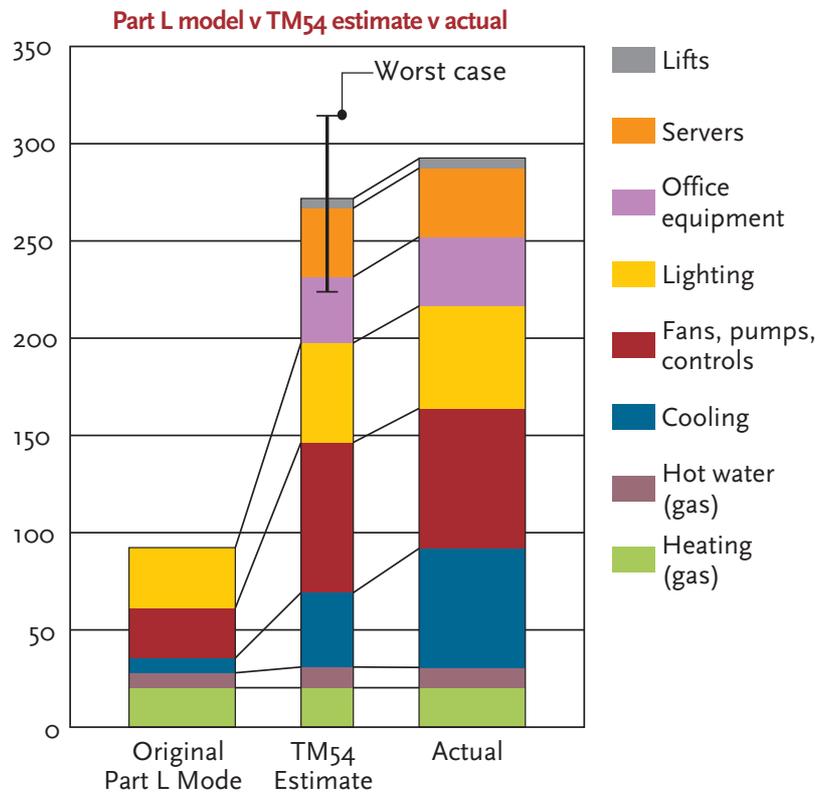
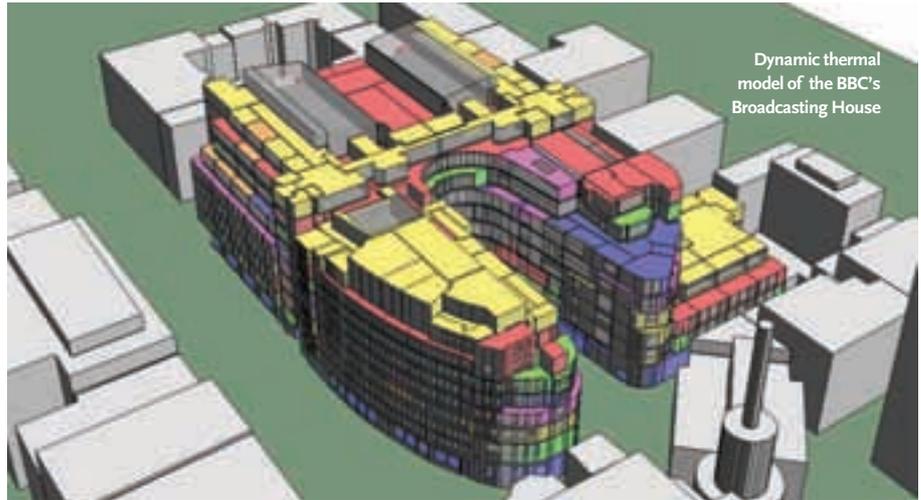


Figure 1: Comparison of ADLzA calculations, TM54 estimate and operational performance for the case study

MIND THE

Document L2A (ADL2A) and monitored energy use after five years of operation. Using the case study building in *TM54*, the graph compares the original Building Regulations Part L model, the estimates based on the *TM54* methodology and the actual energy use of the case study building. The stack bars show that the calculations based on *TM54* provide a much closer estimate of actual energy use than the model used to demonstrate compliance with ADL2A.

So why the big difference? The main reason for the discrepancy between the left and right bars is that the ADL2A calculation uses standard inputs for variables such as the hours of operation, and excludes energy uses such as small power, external lighting, lifts and so on.

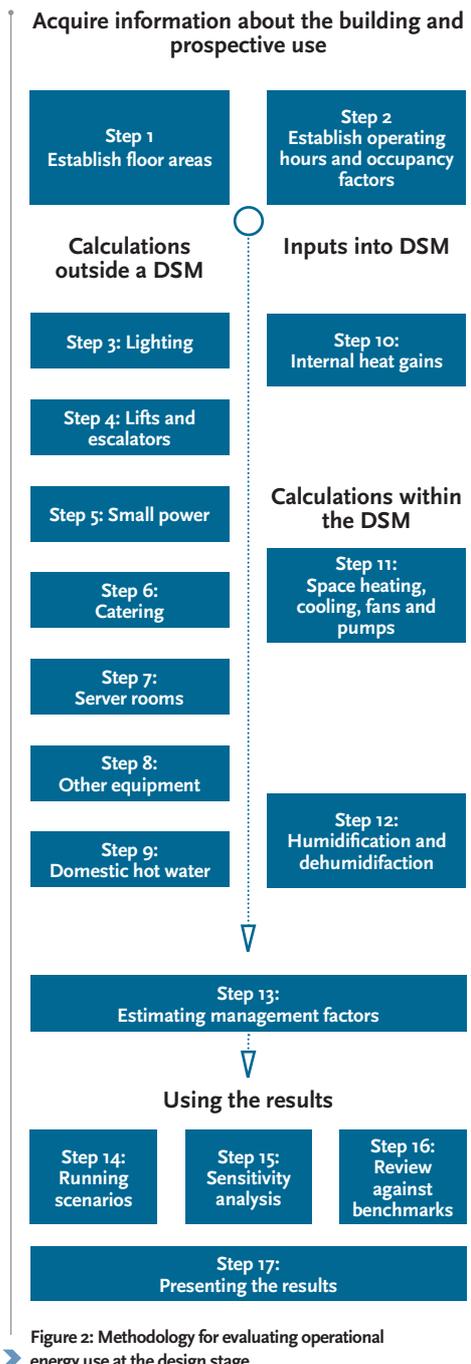
This makes complete sense when you are demonstrating compliance with regulations, as you have to remove many of the input variables to allow comparison between different buildings and you can only include the fixed building services (that is, heating, cooling, ventilation and lighting).

However, it is clear from this graph that ADL2A calculations should not be used as a prediction of operational energy performance, and when they are, they are contributing to the 'design/performance gap'.

How TM54 works

The methodology in *TM54* (figure 2) is built on some key principles to ensure that it aligns with other CIBSE guidance and thinking:

- The principles and approach published in *TM22: Energy assessment and reporting methodology* are adopted to ensure that the energy end-uses are assessed and reported
- Energy-use calculations are taken from



TM54 is available on the Knowledge Portal at www.cibseknowledgeportal.co.uk

Design-stage energy models based on the National Calculation Methodology (NCM) templates provide an excellent way to compare different design options and to demonstrate compliance with Building Regulations

THE GAP

- CIBSE guidance for specific end-uses
 - Dynamic simulation models (DSMs) are used to estimate energy use for heating, cooling, fans and pumps, using more realistic profiles and inputs
 - When possible, dialogue is undertaken between the designers and all prospective occupants about likely operating hours and energy management regimes
 - All the energy uses in the building are included, rather than just the fixed building services
 - Comparisons are made against existing energy use benchmarks to ensure that the results are within a range of likely outcomes
 - Results are presented as a range with a high and low energy-use scenarios; providing a range of values acknowledges the uncertainty about predicting energy use

The TM54 approach proposes that spreadsheet calculations are used to establish some of the end-uses and the likely heat gains in the building and then takes the dynamic thermal model to calculate the energy use associated with heating, cooling and ventilation. It is assumed that a dynamic thermal model will have been built to demonstrate compliance with ADL2A, planning policy and so on and simply proposes uncoupling this model from the NCM templates.

All of the calculations rely on structured discussions with prospective occupants to establish how the building is likely to be used, its intended occupancy hours, likely plant-run hours, operating and maintenance regimes and so forth.

The methodology draws heavily on the existing calculations in other CIBSE documents. For example, the lighting calculation is based on the lighting energy numeric indicator (LENI) and the lift and escalator calculations are based on the formulae for estimating energy use included in CIBSE Guide D.

The methodology provides guidance on calculating many of the energy uses in a building and then emphasises the importance of establishing all of the likely

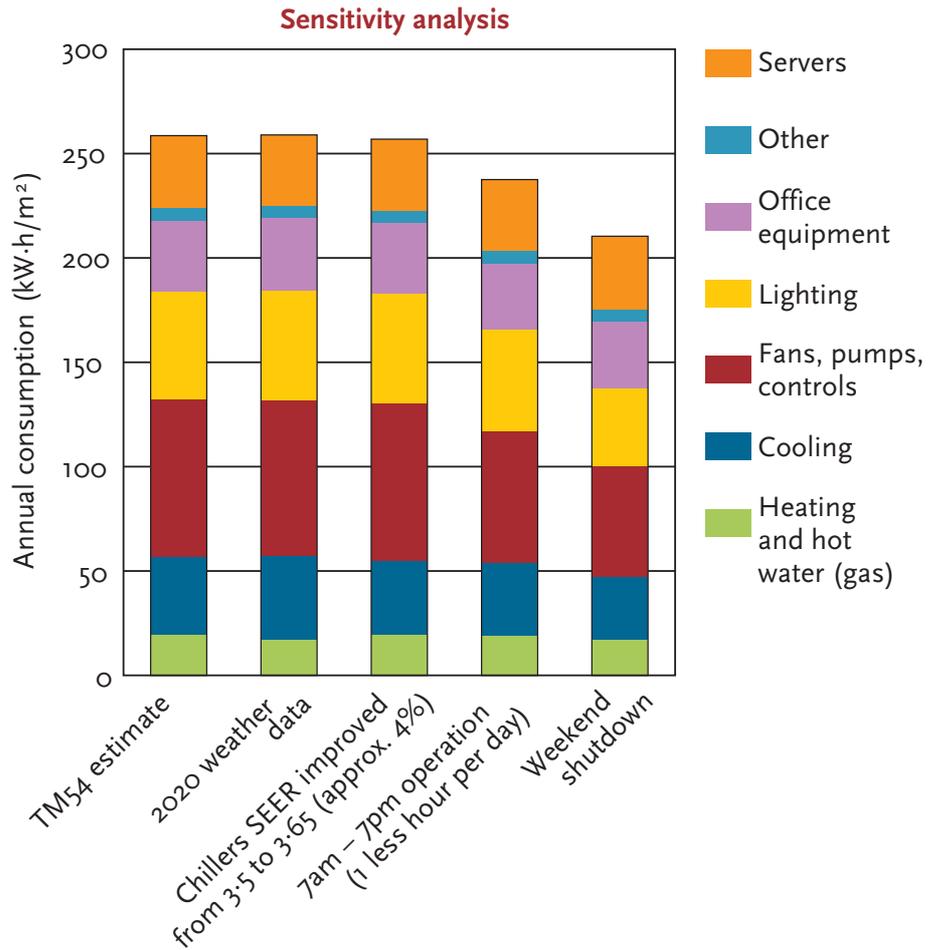
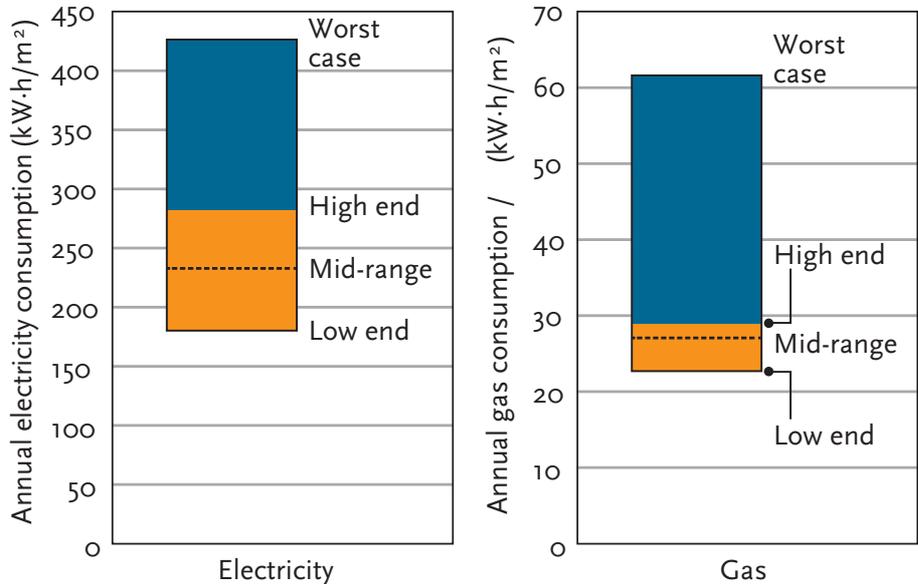


Figure 3: Sensitivity analysis for the case study building



➤ Figure 4: Example of presenting a range of possible outcomes for the case study building



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► end-uses. This energy use can be substantial: in one case study it was found that 60% of the energy use, that for the server room and the catering, was across just 3% of the floor area. This more than doubled the operational energy use over the design estimates.

The guidance explains how to run scenarios and recommends that the sensitivity of different options be tested to determine the potential range of performance. Figure 3 shows a sensitivity analysis of the TM54 case study building. This indicates that a 4% change in the chiller efficiency makes a very small difference in overall energy use, whereas reducing the operating hours by one hour per day provides an 8% reduction, and implementing a weekend shutdown cuts energy use by 19%.

Presenting the results

The guidance then provides examples of how to present the results by using different

scenarios to reflect the level of uncertainty of the estimates.

The results of the calculations, the sensitivity analysis and range of scenarios can be presented as simple graphs showing the overall results (figure 4) and broken down into the different end-uses (figure 5).

In addition to helping designers to estimate performance more accurately, these results will highlight any areas where actual energy use may be higher than a typical building, allowing this to be considered at the design stage. As Davies says: ‘The aim of TM54 is to provide practical guidance to enable the buildings we are designing, or redesigning, to deliver the energy performance that the owners and operators expect, and to reduce their demands for energy in the years to come.’ **CJ**

● **DAVID CHESHIRE** is regional director at Aecom and was a principal author of TM54 along with **ANNA MENEZES** who is a research engineer at Aecom

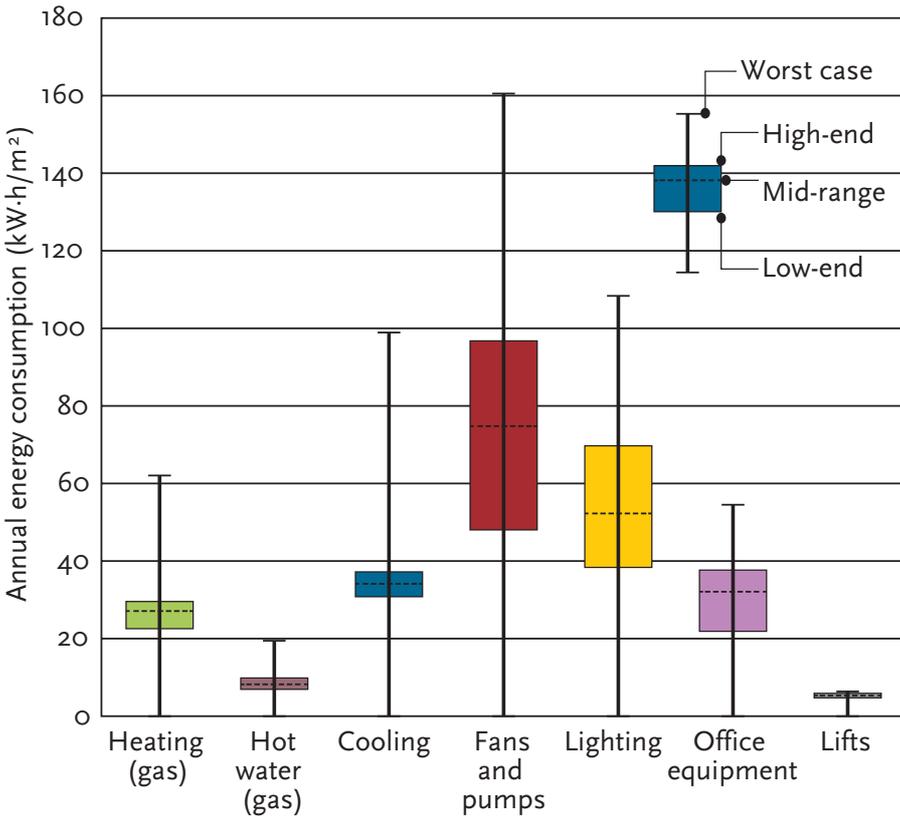


Figure 5: Presenting the results of different scenarios

6 The guidance explains how to run scenarios and recommends that the sensitivity of different options be tested to determine the potential range of performance

TM54 LAUNCH
 TM54 will be launched on 25 September at Prince Philip House, 3 Carlton House Terrace, London. Chaired by CIBSE President George Adams, the event will include an introduction from principal authors, David Cheshire and Anna Menezes, followed by a presentation from Morwenna Wilson on how Argent have been working to close the ‘performance gap’ in their portfolio. For more information go to: www.cibse.org/tm54/launch

TRAINING EVENTS
 The following events taking place at CIBSE HQ in Balham are relevant to TM54:
6 sep 2013 Energy efficiency building regulations: part L
11 sep 2013 Energy strategy reports
24 sep 2013 How to specify a ground source energy system
 For more information go to: www.cibse.org/training



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PEOPLE POWER



New research suggests that giving occupants greater control over their environment is likely to result in lower electricity bills. **Anna Menezes and Richard Tetlow** from Aecom explain all

The construction industry is currently faced with an increasing demand for higher efficiency buildings with lower carbon dioxide (CO₂) emissions. However, extensive research into the operational performance of buildings continually demonstrates that energy-efficient designs don't always result in energy efficiency in practice. In fact, the associated CO₂ emissions of buildings are frequently up to three times the initial design calculations, a discrepancy that has been termed the 'performance gap'.

This situation should be largely unsurprising as typical energy modelling calculations focus on compliance with Building Regulations, rarely considering the actual in-use performance, and in particular the behaviour of the building occupants. The reality is that the energy consumption of a building is heavily influenced by how people interact with their environment, although the extent of this impact is not well understood.

In a recent study undertaken by Aecom, two research engineers aimed to assess the effect of occupant behaviour on the electricity consumption for lighting and small power in a multi-tenanted office building. Prior investigation into the building's electricity consumption for lighting and small power demonstrated significant variations between different

tenants (figure 1). The highest consuming tenant had an annual energy consumption of 155kWh/m², compared with 90kWh/m² for the lowest consuming tenant. But how much of this energy use could be put down to the human factor?

Insights from behavioural psychology

The industry's current inability to accurately account for the impact of people on building energy performance is causing some to question the fundamental assumptions inherent within the design process, and instead to consider what we can learn from other disciplines. In particular, there has been much recent interest in using insights from behavioural psychology to develop a more sophisticated understanding of how people interact with their surrounding environments.

The UK government has even adopted this approach, establishing the Behavioural Insights Team in 2010 with the explicit purpose of applying techniques from behavioural psychology to policy. This has already been influential in the new design of the environmental performance certificate, as well as aspects of the Green Deal, such as incorporating the principle of 'temporal discounting' where people tend to prefer smaller incentives sooner rather than larger incentives later.

Within buildings, developing our understanding of how people's behaviour can affect energy consumption can have implications for a wide range of aspects, from the design and placement of controls to how energy information is fed back to the building occupants.

How the study worked

The study was undertaken at an eight-storey multi-tenanted office building located in central London, consisting mainly of open-plan spaces. To understand how much of the variation in electricity consumption between each tenant could be put down to behaviour, we had to compare metered electricity data with the results of an occupant survey.

Each floor was approximately 2,000m² and was divided into four separately metered zones, providing 32 individual areas that could be let to different tenants.

In order to assess the impact of occupant behaviour on the building's electricity consumption, each of the 32 metered zones was regarded as an individual data collection point. The electricity



consumption for lighting and small power for each zone was collected and then correlated against behavioural scores for each zone, established, using a survey based on the theory of planned behaviour (TPB) – see box. The behavioural scores for each 'predictor' of TPB were obtained through a single-page questionnaire issued to each occupant. The scores were then averaged for each tenant-occupied zone in the building. The average score for each predictor was then compared to the metered electricity in the given zone.

NEW CIBSE TM54

TM54: Evaluating operational energy performance of buildings at the design stage encourages designers to consider the variability in lighting and small power specification by individual tenants occupying the same building. This approach goes some way towards accounting for the variation in energy use by different occupants, prompting more representative estimates of energy use. See Mind the gap on page 34

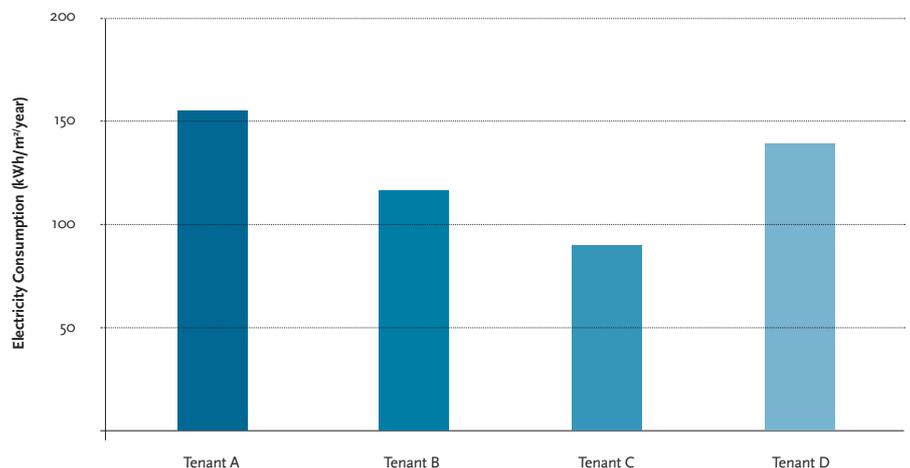


Figure 1: Annual electricity consumption for lighting and small power by tenants

THEORY OF PLANNED BEHAVIOUR

Developed in the Nineties, the Theory of Planned Behaviour (TPB) is one of the most widely applied behavioural models. In essence, it claims that, in order to predict whether a person intends to do something, it is necessary to know the following three factors:

- 'Behavioural attitude' – whether the person is in favour of doing it
- 'Subjective norm' – how much the person feels the social pressure to do it
- 'Perceived behavioural control' – whether the person feels in control of the action

By adjusting these three 'predictors', the likelihood that the person will carry out a specific action can be increased or decreased as required – a concept that is illustrated above.

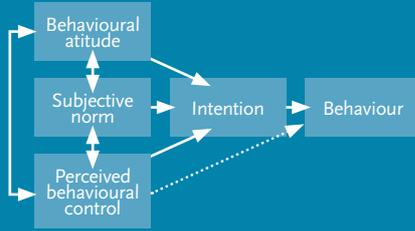


Figure 2: The theory of planned behaviour

A 2010 study by the University of Bristol and Buro Happold used TPB to quantify the impact of occupant behaviour on residential buildings and discovered that, even when factors such as number of occupants and floor area were accounted for, gas and electricity consumption varied by a factor greater than three.

➤ A need for control

The results demonstrated that only one predictor from TPB was having a significant impact on electricity consumption: perceived behavioural control, or whether the person felt in control of the action in question. Analysis revealed that about 17% of the variation in monthly electricity consumption for lighting and small power between building zones could be accounted for by the amount of control that the occupants believed they had. In the building investigated, this implies that lower energy consumption can be expected where occupants perceive themselves to have a high level of control over lighting and appliances. The other predictors – behavioural attitude and subjective norm – were not found to have a significant effect on zonal electricity consumption.

The findings from this study suggest that the more control people perceive that they have over their surroundings, the less energy they consume. This premise goes against the current design trend for more automation in buildings. This highlights the importance of considering how the building users will be able to control their environmental conditions during the entire design process, and suggests a clear benefit in implementing usable and well-located controls, rather than technologies such as passive infra-red detection and other automated services. As controls are often only considered relatively late in the design process, they are highly susceptible to value engineering. Efforts should be made to ensure that intuitive and well-positioned controls are taken into account throughout the design process.

Traditional attempts to reduce the influence of occupants on energy consumption in existing buildings revolve around the assumption that people's behaviour can be altered by providing them with information about their undesirable actions. However, there is evidence to suggest that while this approach may serve to influence attitudes, it often has a negligible effect on actual behaviour. Insights from behavioural psychology can help us to develop a more sophisticated understanding about how we can engage building users and encourage energy-efficient behaviour. **CJ**

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- 1 The Theory of Planned Behaviour. Organizational Behavior and Human Decision Process, vol. 50, pp. 179-211

ANNA MENEZES and **RICHARD TETLOW** are research engineers at AECOM and steering group members of the CIBSE Young Energy Performance Group

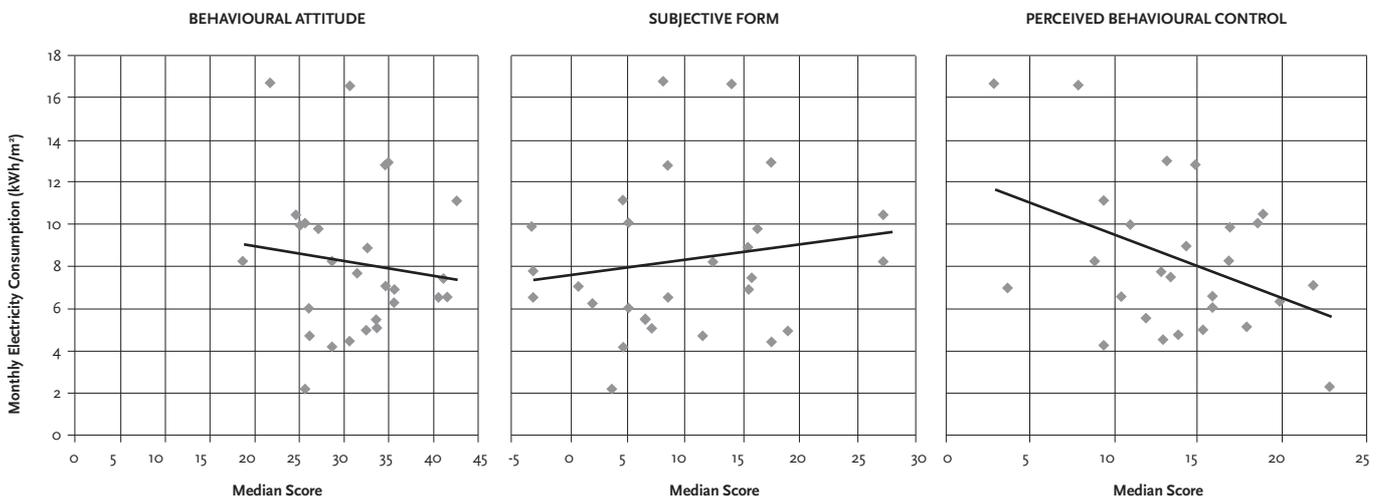


Figure 3: Scatter plots of electricity consumption vs TPB median scores

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Land Securities, one of the UK's largest property companies, carried out a behavioural change programme at three buildings within its office estate in London. **Andrew Brister** looks at the early findings and plans for the future

We are working to help the occupiers of our buildings save money and improve their environmental performance by participating in this initiative

Landlords are responsible for approximately 50% of the energy use in a typical multi-let office, but what of the other half? While it makes sense for landlords to monitor closely the energy consumption that they are responsible for – such as central air conditioning plant, core lighting and so on – it is too easy to lose sight of occupier power use, as well as other environmental considerations such as water use and waste recycling rates.

Land Securities, one of the UK's largest property companies, has set about looking at these issues in detail and has completed

a behavioural change programme at three buildings within its office estate in London. The scheme aims to raise environmental awareness and reduce energy use, waste and water consumption through collaborative engagement in sustainability initiatives. 'Every company wants to improve its efficiency and reduce its costs,' says Land Securities' executive director Richard Akers. 'We are working to help the occupiers of our buildings save money and improve their environmental performance by participating in this initiative.'

Land Securities' occupier engagement programme, run in conjunction with Planet First, was carried out at 5 and 6 New Street Square and 16 Palace Street, London. The seven-month initiative has tackled issues such as energy efficiency, recycling, travel, food, water and procurement.

The pilot came to an end in May 2013 and Land Securities has already started to see



RETAILERS BUY IN TO GREEN FIT OUTS

Land Securities is also looking to change behaviours of its occupiers in the retail sector. Retailers within Land Securities' many shopping centres are responsible for their own fit-outs and the developer recognises that its efforts are often limited by what it can influence when it comes to individual retail units.

In an effort to promote sustainable retail developments and encourage best practice, Land Securities has produced guidance for retailers on how low carbon fit-outs can be achieved in its new and existing retail developments.

The Low Carbon Fit Out Guide – Retail 2012 provides detailed practical guidance on how retailers can potentially reduce energy consumption by adopting best practice fit-out design and specification and effective energy management. The guide includes worked examples and technical analysis to illustrate the benefits, costs and efficiencies of a low carbon fit-out. It was drafted in collaboration with building services consultant Hoare Lea.

The guide was recognised at the CIBSE Building Performance Awards 2013, winning the Training for Building Performance Award.

Land Securities has reduced carbon emissions from its shopping centres by 7% between 2000 and 2011.

improvements at all the sites. Both 5 and 6 New Street Square have increased their recycling average by six percentage points from 74% to 80%, and occupiers at 16 Palace Street have reduced direct energy use in their office space. Land Securities expects to see more positive results in the coming months as the impact of all the initiatives is realised.

'The results so far give us a strong case to propose this for other occupiers across our office portfolio,' says Lizzie Batchelor, environment manager at Land Securities. 'The programme has shown how occupier engagement can bring about change and the key now will be to ensure that long-term change is engendered.'

Occupier engagement followed an agreed environmental programme adapted from Planet First's Sustainability Improvement Programme. From this, monthly sustainability themes were discussed by 'green teams', with a series of actions and events helping to shift attitudes and behaviours among occupiers.

Clearly, getting occupiers on board is crucial. 'A series of initial meetings were undertaken at all sites to introduce the programme and encourage the creation of green teams,' says Steve Malkin, communications director at Planet First. 'At this early stage, it was established that larger groups function

more effectively, setting a more positive tone and fostering an environment conducive to engagement and proactive behaviour.'

Participation has been strong, with more than 95% of occupiers committed. 'The key challenge was the initial engagement with occupiers, as some had concerns over their resource time,' admits Lizzie Batchelor. 'In addition, it was difficult to demonstrate more qualitative outcomes, such as the level of awareness raised and number of individual behaviours that changed.'

Information, ideas and data were regularly supplied to each green team and circulated to all occupants, in order to drive awareness of collaborative objectives as well as report on results achieved. Events were held in lobbies, with external experts brought in to support the programme and share knowledge, including the City of London, City of Westminster, Thames Water, facilities managers NG Bailey and waste contractors, Nordic.

Awareness was further raised via large information screens in the building lobby areas, which displayed sustainability tips relevant to each month. Prizes were awarded to individuals who came forward with good ideas, or who were particularly supportive.

Occupiers have praised the idea. Aran Lane, a member of the facilities team at 16

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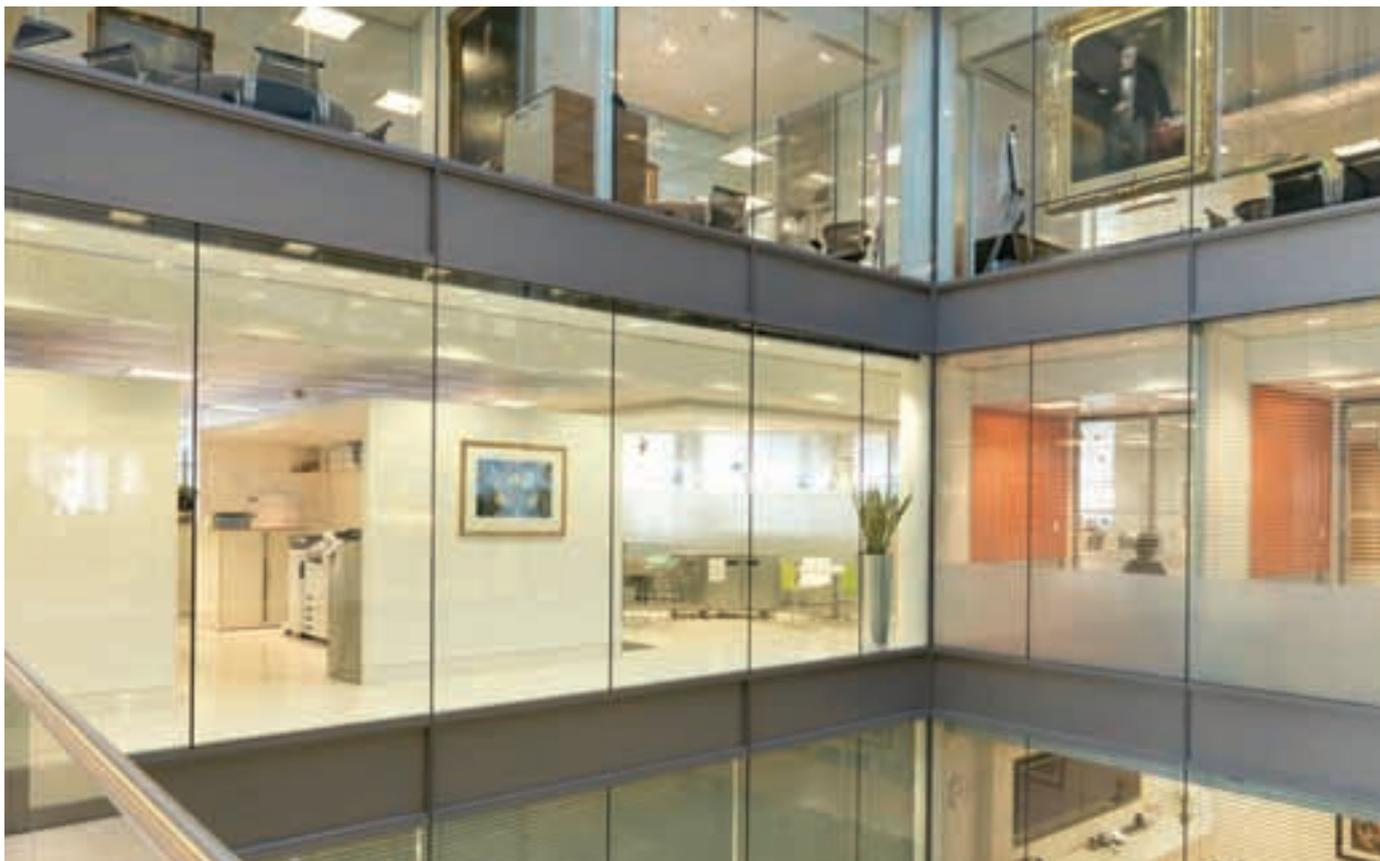


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6 The programme aims to save energy, decrease waste, increase recycling, reduce water use and lower emissions from travel, to help create a more sustainable workplace

▶ Palace Street occupant DP World, says: ‘The scheme has been instrumental in setting up a very proactive green team that has allowed DP World to raise a much higher level of staff awareness on all matters concerning the environment and personal wellbeing.

‘We hope the programme will leave a lasting legacy that will benefit not only the corporate image of DP World or any organisation, but the general wellbeing and environmentally-responsible behaviour of all those who take part.’

The programme aims to save energy, decrease waste, increase recycling, reduce water use and lower emissions from travel, to help create a more sustainable workplace. On lighting energy use, for example, successful measures have included reducing lux levels, changing perimeter lighting and improved control. The building management system at 16 Palace Street was reviewed by NG Bailey to identify further efficiencies.

This building saw an average overall reduction in energy use of 2.24% over occupiers’ areas during the seven month programme. While both 5 and 6 New Street Square saw no significant difference in their overall energy data, Land Securities believes that awareness of the importance of the issue has been successfully raised.

‘One example of this is occupiers’ involvement in Earth Hour, where we

compared average consumption at the building with the same hour on the three prior weeks to calculate the percentage change,’ says Batchelor. The analysis looked at each building as a whole and the demised electricity to each occupier. Overall, each building saw a good reduction, with 5 New Street Square achieving a drop of 15.20% and 6 New Street Square down 11.45%.

Land Securities has highlighted cuts in waste as being one of the main success stories of the scheme. As well as reducing total volumes of waste, the quality of waste segregation has improved. For example, 16 Palace Street showed results in the level of segregation within their dry mixed recycling bags, improving from 76% to 98.6%.

To reduce water use, shower timers have been fitted in all three buildings and half-hourly water meters are also planned. Some occupiers have also pledged to reduce water use through less frequent window cleaning.

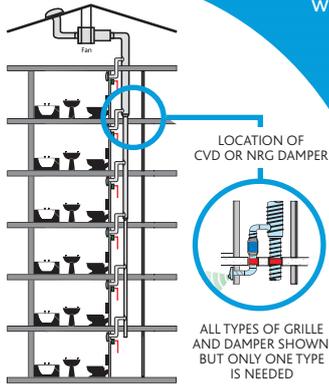
So what next? Occupiers have been sufficiently enthused to continue regular green team meetings at all three buildings and Land Securities is introducing a further programme on two other sites within its London portfolio. Change is in the air. **CJ**

● Land Securities won the Training for Building Performance Award in 2013 with its *Low Carbon Fit Out Guide for Retail 2012*, which aims to help retailers and designers achieve energy savings through efficient design and operation.

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Keep IT TIGHT

Unless buildings are airtight, MVHR systems won't be effective – which poses a particular problem in leaky, existing homes. New research by **Calebre** reveals the extent of that problem

6 Installing an MVHR system in a 'leaky' dwelling increases the building's energy requirements because it increases the air change rate

There is a small but growing market for mechanical ventilation with heat recovery (MVHR) systems in existing homes. In 2009 it was estimated that 15,000 units – worth £30m – were sold annually in the UK, and of these, about 5% were in the retrofit sector.

However, the use of MVHR in existing homes poses immediate questions. Installing any such system presents a technical challenge, as its effectiveness depends on striking the correct balance between optimum heat recovery, fan efficiency, air-flow rate and building airtightness.

But in an existing home, airtightness can be problematic, as it is often difficult to access and address the source of a leak – for example, if service penetrations are located behind fixed installations or constructions.

As there was no information on this, an investigation was conducted by Calebre, the low-energy technology research project funded jointly by Research Councils UK Energy Programme and energy company E.ON.

The findings suggest that existing homes using MVHR must be made significantly more airtight if overall energy savings and carbon dioxide emission reductions are to be achieved.



The E.ON Retrofit Test House which is being used to trial Calebre technologies

What we did

The research used the E.ON Retrofit Test House (figure 1) – a replica of a 1930s semi-detached house. The case study examined the extent to which an MVHR system, fitted as part of an overall retrofit strategy, would reduce energy use and CO₂ emissions. The house was simulated, using dynamic thermal modelling software, at six levels of airtightness, expressed as air permeability values: 10, 7, 5, 3, 1 and 0.63m³/(h.m²) @50Pa.

The upper value of 10m³/(h.m²) @50Pa corresponds with the minimum building standards for new dwellings, and can be achieved by basic draught-proofing measures. It should be noted that air permeability values for existing homes can be higher than this. The lowest value,



What we observed

Installing an MVHR system in a 'leaky' dwelling increases the building's energy requirements because it increases air change rates. The extra air needs to be heated to maintain the internal temperature – although this will be partially offset by heat recovery. Figure 2 shows this increased requirement for the test house, relative to natural ventilation, at air permeability values of 10 and 7 m³/(h.m²) @50Pa.

With an MVHR system specified to minimum building standards, it is necessary to improve the airtightness to 3 m³/(h.m²) @50Pa. At this level, the reduction in space heating energy exceeds the energy expenditure required to operate the system.

It should be noted that the MVHR system uses electricity to operate, which is more carbon-intensive than the mains gas used for the space heating system. This means that a greater reduction in space heating energy is needed to offset the increased electricity consumption and ensure an overall reduction in CO₂ emissions.

For the system operating to best practice standards, the researchers found that energy savings and CO₂ emission reductions were achieved at air permeability values of 5 and 3 m³/(h.m²) @50Pa respectively. In other words, energy savings can be made at a slightly poorer level of airtightness than with the MVHR system operating to minimum building standards. This suggests that in

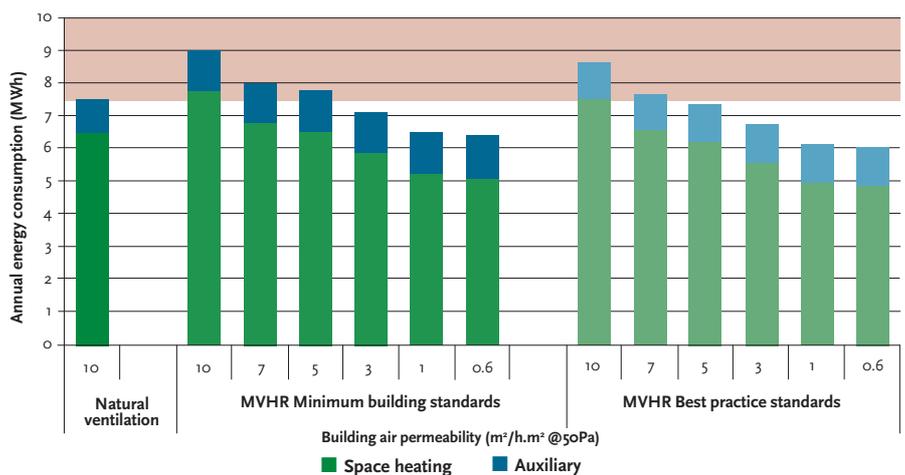


Figure 1: Modelled annual space heating and auxiliary energy consumption of the E.ON Retrofit Test House

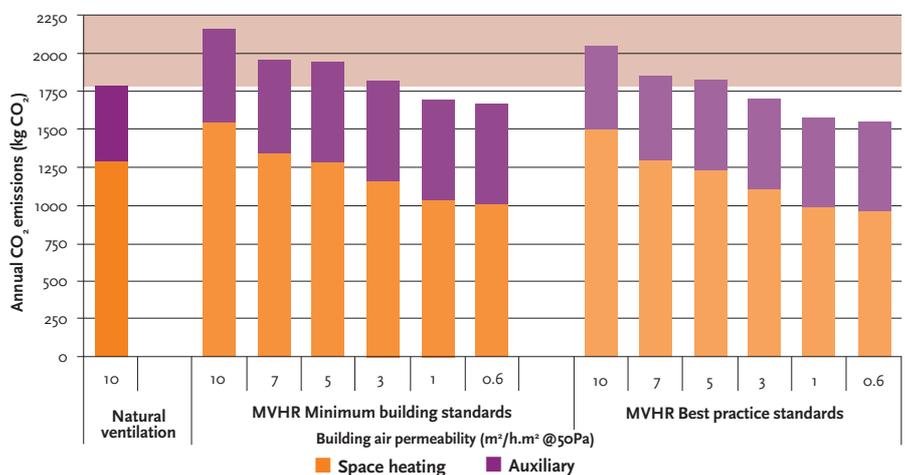


Figure 2 shows that an air permeability of 1 m³/(h.m²) @ 50Pa is needed for an MVHR system specified to minimum building standards to achieve an overall reduction in CO₂ emissions.

0.63 m³/(h.m²) @50Pa, corresponds to the Passivhaus standard of 0.6 ach-1 @50Pa after conversion of units. The mid-range value, 5 m³/(h.m²) @50Pa, represents the measured air permeability achieved by the test house after extensive draught-proofing work.

For each level of airtightness, two MVHR systems were simulated: one specified to minimum building standards, with a specific fan power of 1.5W/l/s and heat recovery efficiency of 70%; and the other to best practice standards, with a specific fan power of 1W/l/s and heat recovery efficiency of 85%. The annual energy consumption and CO₂ emissions were calculated and compared with the simulated naturally ventilated test house – which has kitchen and bathroom extractor fans but no MVHR – at an air permeability of 10 m³/(h.m²) @50Pa.



The simulations indicate that there is potential to reduce both energy use and CO₂ emissions, but real-life savings are only likely to occur if the systems are correctly installed

existing homes where it proves difficult to realise low air permeability values, higher performance systems are needed.

In addition, it may be possible to achieve further savings by using a more complex air flow rate control strategy, provided the ventilation rate can maintain the indoor air quality. Further research on this is required.

The simulations indicate that there is potential to reduce both energy use and CO₂, but real-life savings are only likely to occur if the systems are correctly installed. Calebre Project Briefing Note No. 1 illustrates the need for high-quality workmanship when it comes to draught-proofing and correctly balanced installation. Quality control and training of installers is critical to optimising the operation of these systems.

What we recommend

As a result of the investigation, we concluded:

- The airtightness of existing dwellings must be improved when installing MVHR systems to maximise energy savings and carbon emissions reductions
- Retrofitted MVHR systems should be specified to the highest performance parameters to cope with the higher levels

of air permeability often demonstrated by existing dwellings

- Further research is needed to understand the relationship between MVHR systems and airtightness levels in other building types, and to establish the required air change rate to maintain indoor air quality
- An approved installation process or standard of quality control should be exercised to ensure the optimal operation of the installed systems
- When carrying out airtightness improvements to properties, care should be taken to ensure an appropriate air supply to combustion appliances. **CJ**
- For a copy of the Calebre MVHR briefing email K.L.Chadwick@lboro.ac.uk More information at www.calebre.org.uk

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LIGHTER BYTES

DigiPlex's Air-to-Air modular data centre uses indirect evaporative cooling technology to turn this energy-hungry building type into a model of minimal consumption. **Mike Simpson** reports

6 The evaporative cooling system operates in three modes to remove heat in the most energy-efficient manner



Air-to-Air module section

The DigiPlex Air-to-Air modular data centre has been developed to deliver high levels of cooling with exceptionally low power consumption, while eliminating the risk of fire. Developed in partnership with air treatment specialist Munters and modular frame manufacturer Gardner DC Solutions, it combines indirect evaporative cooling technology with a hypoxic fire prevention system to provide an advanced, sustainable and efficient data centre solution.

The Air-to-Air solution is assembled from three freestanding module types:

a white space, an electrical switchroom, and an air treatment pod (ATP). The white space module is designed to house the IT cabinets; it has a module area of 30m² of net usable space and incorporates a raised floor to provide a route for the chilled air to cool the cabinet racks. The ATP provides up to 100kW of cooling to the white space.

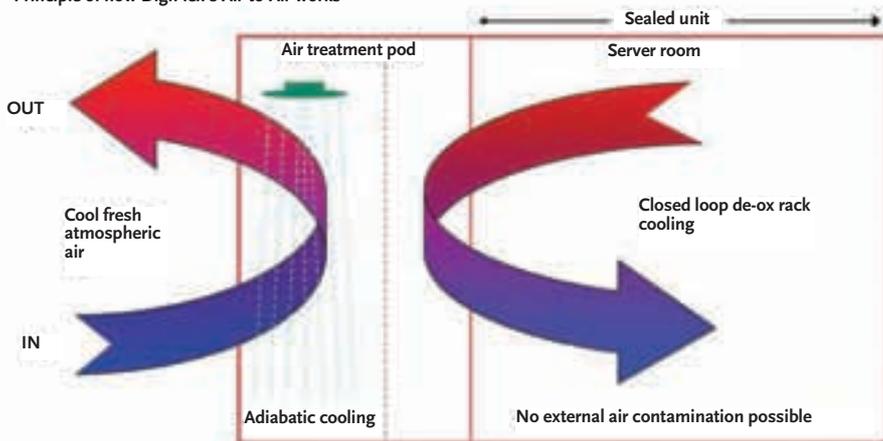
Because it is completely modular, the Air-to-Air solution is easily scalable. Once the shell and basic infrastructure are in place, cooling units and white space modules can be procured and installed as the IT load increases. The minimum build is room², based on three white space modules



An artist's impression of DigiPlex's Air-to-Air modular data centre

Simple Schematic of AzA Principle

Principle of how DigiPlex's Air-to-Air works



➤ matched with three ATPs – two duty, one standby – to provide the necessary cooling.

It is within these ATPs that the key to the data centre's exceptionally low power consumption is found. Each ATP incorporates a low maintenance cooling system that uses the evaporation of water as the principle source of cooling energy, as opposed to the more traditional, energy-intensive, mechanical cooling refrigeration systems based on chillers and computer room air-conditioning units.

At the heart of the evaporative cooling system is a heat exchanger. Here, heat is exchanged between two air streams – cool outside air and indoor air – without them mixing. The outside air enters at the base of the evaporator compartment and is drawn up over a series of ribbed polymer

tubes, removing heat from them before being discharged outside. In the second airstream, 35°C indoor air is drawn into the heat exchanger from the white space hot aisle. It then passes through the polymer tubes, where heat is removed, cooling it to 24°C +/-2°C. The air is then supplied back to the white space cold aisle through the raised floor void.

The evaporative cooling system operates in three modes to remove heat in the most energy-efficient manner. In its simplest mode, the unit is run without supplementary cooling. It will do this when the outside air's dry-bulb temperature (the atmospheric temperature shielded from radiation and moisture) is cool enough to remove sufficient heat from the heat exchange tubes to reduce the indoor air to its set point.

If the outdoor dry-bulb temperature is not low enough, the unit will switch to its second mode, as an indirect evaporative air cooler. In this mode, the heat exchange elements are drenched with a film of water to introduce adiabatic and evaporative cooling effects. To optimise the evaporator's performance and to save on fan energy, the volume of outside air can be varied to match the heat load.

The determining factor in this mode of operation is ambient wet-bulb temperature, which governs the point at which evaporation of water can take place. Where the wet-bulb temperature is only 1 or 2°C below the dry-bulb temperature, it will feel humid and the effect of evaporative

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6 The amount of water and electricity consumed in the ATP can be manipulated by raising or reducing the point at which evaporative cooling is activated

cooling will be reduced. However, even if the outside air enters the unit saturated and at a low temperature, evaporative cooling will still occur when the air is heated as it passes over the heat exchanger; this raises its dry-bulb temperature and enables it to hold more moisture.

The unit also includes a direct expansion (DX) unit to provide a small amount of additional cooling for days when outside air temperature and humidity is exceptionally high. Heat from the DX unit is rejected into the scavenger exhaust air stream, avoiding the need for additional plant outside the facility.

In cool, northern European climates, run-time for the DX unit will be minimal. Research by consultant Cundall Johnston and Partners predicts that for a typical year at London Heathrow airport, DX cooling will be required for fewer than 50 hours. Even in hot, humid environments with the DX unit running, the Air-to-Air solution will show significant running cost-savings over a refrigerant-cooled data centre.

To enable the unit to work cost-effectively anywhere in the world, the amount of water and electricity consumed in the ATP can be manipulated by raising or reducing the point at which evaporative cooling is activated. In northern Europe, where water is plentiful and energy is relatively expensive, it is set up to maximise the benefits from evaporative cooling. By contrast, in locations where water is relatively expensive and energy plentiful, as in the Middle East, the DX unit minimises

the water use in the evaporative cooler.

The energy efficiency of the Air-to-Air solution is demonstrated by its power usage effectiveness (PUE), which is a measure determined by dividing the overall power that a building uses by the energy used in the white space alone. On a conventional data centre, the PUE ratio can be as high as two, which means that computer equipment accounts for only 50% of energy. The Air-to-Air ATP, however, will help to deliver a PUE ratio of less than 1.1. In other words, less than 10% of the energy used by the data centres is spent keeping them cool.

An additional benefit of the energy efficiency of the system is that a smaller power supply is needed for the site. This reduces the utility costs of getting power to site and makes more sites viable. In addition, transformer and generator ratings can be reduced, along with switchgear and cable sizes.

The ATP also has a low rate of water consumption, as water is collected in a sump at the base of the unit and returned to the sprays (the unit automatically refreshes the sump water when it becomes dirty). And, unlike misting systems, it does not need a cleaned or sterilised water supply, instead using harvested rainwater, switching to mains water if the tank falls to a minimum reserve level.

Another major advantage of using evaporative cooling is that it enables the white space to be sealed and positively pressurised. As a result, the Air-to-Air data centre can incorporate the DigiPlex DeOx innovative fire prevention system. This environmentally friendly technology actively eliminates the possibility of equipment catching fire – in stark contrast to systems such as gas suppression, which are triggered only after a fire has occurred.

The DeOx system works by compressing the air, drying it and then passing it through a molecular filter to reduce the proportion of oxygen molecules from 21% to 15%. This means there is sufficient air for humans to work normally, but insufficient oxygen to enable a fire to ignite.

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Corrugated stainless steel tube for use in domestic, commercial and industrial applications

This module considers the application of CSST in the UK market

Corrugated stainless steel tube (CSST) was first developed around 40 years ago in Japan, where gas piping must be able to withstand movement caused by earth tremors. Now used all over the world, its share of UK and European markets is growing steadily.

CSST is manufactured from austenitic stainless steel strip, which is corrugated during the manufacturing process to give it semi-rigid properties, while also maintaining its strength and resistance to impact. This CPD article will relate specifically to the application of CSST in the UK market; local codes and standards will differ around the world.

CSST is mainly used between the outlet of the gas meter – or second stage regulator for liquid petroleum gas (LPG) – and the inlet to fixed appliances, as an alternative to rigid pipe materials such as steel and copper. It can be used in domestic, commercial and industrial applications. CSST in the UK market will be manufactured to BS 7838:1996 *Specification for corrugated stainless steel semi-rigid pipe and associated fittings for low-pressure gas pipework of up to DN 50* and/or BS EN 15266:2007 *Stainless steel pliable corrugated tubing kits in buildings for gas with an operating pressure up to 0.5 bar*.

Both standards result in assured products, but CSST manufactured to BS 7838 may be used in a broader range of situations, such as being routed externally and being buried directly in the ground or screed without additional corrosion protection.

The outer jacket of a BS 7838 product is typically thicker (minimum 0.5 mm) than that of a BS EN 15266 product (which has no minimum specification). The outer jacket of a BS 7838 product is also manufactured and tested to be resistant to the effects of ozone, ultraviolet light and higher temperature ranges.

If a product manufactured to BS EN 15266 is to be used externally or in harsher environments, additional corrosion and mechanical protection needs to be applied, as would be required for rigid steel and some copper applications. Both standards cover first, second and third family gases.

First family gas – Manufactured gases such as coal gas, used in the UK until conversion to natural gas was undertaken between 1967 and 1977.

Second family gas – Natural gas, which is predominantly used in the UK and supplied from the national gas network.

Third family gas – Liquefied petroleum gas (LPG), which includes propane and butane (usually supplied in bulk vessels or cylinders).

Manufacture and supply of CSST

CSST is available in diameters ranging from DN 12 to DN 50 (nominal diameter 12 mm to 50 mm), making it suitable for most domestic, commercial and many industrial gas installations.

Products manufactured to BS 7838 will be certified to a maximum operating pressure

of 0.075 bar, whereas BS EN 15266 allows pressures up to 0.5 bar. As the majority of natural gas installations downstream of the gas meter will rarely be higher than 21 mbar (0.021 bar), and for LPG installations, 37 mbar (0.037 bar) after the second stage regulator for propane and 28 mbar (0.028 bar) for butane, both standards stipulate operating pressures significantly higher than would be typically encountered.

Where higher pressures are required – for example, for industrial processes – the CSST manufacturer should be consulted, as higher operating pressures may be permissible.

CSST is manufactured from stainless steel strip that, when manufactured to BS 7838, falls into the '300 series' classification of stainless steel. Products manufactured to BS EN 15266 will comply with the requirements of BS EN 10028-7 *Flat products made of steels for pressure purposes. Stainless steels*, and may have classifications such as 1.4306 and 1.4404, indicating the properties of the steel, including maximum carbon content and minimum nickel content.

During manufacture, the stainless steel strip is rolled into a tube, with a single longitudinal butt weld along the seam. The smooth tube is then annularly corrugated so it becomes semi-rigid and can be bent and formed by hand. Some manufacturers of CSST anneal (or soften) the stainless steel during the manufacturing process, which can result in the product being less resistant to mechanical damage. ➤



Figure 1: Reels of CSST on site, with pipework routed up external ventilated risers



Figure 2: Reel of CSST with assorted fittings and standard hand tools

► This should be considered when specifying CSST and the environment through which it will be routed. Where a product is not annealed during the manufacturing process, the product will be more resistant to mechanical damage.

Following the formation and corrugation of the CSST, a yellow polyethylene outer jacket is extruded over the bare stainless steel. This is primarily to provide corrosion protection. If the product is manufactured to BS 7838, the outer jacket must contain protection against attack from ozone and ultraviolet light and be suitable for continuous use at an ambient temperature of 95°C. Other provisions that may be designed in to the outer jacket include chemicals that prevent flame spread and reduce smoke density when exposed to a fire.

Manufacturers also need to follow robust quality and testing procedures to ensure the product they supply is gas-tight when it leaves the manufacturing facility. The gas-tightness test involves a pressure test at 2 bar (26 times the maximum operating pressure of a BS 7838-compliant product).

CSST is typically supplied on wooden reels (similar to electrical cable) of various lengths up to 90 m, rather than in the shorter straight lengths of rigid pipe. Some CSST manufacturers also supply shorter lengths in a 'kit' format, typically in lengths under 15 m.

Being semi-rigid and available in long lengths, a significant benefit of using CSST

is that far fewer joints are needed than with rigid steel or copper gas piping, so there are less potential leak sources. It also makes CSST much faster to install than rigid materials.

CSST is also very light compared to rigid materials, so is easier to transport and store on site. As an example, a 45 m reel of DN 50 CSST will weigh approximately 55 kg, compared to more than 200 kg for the equivalent length and size of rigid steel pipe. CSST assembly only requires the use of standard hand tools, eliminating the need for threading machinery/tools and the associated need for on-site electric power. Joint assembly is simple, and the CSST fittings can be reused several times if repair or re-routing is required.

Installation of CSST

Each manufacturer of CSST will provide a range of fittings allowing its CSST to be joined to rigid materials or, if required, to join CSST to CSST – manufacturers' fittings are not interchangeable.

Most CSST fittings form a metal-to-metal seal between the brass fitting and stainless steel pipe. Where this form of seal is achieved, no jointing compound or PTFE tape may be used on the metal-to-metal sealing faces or internal thread section. Some fittings, however, will need a washer (or similar gasket) between the sealing faces to form a gas-tight seal. If this seal is required, it must only be a washer/gasket as specified and supplied by the manufacturer.

There will also be differing methods to form the sealing face on the CSST. Some manufacturers will use a fitting that automatically forms a flare on the end of the CSST when the fitting is tightened; in this case, no specialist tools are required. Other manufacturers require specialist tools for their product.

In all cases, assembly of the CSST fittings must be carried out in accordance with the manufacturer's instructions.

Once the fitting has been assembled and

a gas tightness test completed, any exposed stainless steel needs to be wrapped with the manufacturer's approved tape. This is typically a self-amalgamating silicone tape that forms a water tight seal between the fitting and the outer jacket of the CSST. If this seal is not achieved, corrosion of the stainless steel may occur.

Installation standards

All of the standards below (see table 1) include guidance on how CSST should be installed, but the most important consideration is the CSST manufacturer's specific installation requirements. Both BS 7838 and BS EN 15266 place a requirement on the manufacturer to provide guidance on the installation requirements of its product.

In many cases these will follow the same principles as the normative documents listed above. However, in some cases, the manufacturer's specific guidance will take precedence. It is for this reason that the Gas Safe Register considers manufacturers' instructions to be 'appropriate standards' for compliance with legislation such as the Gas Safety (Installation and Use) Regulations.

General installation practices

CSST is installed following the same general principles as rigid pipework.

Sleeving – Although CSST has a yellow polyethylene outer jacket, it must still be sleeved where it passes through any wall or solid floor.



Figure 3: Section through typical CSST fitting (CSST to male BSP) showing flare for sealing face

Installation standards

BS 6891:2005 +A2:2008	Installation of low pressure gas pipework of up to 35 mm (R1¼) in domestic premises (2nd family gas) – specification
BS 5482-1:2005	Code of practice for domestic butane- and propane-gas-burning installations – part 1: installations at permanent dwellings, residential park homes and commercial premises, with installation pipework sizes not exceeding DN 25 for steel and DN 28 for corrugated stainless steel or copper
IGEM/UP/2 Edition 2	Installation pipework on industrial and commercial premises
IGE/UP/7 Edition 2	Gas installations in timber-framed and light steel-framed buildings
IGEM/UP/11	Gas installations for educational establishments
IGEM/G/5 Edition 2	Gas in multi-occupancy buildings
UKLPG COP22	Code of practice 22 – design, installation and testing of LPG piping systems: 2011
This list of standards should not be considered as exhaustive, as other standards may apply.	

Table 1: A selection of relevant installation standards for CSST



Figure 4: CSST manufactured to BS 7838 being buried directly in the ground

The sleeve itself needs to be made of a material that is capable of containing gas, such as copper, steel or PVC. The sleeve needs to be secured to the fabric of the building (with an appropriate adhesive such as cement), and the annulus space between the CSST and the sleeve sealed at one end only with a non-setting fire-resistant compound. The seal should, where possible, be inside the property, so any potential gas escape within the sleeve will ventilate to the outside air.

Support – CSST must be supported at regular intervals along its length. The maximum interval between supports will depend on the pipe diameter (see Table 2 for example intervals). CSST manufacturers may also specify different intervals, depending on whether or not the pipe is annealed.

Pipework within fire escape routes/shafts – CSST can also be installed in one continuous length through protected shafts and fire escape routes. CSST used for this application will need to meet the requirements of Fire Test A, detailed in Annex A of BS EN 1775:2007 *Gas supply – gas pipework for buildings – maximum operating pressure less than or equal to 5 bar – functional recommendations*. If the CSST meets this standard, it will be deemed to have a minimum 120-minute fire resistance, and will meet the requirements of the Building Regulations for such installations.

Access to fittings – CSST fittings are deemed to be ‘mechanical fittings’ and, as such, should not be concealed within the fabric of the building, and must remain accessible. This does not prevent fittings from being concealed in such areas as risers or ceilings, providing an appropriately-sized access panel is also installed.

Pipe sizing – When sizing a typical gas installation, the maximum pressure drop between the outlet of the meter and the inlet to any connected appliance must not exceed 1 mbar when operating at maximum flow (all appliances in operation).

As CSST is a corrugated pipe, there is a

Nominal Size	Interval for vertical run (m)	Interval for horizontal run (m)
Up to DN 15	2	1.5
DN 22 up to DN 50	2.5	2

Table 2: Recommended maximum interval between pipe supports (taken from BS 6891:2005)

slightly higher pressure drop compared to smooth bore pipes of similar diameter. Sizing of CSST installations follows the same principles as smooth bore pipes but, rather than using the sizing data published in installation standards such as BS 6891, it is prudent to use the data published by the CSST manufacturer. This data will be more accurate than the generic data published in the standards and will, therefore, result in more efficient (and economical) installation design.

Due to the longer lengths available, it is more common to design a CSST installation as a radial system (fed from a manifold), rather than a series pipework installation (which is the traditional UK method). This often allows smaller pipes to be used, which also requires less space.

Burial of CSST – CSST manufactured to BS 7838 can be buried directly in the ground or screed without the need for additional corrosion or mechanical protection. Products only manufactured to BS EN 15266 should not be used in this way. The burial depth will depend on the application. If a pipe is to be buried in the screed in domestic premises, a minimum of 25 mm depth of cover above the pipe would be needed; if buried externally – for example, below a path – it would require a minimum of 450 mm cover above the pipe (Figure 4).

Pipework passing through voids – It is a requirement of the Gas Safety (Installation and Use) Regulations 1998 that any void through which a gas pipe passes must be adequately ventilated. The requirements for ventilation of voids can be found in various installation standards, depending on the situation. Specific details for services in ducts and risers can be found in BS 8313:1997 *Code of practice for accommodation of building services in ducts*.

If a void cannot be readily ventilated, it is possible to pass a duct through that void (which is ventilated at each end to a safe space) and then pass the gas installation pipework through the duct. The benefit of using CSST for this application is that, as it is semi-rigid, it can be passed easily through a secondary containment such as a flexible polyethylene duct. This is often the method chosen by designers where pipework has to pass from a ventilated riser, through an unventilated ceiling void above a corridor, to individual apartments (see Figures 5 and 6).

Flux and other contaminants – If soldering of copper pipework is being undertaken in the vicinity of CSST, it is important that no flux comes into contact with the CSST. Flux is

highly corrosive and will cause pinholing in the CSST in a relatively short space of time. If flux does come into contact with CSST, it should be washed off immediately and the CSST thoroughly dried.

Other contaminants – Chlorine-based products, such as cleaning fluids and some leak detection fluids (LDF), can affect the integrity of CSST. If LDF is used, it must be suitable for use with stainless steel, be non-corrosive and manufactured to BS EN 14291:2004 *Foam producing solutions for leak detection on gas installations*. After use, the CSST should be thoroughly flushed and dried.

By employing CSST, the installation time may be significantly reduced – manufacturers suggest that it can save 75% of installation time – by reducing the jointing needs and allowing the forming of bends by hand. Fewer joints will reduce the opportunity for leaks and will not require threading, welding or soldering. The relatively lightweight two-hour fire-rated material is designed to withstand normal shrinkage and movement in buildings, and when manufactured to BS 7838, can be buried directly in the ground or in concrete screed.

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Turn over page to complete module ➤



Figure 5: CSST inserted into polyethylene secondary containment



Figure 6: Secondary containment passing through unventilated ceiling void (with CSST inside)

Module 56

September 2013



1. When was CSST first developed for general use?

- A About 10 years ago
- B About 20 years ago
- C About 30 years ago
- D About 40 years ago
- E About 50 years ago

2. Which of these is always true for CSST manufactured to BS EN 15266?

- A It is resistant to the effects of ultraviolet light
- B It allows pressures up to 0.5 bar
- C It has a prescribed minimum outer jacket thickness
- D It can be buried in screed without the need for protection
- E It will not be suitable for third family gases

3. Which of these is not a benefit of using CSST?

- A It is light, compared to rigid materials
- B It can be bent by hand without special tools
- C It has a faster installation time than rigid pipework
- D As it is already sleeved, no sleeving is required when passing through walls
- E Being semi-rigid means that it can be 'threaded' through secondary polyethylene ducting

4. Leak detection fluids for CSST systems must comply with which standard?

- A BS EN 1775:2007
- B BS EN 14291:2004
- C BS EN 15266
- D BS 5482-1:2005
- E BS 7838

5. If a CSST was to be buried in a floor of a domestic premises, what is the required minimum depth of cover of screed above the pipe?

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

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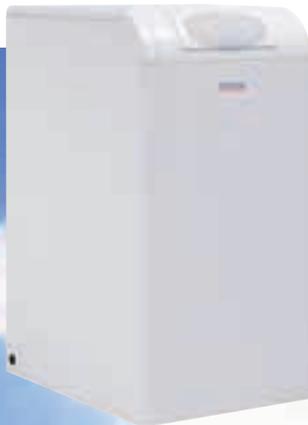
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Vent-Axia celebrates winning tenant services award for innovation

Vent-Axia, a leader in low-carbon technology, is celebrating winning the Best Innovation category at this year's prestigious Tenant Services Awards at Stroud District Council, Gloucestershire. Scooping the award for its revolutionary Lo-Carbon Tempra single room heat recovery unit, Vent-Axia received the accolade at an awards ceremony in Gloucestershire. Part of the company's Lo-Carbo initiative, Vent-Axia's Tempra can be retrofitted through a 100 mm diameter hole in the wall. This allows traditional inefficient extract fans to be easily replaced with this discreet, low-energy alternative.

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A full service installation from Fläkt Woods

Fläkt Woods has designed, supplied and installed six bespoke JM Aerofoil axial fans, complete with inverter drives, to the Western General Hospital in Edinburgh. The project involved replacing six fans which had been in use for more than 40 years, with highly efficient models. The original units were running constantly at an estimated 76% efficiency, whereas the new units are over 93% efficient. Coupled with the new inverters, the running costs have been significantly reduced, ensuring a payback period of less than two years.

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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.

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Gordonstoun School gets a Grundfos pumps upgrade

Founded in 1934, Gordonstoun School is one of the most famous independent public schools whose alumni include three generations of the royal family. Set in a 150-acre estate in Elgin, it provides co-education to 600 day and boarding pupils. Its enlightened approach to education has recently been extended to a review of its infrastructure. This included the boiler house, which had remained unchanged for more than 20 years. With a desire to improve energy efficiency and reduce its carbon footprint, Gordonstoun appointed biomass heat specialist HWEnergy to deliver the best solution. HWEnergy in turn collaborated with Grundfos Pumps to deliver the bespoke pump solution. Now fully operational, the new system combines a range of ultra-efficient members of the award-winning Grundfos MAGNA circulator pump family. Additionally, a ready-to-install packaged pump skid, comprising 2 x Grundfos TPE 80-400/2 energy efficient pumps, was delivered complete with suction/discharge heads and an auto-changeover panel. With a strong reputation for excellence, the school sets the highest standards in every aspect of its operation. This includes the estate management staff, who are delighted with the overall results – including the Grundfos pump solution, which is already proving a worthwhile investment in terms of much lower running costs and significantly reduced CO₂ emissions.

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Rinnai mobilises for CPD training

Rinnai UK is presenting a series of CIBSE/CPD training courses that will offer specifiers and designers a valuable insight into the energy saving properties and benefits of continuous flow gas-fired water heaters. During 2013, the company's 'Energy efficient on-demand water heating seminar' will be available at Rinnai's Runcorn, Cheshire, headquarters in its dedicated training facility, or at a venue convenient to delegates. Courses cover traditional and new technologies for commercial water heating, and highlight where considerable energy and monetary savings can be achieved.



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New non-penetrative carrier for flat roof membranes

Global fixings manufacturer EJOT is launching a multi-purpose carrier system, developed specifically for roofs waterproofed by single ply membrane. EJOT EJObar creates a non-penetrative fixing base for an infinite range of applied systems – typically mechanical and electrical essentials – to be secured to the flat roofing system. EJOT EJObar is supplied in a range of practical lengths and comprises of a PVC profile casing and a strong aluminium insert, all sealed tight by two endcaps.



● Visit www.ejot.co.uk

Aereco launches first fully demand-controlled domestic mechanical ventilation heat recovery system

The latest innovation from ventilation expert Aereco is the fully demand-controlled (DC) mechanical ventilation heat recovery (MVHR) system, the DXR. It is said to be the first fully DC domestic MVHR system, both on supply and exhaust, to be developed. Aereco says it can achieve 92% energy savings, compared with a mechanical exhaust ventilation (MEV) arrangement at constant airflow, while providing the same indoor air quality. Aereco DXR is engineered to adjust ventilation automatically according to the specific



needs of each room when other products in the market propose constant or globally controlled airflows.

● Visit www.aereco.co.uk

Viessmann's new line of brine/water pumps increases output five fold when used in a cascade

Viessmann has launched a new line of brine/water heat pumps, offering outputs from 59 kW to 250 kW. The Vitocal 300-G Pro range is a development of the company's best-selling Vitocal 300-G heat pump series. Maximum output can be increased almost five times, to 1,200 kW, when used in a cascade. Seven outputs are now available: 90 and 120 kW in a single stage, and 90, 120, 150, 180 and 250 kW in two stage units. The new heat pumps are ideal for industrial, commercial and agricultural settings.



● Visit www.viessmann.co.uk

Faster installation and lower maintenance costs with ATAG's new 'Q' Series cascade rig

As part of its policy of continual product development, ATAG Heating UK has introduced an enhanced installation rig for its Q Series condensing boiler's Cascade installations. The rig enables up to three Q Series condensing



system models to be installed in a variety of configurations and, being only 1.5 m in overall height, is particularly suitable where plant headroom is restricted. Advantages of the new rig include faster and easier installation, a reduced surface area requirement and lower maintenance costs.

● Call 01243 815770

UK consultants visit LG HQ and preview next generation of VRF a/c products

LG hosted a party of industry-leading consultants from the UK visiting the state-of-the-art air conditioning product production facility in Changwon, South Korea, to preview new energy efficient and technologically advanced developments. The visitors received an overview of the company, and heard how it is committed to providing a high standard of service. LG, riding high on the global success of its Multi V III VRF, claims to invest more than any other manufacturer on research and development, which extends into sustainable integrated building heating/cooling solutions and heat pump technology.

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





Driving the green agenda

A combined heat and power (CHP) plant managed by Dalkia, a specialist in energy generation and utilities management services, is the efficient source of electricity behind powering the first road-going electric van at the Royal Liverpool and Broadgreen University Hospitals NHS Trust. With more than 20 years' experience in leading energy efficiency projects, Dalkia is the trust's partner of choice in driving carbon and operating cost reductions. With the launch of the NHS's first zero-emission electrical van in the north west in March 2013, the trust has taken a further step towards a greener future.

● Visit www.dalkia.co.uk

Toshiba's technology briefings attract consultants and contractors across the country

Toshiba Air Conditioning, a division of Toshiba Carrier UK, is rolling out a series of technology briefings to update consultants and contractors about the latest developments in air conditioning and refrigerant containment systems. The national tour has already staged events in Manchester, Bristol, Newcastle and London, with further briefings planned for Leeds, Birmingham and Sheffield later this year. The well-attended sessions include details of the company's recently introduced SHRM-i three-pipe heat recovery VRV system, which delivers the best part-load efficiency available on the market today.

● Visit www.toshiba-aircon.co.uk



Multi Service Chilled Beams with ground source in the heart of Mayfair

Multi Service Chilled Beam (MSCB) specialists Frenger have supplied their Radiant passive MSCBs for a prestigious speculative office development operating in conjunction with sustainable ground-source energy in the heart of Mayfair's conservation area. The project, developed for Grosvenor Estates, was rated BREEAM Excellent and completed at the end of 2012, providing grade 'A' office spaces across



five floors. The architectural aspirations for the project were set out at an early stage to provide a unique aesthetic for the building interior and the services contained within.

● Call 01332 295678 or visit www.frenger.co.uk

New recessed air curtains from Dimplex

A new range of recessed high power commercial air curtains that are quicker to install, easier to maintain and packed with energy saving features for end users, has been launched by Dimplex. The new, improved, DAB recessed range, which covers 1 m, 1.5 m and 2 m widths in electrically heated, water heated or ambient and cold store models, offers high output airstreams for entrances up to 4 m high. For the first time, this range of high power models offers dedicated recessed units, which means a faster installation for contractors.

● Call 0844 879 3587 or visit www.dimplex.co.uk/commercial



Lead-free plumbing fittings from Sanha

A range of lead-free components is being launched by Sanha, a specialist German manufacturer of pipes and fittings, ahead of changes to the drinking water regulations coming into force in December 2013. The new European Drinking Water Directive sets a limit for the lead content of drinking water of 0.01 mg/l. With this extremely low threshold, the lead content that can leach into water from standard metal alloys is a problem for contractors. Sanha believes that the only ethical response is to develop materials and products that are 100% lead free.

● Call 01628 819 245 or visit www.sanha.co.uk



New Potterton commercial combi boiler in Surrey care home heating system refurbishment

Baxi Commercial has supplied a new Potterton Commercial iHE stainless steel, commercial condensing combination boiler for installation in a heating system refurbishment at Coppice Lea Care Home in Merstham, Surrey. A major factor in residents' comfort is the provision of a warm and comfortable environment with constant hot water. With these criteria in mind, it was decided to upgrade the heating system at Coppice Lea Care Home with the Potterton Commercial iHE model from Baxi Commercial, the only boiler of its type on the UK market.

● Email Jeff.house@baxicommercialdivision.com, visit www.pottertoncommercial.co.uk or call 0845 070 1055



Bosch Industrial Heating expands into UK steam market with UNIVERSAL range

To fulfil customer requirements and offer a complete industrial boiler range, Bosch Commercial and Industrial Heating is set to expand its product portfolio and bring Bosch's established level of expertise from the continental steam boiler market to the UK. The Bosch UNIVERSAL steam boiler range offers a shell boiler system for all applications with individual outputs, from 175 kg/h to 55,000 kg/h. Its large-scale industrial steam boiler systems are ideal for process driven sites, such as paper mills, breweries and distilleries.

● Email commercial.enquiry@uk.bosch.com, visit www.bosch-thermotechnology.co.uk or call 0844 892 3004

Helva launches 434 EnOcean Gateway

Helvar is pleased to announce the launch of the 434 EnOcean Gateway – a new module that allows the integration of EnOcean controls and sensors into a Helvar DALI lighting network. The 434, which can be wall- or ceiling-mounted and is connected to a DALI network via a standard two-wire cable, will deliver a wealth of energy saving and installation potential for lighting



specifiers, designers and installers. Helvar recently joined the EnOcean Alliance, and the 434 Gateway is the first product the company has launched in a dedicated range currently under development.

● Visit www.helvar.com

Controlled lighting at First Direct Leeds Arena

Lighting at the new First Direct Arena in Leeds is being controlled through a sophisticated lighting management system supplied and commissioned by lighting control specialists, CP Automated Lighting (Northern). The system was selected by contractors Rotary Yorkshire. The control solution provided a fully networked lighting management system using DSI and DALI digital dimming, and an automatic time-scheduled test and monitoring emergency lighting system – all controlled via a single head-end supervisory PC. To achieve this, CP Northern supplied and integrated a range of lighting control modules, DALI gateways and sensors from CP Electronics.

● Visit www.cpnorthern.co.uk, call 0845 0755884 or email sales@cpnorthern.co.uk



Riegens' wide portfolio provides ideal for New Holland Park School

The breadth and versatility of Riegens Lighting's product portfolio has proved ideal for meeting the diverse lighting requirements of the newly constructed Holland Park School in west London. Products supplied include a number of bespoke designs created specifically for this project. Riegens worked closely with the projects' lighting designers to ensure optimum lighting and energy performance in all of the spaces, facilitated by the use of DALI-based lighting controls throughout. In classrooms, special suspended rafts have been created, with recessed luminaires and sensors.

● Email riegens-lighting@riegens-lighting.com, visit www.riegens.co.uk or call 01376 333400



Mikrofill supplies a warm welcome

The St George's Hotel is situated in Llandudno, North Wales. Sufficient hot water production had proved a problem for the establishment, so it turned to Ener-g, a specialist in the energy efficiency market which, in conjunction with installer Heater Services of Rochdale, provided a solution. Access and space within the main plant room was tight, so using 4No Ethos 130 kW wall-mounted condensing boilers with freestanding frames provided the contractor with flexibility.



The oversized calorifiers were removed in favour of 3No Rapide Extreme 500 litre hot water loading systems.

● Call 08452 606020 or visit www.mikrofill.com

Elizabethan manor prepares for bio-fuel changeover

Glynde Place, Sussex, is a traditional country house. Recent refurbishment work has taken place, including the provision of a new R Series light oil condensing boiler by Atlantic Boilers, of Ashton-under-Lyne. The environmentally friendly R Series has an efficiency of between 92% and 99% gross calorific value (GCV). Alongside the new boiler is a 50 kW/500 litre Espresso domestic hot water plate heat exchanger package. The system is designed to changeover at a later stage from the existing (fossil) light oil to B100 bio-liquid.

● Call 0161 621 5960, email Nabeela@atlanticboilers.com or visit www.atlanticboilers.com



KE Fibertec is BIM ready for 2016

If you are looking to use fabric ducting on your building information modelling (BIM) project, KE Fibertec has 1,253 products to choose from in the MagiCAD database. The selectable products span the entire product range, from low impulse systems for laboratories – through inject hybrid systems for classrooms – all the way to Direjet long throw nozzle systems for swimming pools and warehouses. Fabric ducting is bespoke, so a range of lengths and diameters are selectable from the database.



● Call 02380 740751 or visit www.ke-fibertec.com

Remeha provides energy-efficient heating at Hendon Town Hall

Two Remeha Gas 310 Eco Pro condensing boilers have been installed at Hendon Town Hall – the Grade II listed pre-Renaissance building owned by the London Borough of Barnet and leased to Middlesex University – to reduce greenhouse gas emissions and fuel bills. The highly efficient Remeha Gas 310/610 Eco Pro range (outputs from 52 kW to 1,202 kW) delivers exceptional annual efficiencies of 109.35% NCV and ultra-low emissions of all harmful greenhouse gases, including NO_x and CO₂. This is in keeping with the ethos of the University of Middlesex, which strives to minimise its impact on the environment and the local community.

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

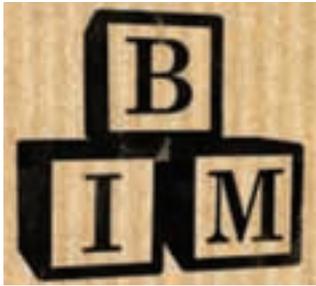


PRODUCTS & SERVICES

Telephone: 020 7880 7614 Email: Patrick.Lynn@redactive.co.uk

Remeha Commercial joins the BIM vanguard

A new added-value service has been launched by Remeha Commercial, offering its customers building information modelling (BIM) objects on all its condensing and 'super condensing' boilers. The free download is available from the company website, on registration, for easy integration into a specific model. The Revit files consist of 3D digital models of the products, with additional asset data on each boiler type, including heat outputs, carbon and NOx emissions, size and weights, service and maintenance areas and maintenance schedules. 'As a leading heating manufacturer, it is vital that we are embracing this level of design and customer service,' said Chris Meir, Remeha commercial's national sales manager.



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

PACAIR renews long-standing relationship with Mitsubishi Electric

Mitsubishi Electric has renewed its five-year rolling contract with bespoke design and air conditioning supplier, PACAIR, following the company's ongoing success as an official value added reseller (VAR). PACAIR offers its services across Mitsubishi Electric's comprehensive range of air conditioning, heating and ventilation products and the contract renewal reflects the continued belief by PACAIR founder Nigel Palmer in the value of relationships in today's highly competitive industry: 'Our sales have gone from strength to strength, despite the incredibly competitive market,' he says.



● Email sales@pacair.co.uk or call 01442 254401

Mitsubishi Heavy Industries Air Conditioning Europe launches a unique product to the UK and European markets

Q-ton is the only product of its kind capable of achieving hot water temperatures of 90°C with a coefficient of performance (COP) of four and above from ambient temperatures as low as -25°C. Launched by Mitsubishi Heavy Industries Air Conditioning Europe (MHIAE) the CO₂ technology heat pump is both cost effective and eco-friendly (0% ODP). What really makes this product special is that it also maintains a COP above 2.3 at -25°C. Currently, MHIAE is the only manufacturer to supply this type of product in the UK and Europe.



● Email katelynn_sturgeon@mhiae.com or call 02070 252750

DIRECTORY Your guide to building services suppliers

Telephone: 020 7880 7614 Email: patrick.lynn@redactive.co.uk

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Closing date: 12 noon on 12 September 2013.

Further particulars and an application form are available on our website: www.uea.ac.uk/hr/jobs/ or Tel. 01603 593493.



Senior to Associate Mechanical, Electrical, C&I Engineers

Reading, Berkshire, £35 - £65p/h DOE

Our client is a market leading firm of consulting engineers and project managers offering security engineering design and project management services that secure and protect the built environment. They have multiple long term contract vacancies for degree qualified engineers at senior to associate level that possess extensive building services, nuclear, pharmaceutical, or process experience. Due to the sensitive nature of the site at which you will be working, all applicants must be British passport holders. BAR1364/CB

Principal Mechanical Design Engineer

London, £50 - £55k + car + benefits

This is a career changing opportunity with an international multi-disciplinary consultancy with a staff count of 400 operating in 20 countries worldwide. As a key member of the design team, you will lead the engineering design on projects, and contribute to their operational delivery by supporting the team Associate with a variety of managerial tasks. BAR 1332/JA

Intermediate Electrical Design Engineer

Circa £34k + benefits, Central London

A unique opportunity has arisen within a dynamic team of highly experienced consulting Building Services engineers. This consultancy specialises in the development of sustainable buildings through innovation and technical expertise. They are in a period of expansion, and require a self-motivated engineer with a passion for environmentally friendly design that can work closely with the team in delivering state of the art solutions to green buildings. BAR2099/TA

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

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Mechanical & Electrical Associates | London | to £70K | ref: 4056

A world renowned multi-disciplined consultant requires both Mechanical and Electrical Associates with excellent leadership and management skills to join their team due to expanding workload and continued growth. Excellent opportunity for career progression!

Electrical Design Engineer | London | to £30LTD or £40K | ref: 3596

A large M&E consultant requires a contract or permanent intermediate Electrical Design Engineer to work on a variety of prestigious projects. Experience using Amtech and Dialux would be preferred. You should hold a minimum qualification of an HNC.

Principal Mechanical Design Engineer | London | to £35LTD | ref: 4027

Our client is a busy blue-chip M&E contractor. Candidates will join their open-plan, vibrant office and work on a variety of projects including schools and data centres. This is a client facing role.

Electrical Design Engineer | London | to £35LTD | ref: 4013

Our client is a leading M&E consultant working on a number of hotel and private residential developments at stages D-F. Candidates will have proven experience working on projects at detailed design stage. Long term contract opportunity!

Mech Project/Design Engineer | Greater London | to £33LTD | ref: 4045

Our client is looking for a Mechanical Project/Design Engineer to work within their Facilities Management department. Working on plant replacement schemes, you will be managing numerous projects at a time as well as maintaining existing client relationships.

Electrical Design Engineer | London | to £320LTD per day | ref: 4004

A market leading M&E contractor with a full order book of major rail projects is looking for a senior Electrical Engineer to join their established team. You will need previous hands on design experience working to Network Rail or LUL standards.

t: 02392 603030
e: cv@blueprintrecruit.com
www.blueprintrecruit.com

0845 408 1705
sol-rec.com



Senior Electrical Design Engineer, London (SE1), £50k + Bens

We are currently working with one of the most reputable Award Winning Multi Disciplinary Consultancies based in the UK, who also have several offices across Europe, Asia and the Far East.

Established for over 50 years, they have built up a portfolio of top end projects and employ only the best architects and engineers. Their ethos is to work with clients and the community to create special places for living, shopping, working, culture and learning.

This newly created position is working within the Sustainability Design Team. As well as in-depth Electrical Design experience and a desire to work on Environmental Projects, you will also need to have an understanding of other building design disciplines. The client sector for this particular role will be office workplace and clinical/scientific sectors.

Other Opportunities

HVAC Principal Design Engineer	Up to £34.00 p/h	High End Residential
P.H. Intermediate	Up To £45k p.a	City of London
HVAC Senior Perm	Farringdon	High End Residential
Associate Electrical	Up to £60k p.a	Farringdon (Workplace)
Senior HVAC Design Engineer x 2	Up to £48k p.a	Berkshire
Electrical (Senior)	£34.00 p/h	West End of London

Chris Murphy: cm@sol-rec.com
Simon Lee: sl@sol-rec.com



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Principal Electrical Design Engineer | Cardiff
£40,000 Plus Benefits and Car Allowance

We are currently working on behalf of a well-established UK based building services consultancy with a large network of regional offices. They are currently looking for an Electrical Design Engineer to take a lead role and oversee junior engineers on specific projects. This is a fun and exciting place to work with an enviable portfolio of clients. The ideal candidate for this position will have a minimum of 7 years' experience within a building services consultancy and will, ideally, be chartered and qualified to degree level. This is a fantastic opportunity for a passionate engineer to gain experience from one of the leaders in the industry.

Senior Mechanical Engineer | Cambridge
£45,000 Plus Benefits

This opportunity is to work for a large engineering consultancy, who have offices in Cambridge. They currently require a passionate Senior Mechanical Engineer to help run projects, and become an integral member of an experienced team of MEP building services engineers, some of who will be partly under your responsibility to develop and manage through a varied portfolio of projects. This portfolio includes project types such as residential, commercial and educational, and it is therefore essential that you have experience of working within these sectors.

Associate Director | Central London
£65,000 Plus Benefits

An elite building services consultancy is currently seeking an enthusiastic, talented and experienced individual to join them at Associate Director level, with the view of becoming a full Director within 18-24 months. Undertaking projects from major housing developments, commercial and international hotels, to major new settlements, you will be expected to run the Mechanical team and assist with the management of all building services engineers on a number of projects, ensuring the team undertake detailed design to the required standards, deliver projects on time and profitably and manage technicians and graduates. At a project level, the role will include Project Director duties. The ideal candidate could come from a mechanical background, ideally be Chartered and have previous experience of running teams on projects within a building services consultancy.

Contact: george@conradconsulting.co.uk | 0203 159 5387
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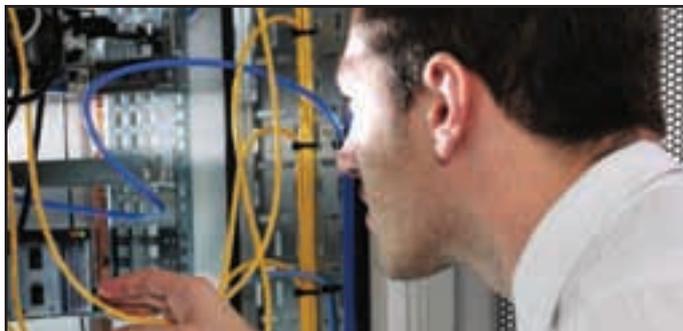
Successful candidates should come from a building services design background and hold a relevant degree. Applications from engineers with previous experience of large scale retail and hotel schemes, and/or stadiums will be of particular interest.

The initial requirements are for three months, and in addition to the hourly rate, the package will include return flights, car, and accommodation. Subject to satisfactory completion of the initial period, there may be an opportunity to join on a permanent basis.

BAR1236/PA

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

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Senior Principal Building Services Engineer (Lifts)

£50,700 - £57,970 p.a. inc
depending on experience/performance
Ref: SUR188

Overseeing a caseload of building services engineering work, you'll focus on lift engineering projects. This will include the design and control of alterations and improvements including major maintenance and refurbishment works. An experienced professional engineer, preferably Chartered, you'll have substantial experience of contributing to the management of property services at a strategic level.

Senior Principal Building Services Engineer (Electrical)

£50,700 - £57,970 p.a. inc
depending on experience/performance
Ref: SUR189

Focusing on electrical engineering projects, you'll manage a caseload of building services work. The role encompasses both maintenance works and the upgrade of properties for re-presentation to the market. An experienced professional engineer, preferably Chartered, you'll have substantial experience of contributing to the management of property services at a strategic level.

Graduate Building Services Engineer

£31,160 - £35,300 p.a. inc
depending on experience/performance
Ref: SUR190

From preparing feasibility studies to monitoring contractors' performance, you'll assist in the management of complex, high-profile building services projects. You'll make particular use of your mechanical engineering expertise and will need a degree in Building Services Engineering or a related field.

For more information and to apply online, please visit www.cityoflondon.gov.uk/jobs.
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A Minicom service for the hearing impaired is available on 020 7332 3732.

Closing date: 12:00 noon on 30 September 2013.

Interview date: w/c 7 October 2013.

Please do not send your CV



The City of London Corporation is committed to Equal Opportunities and welcomes applications from all sections of the community.



Events & Training

NATIONAL EVENTS AND CONFERENCES

2013 RIBA Stirling Stories with *The Observer*
 10 September, London
 The RIBA Stirling Prize 2013 shortlisted architects come together in a public event to reveal the stories behind their buildings.
www.architecture.com

The limits of thermal comfort: avoiding overheating in European buildings
 23 September, London
 Overheating has become a key problem for building design. This half day seminar will bring you up to date with the current guidance and standards.
www.cibsetraining.co.uk

Presenting the industrial strategy: government and industry in partnership
 24 September, Sheffield
 Peter Hansford is among speakers at the event, organised by BIM4SME – Sheffield and Hull & Humber City region. A *Question Time* format will discuss the opportunities for small- and medium-sized enterprises and the potential of BIM.
www.rics.org/uk/tag/bim

CIBSE Young Engineers Awards 2013
 9 October, London

The winners of the CIBSE ASHRAE Graduate of the Year and Employer of the Year awards are announced at the Institution of Mechanical Engineers (IMechE).
www.cibse.org/events

CIBSE GROUPS AND SOCIETIES

For more information visit
www.cibse.org/events

Golf outing
 5 September, Belfast
 A Northern Ireland region lunchtime golfing trip to the Rockmount Golf Club.
d.willis@blgroup.co.uk

Conservation and control of water at the point of use
 10 September, London
 A Society of Public Health Engineers evening event, with a technical talk by Delabie.
www.cibse.org/sophe

Energy and Behavioural Change, Panel and Workshop
 12 September, London
 A panel debate followed by a workshop to discuss how building services engineers can influence energy consumption at concept, in design, facilities management and in use. A Home Counties North West region event.
www.cibse.org/events

Keep calm and carry on – Cooling
 18 September, London
 Cooling and humidification event, critical environments, and an update from Trox and BIM4FM work.
www.cibse.org/events

Blue Roof Thinking
 18 September, Manchester
 A free Society of Public Health Engineers event, with presentations from WSP Group and Harmer Drainage/Alumasc Rainwater.
www.cibse.org/sophe

Appeal v Economy – New developments in Glass Fibre Reinforced Concrete (GFRC)
 19 September, London
 A free event from the Society of Façade Engineering. Booking is essential for the Stefan Falkner, of Rieder Smart Elements GmbH, lecture.
www.cibse.org/sfe

Lifts – BS EN 81
 24 September, Chelmsford
 A Home Counties North East region event, with a speaker from Titan Lifts.
Robert.harness@uk.ebmpapst.com

SLL Lighting Code 1 (LG1) – Lighting the Industrial Environment
 2 October, Birmingham
 Doors open at 6pm for a 6.30pm start. Light refreshments are provided.
www.cibse.org/events

CPD TRAINING

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

Energy Efficiency Building Regulations: Part L
 6 September, London

Introduction to building services
 10 September, London

Energy strategy reports
 11 September, London

Introduction to IET Wiring Regulations for Electrical Installations: BS7671
 13 September, London

Earthing and bonding systems
 17 September, London

Lighting and energy efficiency
 17 September, Leeds

Fire detection and alarm systems for buildings – BS 5839 Part 1 2013
 18 September, London

Introduction to energy efficiency
 19 September, Manchester

Part B (Fire Safety) of the Building Regulations
 19 September, London

How to specify a ground source energy system
 24 Sept, London

Electrical distribution design
 24 September, London

Rainwater harvesting and greywater recycling in the sustainable environment
 25 September, London

Emergency lighting to comply with fire safety requirements
 26 September, London

Low and zero carbon energy technologies
 26 September, London

ENERGY ASSESSOR TRAINING

For more information visit www.cibsetraining.co.uk/energyassessor

CPD – writing a comprehensive and compliant air conditioning report
 10 Sept, Leeds

Energy Performance Certificate training
 11 Sept, London

Air conditioning inspection for buildings
 26 September, London

CPD – Energy Performance Certificate Conventions
 1 October, London

iSBEM training
 2 October, London



The CIBSE Building Performance Awards 2014

11 February 2014, London

The CIBSE Building Performance Awards entry deadline is fast approaching on 12 September 2013. Judges are looking for entries from the most innovative businesses, teams and individuals that deliver excellence in low energy products, building projects and training.

There are 14 awards up for grabs, including the new International Project category for new or refurbished projects (outside the UK). Other categories include Carbon Champion of the Year, Building Services Consultancy of the Year and Client of the Year.

Entrants are asked to demonstrate high levels of user satisfaction and comfort, and outstanding measured building

performance, energy efficiency and reduced carbon emissions. Judged by a panel of distinguished industry leaders, winning a CIBSE Building Performance Award is one of the most prestigious accolades in the building services industry and demonstrates commitment to energy reduction.

Entry to the Building Performance Awards is free, and details of how to enter can be found at www.cibseawards.org

The shortlisted entries will be celebrated, and the winners announced, at a dedicated awards ceremony at London's Grosvenor House hotel on 11 February 2014.

Book your place online at www.cibseawards.org for what promises to be an entertaining and informative evening.



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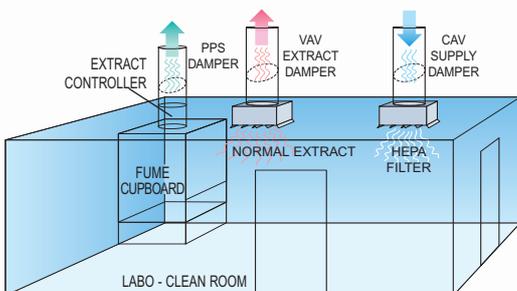


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