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The official magazine of the Chartered Institution of Building Services Engineers

May 2011

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020 8772 3697. Individual copies are also available at a cost of
£7 per copy plus postage.

Cover photo: Shutterstock

The energy saving figures do add up

The Great British Refurb should be at the top of the government's agenda and the centrepiece of the nation's attempts to meet its emissions-cutting targets, right? Most of those attending last month's CIBSE national conference would probably have answered 'yes' to such a question if they'd been polled on it. But their conviction on this issue may well have received a jolt from the dry facts and figures presented by one of the speakers, Simon Harris, a senior cost consultant.

Harris's number-crunching showed that, for large commercial buildings, the cost of making significant improvements can be very high, the payback can take decades – and a building's Display Energy Certificate may be taken only one notch higher (rising from a G to an F rating, in one case study cited by Harris). This seemed like a grenade being quietly thrown into the conference arena – the event, after all, was focused on 'the great refurbishment challenge'.

However, the key messages from the wide range of conference

speakers and delegates did add up to a robust defence of refurbishment as central to cutting emissions. The real economic basis for this approach is not that refurbishment simply may not be 'cost-effective': it is that policymakers and the built environment sector need to ensure both refurbishment and new-build projects take a 'fabric first' approach, reducing the requirement for expensive fitting and retrofitting of high-maintenance technologies that may not, in fact, do the job.

Removing the need for high energy use in the first place is the best economic approach to cutting emissions

for expensive fitting and retrofitting of high-maintenance technologies that may not, in fact, do the job.

In other words, removing the need for high energy use in the first place offers the best economic approach to cutting emissions in coming decades.

The key message is: we need to be raising the bar on refurbishments now, and keep raising it. Educating and incentivising property owners and developers to adopt this approach is the right way forward. There really is no alternative.

Bob Cervi, Editor

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In Brief

DEVELOPING GREEN AMBITIONS

The UK government has backed a global scheme aimed at helping developing countries to reduce their carbon emissions. The World Bank's Partnership for Market Readiness will help countries set up their own carbon trading systems, to allow more investment in green technologies across the world and to help stimulate private-sector low carbon investment opportunities.

www.decc.gov.uk

RAMBOLL ACQUIRES GIFFORD

Danish engineering firm Ramboll has announced an agreement to acquire Gifford, a leading UK engineering and environmental consultancy. Gifford LLP will join Ramboll UK Ltd to create one of the UK's strongest and broadest multidisciplinary engineering and consultancy groups, with nearly 1,000 employees. The acquisition forms part of Ramboll's strategy for growth.

ATKINS CUTS 1,000 JOBS

Engineer WS Atkins has confirmed it has cut 1,000 jobs since September, reducing its total number of employees to 17,500. The company said in a trading statement for the year ended 31 March that it was adjusting its workforce to meet challenging market conditions, after increasing numbers to 18,500 in the previous 12 months.

JOHN LEWIS TRIALS FUEL CELL

Retail giant John Lewis has agreed to trial alkaline fuel cell technology to generate low carbon electricity at one of its stores. The firm has signed a memorandum of understanding with Surrey-based AFC Energy to look at the potential costs and savings of installing the technology. John Lewis has pledged to reduce its emissions by 15% by 2020.

Schools review calls for streamlining of design

● Report on procurement process leaves some questions unanswered, says critic

Large savings can be made by streamlining the ways schools are procured, designed and built, says the long-awaited James Review set up after the closure of the Building Schools for the Future programme last year.

There is often a lack of expertise among those responsible for procuring school buildings – usually head teachers – which has been one of the main reasons that opportunities to improve buildings or reduce costs have been lost, says the report, Independent Review of Education Capital, which was produced by a task force led by Sebastian James, a director at retailer Dixons.

James's central recommendation is an increase in the remit of Partnership for Schools, which it says should act as a central body in the procurement process and should be involved in negotiating contracts with construction firms.

On the standardised approach to drawings and specifications, the report states that problems have been caused by an 'ad hoc' process: 'Among the many knock-on problems this has created are high costs (of both design and build), variable quality, a need for every school to pass through an arduous cycle of checks and balances and no opportunity for improvement'.

The Review recommends that a suite of drawings and specifications should be developed across a wide range of projects. These drawings should cover the layouts and dimensions of the spaces and walls, and details of how different materials and components



School design is at the centre of the proposals

will be fixed together. The specifications would be a written description of the standards and performance required of the materials and components that make up the building.

Neil Bentley, deputy director-general of the CBI, praised the notion of centrally-approved designs as 'a sure-fire way to make significant savings' and urged the government to respond swiftly to the recommendations.

However, Mike Entwistle, associate director of Buro Happold, described the Review as 'something of a let-down, with many questions left unanswered'.

'What will be standardised and when will guidance be available,' he asked, adding: 'There is a risk that much of the good work done over the last 10 years is now to be forgotten.'

English schools need at least £8.5bn of repairs, according to civil service estimates that were passed to the *Financial Times*. This does not include repairs that were expected to be remedied by the scrapped £55bn Building Schools for the Future programme.

However, the Department for Education saw its budget slashed by £16bn in the coalition cuts, leaving schools facing bills for their own repairs. Half of England's schools were built between World War Two and the mid-1970s, so are becoming life-expired. Many of the constructions still contain asbestos.

'There is a risk that much of the good work done will now be forgotten'
Mike Entwistle



Key recommendations

- The use of standardised, consistently improved and updated drawings and specifications in the design of future school buildings
- The retention of budget for demand-led programmes such as free schools
- The avoidance by the Department of Education of multiple funding streams for investment, which could be managed more productively at a local level
- Apportioning notional budgets to local authorities under a specific process, enabling local and national demands to be prioritised

For more information visit:
www.education.gov.uk

UK misses target on renewables

● Figures confirm doubts over targets, says report from energy foundation

The UK failed to reach its 10% renewable electricity target for 2010, producing just 6.5% of electricity from renewable sources, despite a subsidy to renewable generators of £5bn during the previous eight years.

The Renewable Energy Foundation (REF), which published an information note commenting on data from DECC and Ofgem, says the figures confirm long-standing doubts over the UK's future targets.

John Constable, director of policy and research for REF, said: 'The EU's renewable targets have long been known to lack credibility and clarity of purpose.'

'The UK results we are publishing today show that, in spite of very high costs to consumers, the 2010 target has been missed by a large margin and the EU 2020 target is plainly beyond reach.'

'The counterproductive target-led renewable policy agenda to 2020 has now reached the end of the road, and should be replaced with a more



feasible and reasoned strategy,' Constable said.

Meanwhile, the Carbon Trust has released figures suggesting that the UK is poised to grab a 10% share of the global offshore wind market – a sector set to grow by 10%. The report stated that the industry could contribute a total of £100bn to the UK's finances between 2010 and 2050 – as well as creating 230,000 jobs in that time.

'The EU's renewable targets have long been known to lack credibility and clarity of purpose'
John Constable

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MPs seek more answers on planning pledge

A vaguely worded environmental pledge in George Osborne's Budget statement has prompted MPs to push for further clarification.

The statement said: 'Councils are spending 13% more in real terms on planning permissions than they did five years ago, despite the fact that applications have fallen by a third.'

'Yes, local communities should have a greater say in planning, but from today... we will introduce a new presumption in favour of sustainable development, so that the default answer to development is "yes".'

But the Commons Environmental Audit Committee has asked the government to explain what 'a presumption in favour of sustainable development' is, fearing that current standards of sustainability could be watered down.

Its report says: 'We are concerned that the intention to introduce a presumption in favour of sustainable development might not be accompanied by a statutory description of what that means.'

'As a result, the principles of sustainable development - living with environmental limits, ensuring a strong, healthy and just society, achieving a sustainable economy, promoting good governance and using sound science responsibly - are unlikely to be adequately represented in the planning process.'

www.parliament.uk/eacom



The government's zero carbon homes policy faces further strong criticism

WWF resignation adds to ministers' zero carbon woes

● Environmental group walks out of Zero Carbon Hub in protest at policy change

The government's plans to introduce zero carbon homes has received another blow, as a leading environmental group has joined condemnation of an apparent watering down of the policy.

WWF-UK announced that it had resigned from a government advisory body, the Zero Carbon Taskforce, in protest at the change to the zero carbon homes policy that was announced in the March Budget.

Last month the UK Green Building Council and other organisations criticised the announcement in Budget documents that new homes will not have to source all their energy from carbon-neutral sources from 2016.

WWF said in a statement: 'By removing appliances and their energy use from the definition, this policy can no longer be defined as "zero carbon".'

'The change effectively transfers the task of

providing clean energy for these homes from the housebuilder to the wider power sector.

'It will make decarbonising the grid by 2030 (as recommended by the Committee on Climate Change) that much harder and, by transferring the costs from the housebuilder/homeowner to energy bill payers

in general, what was a private cost for a homeowner now becomes a cost for the general public, regardless of income and ability to pay.

'WWF can therefore no longer work with the taskforce, nor support the policy.'

Colin Butfield, head of campaigns at WWF-UK, added: 'It is a shattering blow to find out, without consultation, that the government has taken a

decision to undermine both climate and housing legislation.'

Paul King, chief executive of the UK Green Building Council, had previously accused ministers of conducting a 'U-turn' on the zero carbon homes policy, saying 'a zero carbon home will no longer do what it says on the tin.'

'Government has taken a decision to undermine both climate and housing legislation'
Colin Butfield

Movers & Shakers | The latest appointments in the sector



Allan Mann BSc, PhD, CEng, FREng, FStructE, MICE has won the 2011 Institution of Structural Engineers Gold Medal award for his exceptional contribution to the advancement of structural engineering.



Surrey-based engineering and sustainability consultants, Flatt Consulting, has appointed **Kristian Johnson** as technical director.



Lee Thompson has been appointed as an associate at the Surrey-based engineering and sustainability consultants, Flatt Consulting.



Sustainable energy technology business ENER-G has appointed **Yan Evans** as group business development director. He is a chartered engineer, and is a member of several institutions.



Neil Thomas has been promoted to managing director of Atkins' UK water and environment business. He previously led its highways and transportation (UK) business.



Donald Lawson has taken over as the worldwide chief executive of multi-disciplinary consultants, Atkins, this month. Previously he was Faithful+Gould's UK chief operating officer.

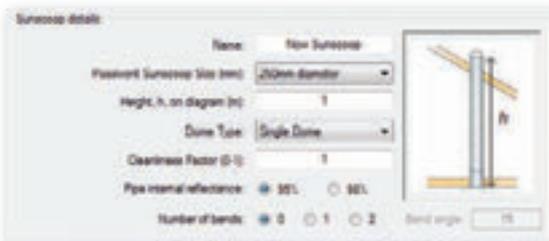
Introducing Passivent Sunscoop™ Builder

WHAT IS IT?

Passivent Sunscoop Builder is a new unique software tool, to help architects and specifiers accurately and quickly assess the impact of natural daylighting on a building's thermal/energy performance. It has been developed by leading software house Environmental Design Solutions Ltd (EDSL) - which complements the already proven Passivent Airscoop Builder tool for natural ventilation of buildings.

WHAT IS TAS?

Tas is a building thermal analysis tool commonly used for calculating energy consumption and assessing peak summer temperatures. It is approved by the CLG for Part L calculations and for producing EPCs (energy performance certificates). The positive impact of Airscopos on room ventilation and of Sunscoops on the room daylight factor can easily be incorporated into these calculations. Tas has a long history of modeling naturally-ventilated and mixed- mode buildings to a high degree of accuracy.



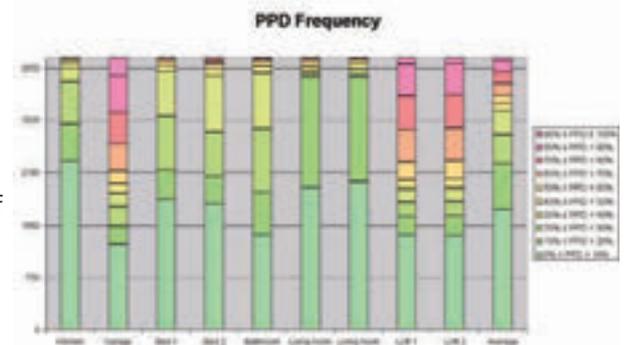
WHAT DOES THE UTILITY DO?

Passivent Sunscoop & Airscoop Builder has been purpose designed to interface with EDSL's established Tas building thermal analysis tool, which is the first dynamic simulation modeling (DSM) of its kind to be approved for both Building Regulation Approved Document L2 and the Energy Performance Certificate. The Passivent programme adds a further dimension to the Tas Building Designer system, which already calculates performance taking into account the long-term dynamics affecting the building according to its location and orientation.

WHY USE IT?

Available as a free download from www.passivent.com and www.edsl.net, Passivent Sunscoop Builder enables users readily to model the building daylight factor to BRE methodology, taking account of Passivent's Sunscoops and Sunstruct. It also enables calculation of the number and size of Sunscoops required to achieve a given internal illuminance, enabling their associated impact on energy and carbon performance to be assessed.

For more information see www.edsl.net
and www.passivent.com



In Brief

RHI BIOMASS WARNING

The charity Environmental Protection UK has warned that the Renewable Heat Incentive (RHI) risks increasing air pollution in towns and cities. The scheme will make payments to households that install eligible systems, including biomass boilers. But figures recently released by the Committee on the Medical Effects of Air Pollutants suggest that pollutants from biomass systems could be causing 200,000 premature deaths a year.

WYG SELLS UK UNIT

Consultancy WYG has announced the sale of part of its UK engineering business, Adams Kara Taylor (AKT) to AKT2 Limited, a company backed by AKT management and Tyréns AB for a cash consideration of £3.75m. WYG (then White Young Green) acquired AKT in November 2006; since then AKT has operated under WYG's ownership as a near stand-alone entity.

ASSISTED LIFESTYLE FUNDING

Up to £18m is to be invested by the Technology Strategy Board in a project aimed at showing how technology and innovation can help support older people and those with disabilities to live independently. It is hoped that the DALLAS programme (Delivering Assisted Living Lifestyles at Scale) will help to grow the sector within the UK. www.innovateuk.org

MERGERS ON THE RISE

The number of mergers and acquisitions in the construction sector rose sharply in the first quarter of 2011 – doubling the number of deals done in the last quarter of last year – according to Grant Thornton LLP. The finance company's Construction M&A Tracker noted that there were 28 deals in January, February and March – the highest level of deals since the second quarter of 2010.

A two-stage process for the roll-out of smart meters has been revealed by government



Timetable set for mass roll-out of smart meters

● Minister announces two-stage process for widespread meter installation by 2019

A timetable has been set for the installation of 53m smart meters in 30m homes and businesses in Britain between 2014 and 2019.

The Department of Energy and Climate Change (DECC) has set out a two-stage process for the roll-out of the smart meters.

The 'foundation' stage of the roll-out, which is already underway, involves DECC working with industry, consumer groups and others to building and test the equipment, according to DECC.

During this stage the government will also establish a company to provide data and communications services for the smart metering system nationwide.

The mass installation programme will then begin in 2014 and is expected to take around five years.

Energy Secretary Chris Huhne said: 'Smart meters

are a key part of giving us all more control over how we use energy at home and at work, helping us to cut out waste and save money.

'In combination with our plans to reform the electricity market and introduce the Green Deal for homes and businesses, the rollout of smart meters will help us keep the lights on while reducing emissions and getting the best possible deal for the consumer.'

By 2020, the average consumer of both electricity and gas is expected to be saving around £23 a year on energy bills as a result of the new meters, according to DECC.

Data gathered as a result will allow energy companies to bill more accurately and plan more comprehensively for the future, ending the practice of estimated billing.

The announcement follows a consultation called The Smart Meters Prospectus.

'The roll-out will help us keep the lights on while reducing emissions'

For more information visit: www.decc.gov.uk

UK slips down green growth league

The UK is falling behind other countries in the race to meet environmental targets, as government cuts are seeing schemes delayed.

In 2010, the UK ranked third in the world for investment in green growth, but it has now slipped to 13th according to a report by the Pew Environmental Group.

China now tops the table with other developing countries, including India and Brazil, also outranking Britain.

Ministers have been debating whether to accept recommendations by the Committee on Climate Change that would require the UK to cut 1990 levels of carbon

emissions by 60 per cent for 2030.

However, there are departmental divisions between the Department for Energy and Climate Change, which wants to bring in tough targets to stimulate green growth, and the Treasury and Department for Business which would like less challenging targets as Britain recovers from recession.

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Energy Bill is a key chance to extend DEC's, say experts

● Report on DEC's argues case for wide roll-out of the certificates

There is a key opportunity to use the current Energy Bill going through Parliament to make Display Energy Certificates (DECs) mandatory for all commercial building occupiers.

A report from a cross-industry group of experts, disclosed in last month's *Journal* and now published by the UK Green Building Council (UKGBC), calls for DEC's to be widely extended.

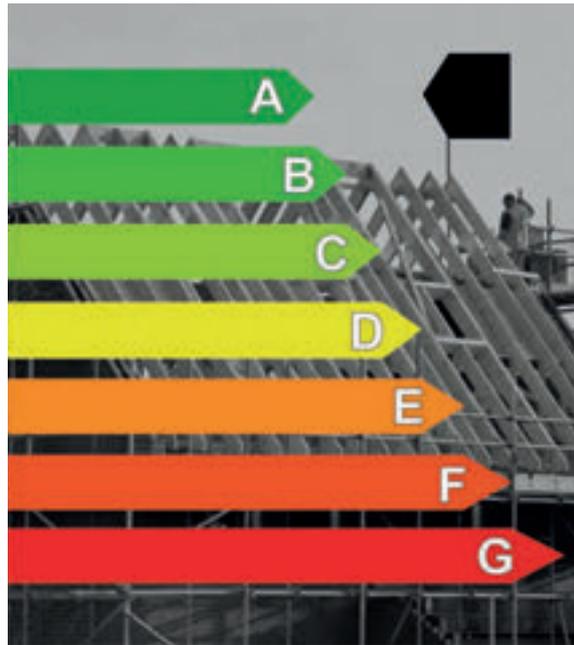
Carbon reductions in existing non-domestic buildings looks at how DEC's and the Carbon Reduction Commitment Energy Efficiency Scheme (CRC) could be better married to help reduce energy use in commercial buildings.

UKGBC chief executive Paul King stressed the importance of measuring data before action could be taken to reduce consumption.

He said: 'The property sector urgently needs to go on an energy diet but, to do so, it has to be able to accurately measure and report on its energy use. DEC's do exactly that and should be rolled out to all buildings as soon as practically possible.'

CIBSE's technical director, Hywel Davies, said: 'The headline message is that DEC's have the potential to save energy in commercial buildings and we are already seeing that in the government estate.

'The UKGBC report makes a strong



case for rolling out DEC's to motivate people to manage their building energy use better.'

In tandem with the report, CIBSE has also carried out its own technical review of the DEC benchmarks, which has broadly given the benchmarks a clean bill of health.

'DEC's are a very good way of showing people where they can save energy, reduce their costs and cut emissions, and in doing so, contribute to the UK energy deficit,' said Davies.

One of the main problems with DEC's at present is that the landlord cannot always be held responsible for a tenant's energy use, while a tenant has no control over how the rented building they occupy was designed or controlled, and hence, its energy efficiency.

But the taskforce believes DEC's can be applied to all building types, if some changes are made to the methodology used to produce a DEC for both a landlord's services and a building's occupier.

The government recently published its Carbon Plan, which confirms ministers' commitment to extending DEC's to the commercial building sector in October 2012. The UKGBC report recommends that a phased roll-out of DEC's should begin in 2012, which it says could be set down in law via the Energy Bill. The bill is primarily concerned with introducing the Green Deal programme.

As regards cost, the task group recommends that buildings with DEC ratings of F or G should be subject to a rigorous energy assessment to encourage metering, to improve both ratings and building performance.

A DEC for this would rely on basic data, such as the building's type, area, occupancy hours and energy use.

According to the report, DEC's could also be used to capture the emissions data of other greenhouse gases, emitted through activities that do not stem from the use of a building's services – for example, from manufacturing, process and construction emissions.

However, it concedes that

it will not be possible to capture all such emissions in a DEC league table.

In light of the change to the CRC from a trade and cap scheme to a carbon tax, the taskforce found that industry felt a trading mechanism was still deemed to be the most efficient way of easing the cost burden on businesses, while acknowledging that a tax would be the best way of overcoming the current landlord/tenant issues in the short term. The report recommends that the cap and trade scheme is reintroduced in the future.

See the benchmarking article on page 28

'The report makes a strong case for rolling out DEC's to motivate people to manage their energy better'
Hywel Davies

KEY RECOMMENDATIONS

- Annual Display Energy Certificates (DEC's) should become mandatory for all non-domestic building occupiers, with a phased roll-out starting in 2012.
- Annual DEC's for landlords' services should become mandatory, starting with multi-let non-domestic buildings over 1,000 sq m, with a phased roll-out.
- It should be mandatory for landlords to pass data to occupiers; this should be based on the Landlord's Energy Statement (LES).
- DEC's (for occupiers and for landlords) should be introduced to non-domestic buildings via a 'mandatory soft start' in 2011-12, to take place prior to the formal display of certificates from 2012-13.
- Once the scheme is fully established, the DEC data should be publicly and freely accessible, with an official review of the data published annually.
- A system should be developed to enable DEC's to be aggregated to produce a range of league tables based on occupiers, landlords, sectors, buildings types and uses.
- There is a need to increase the pool of suitably accredited DEC assessors to meet the increased demand.
- An independent, funded technical body should be established to review data and benchmarks, and deliver technical support for DEC's.

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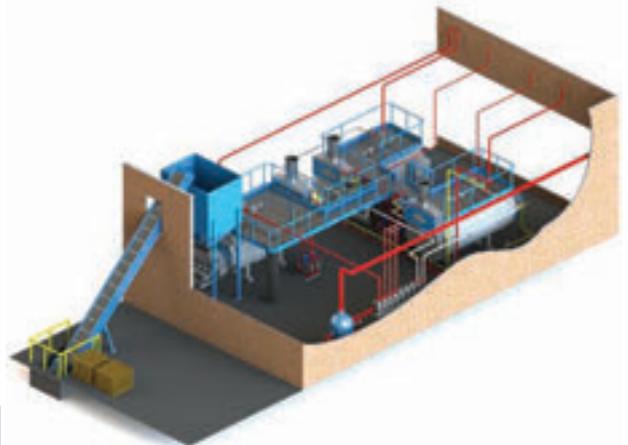
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Sustainability winners announced

This year's CIBSE Sustainable Design and Research in Engineering and Built Environment award (SDAR) was won by Michael Keohane and Declan Leonard. Their winning paper was on University College Cork's Western Gateway Building – a case study for the 'Integration of low temperature heating and high temperature cooling systems'.

The CIBSE Republic of Ireland branch launched the Sustainable Design competition in 2009. It is organised by the department of electrical services engineering at the Dublin Institute of Technology, and sponsored by John Sisk and Son.

The award aims to encourage innovation and evidence based evaluation in building services engineering. It is different to other 'best project' competitions in that it is intended to encourage research, disseminate knowledge and raise the level of innovation in schemes. Entries must evaluate what they are doing and examine mistakes as well as successes in an open way on innovative projects.

For more information visit www.cibseireland.org

Big Bang inspires engineering explosion

● Education and careers fair raises awareness of building services

The Institute once again attended 'Big Bang: UK Young Scientist and Engineers' Fair', thanks to generous support from CIBSE Patrons.

The three-day education and careers fair is led by Engineering UK, and was held at London's Excel venue in March. Targeted at nine- to 19-year-olds, it aims to inspire young people by bringing STEM subjects (science, technology, engineering and maths) to life.

More than 28,000 people attended, including 20,000 young people – helping to cement this as the largest single celebration of science and engineering for young people in the UK.

This year CIBSE was based in the Careers Hub, which was organised by Engineering UK.

Representatives from CIBSE's Young Engineers Network (YEN) helped man the stand, answering questions about what building services engineers do, how they differ from other engineers in other sectors, and what particular contribution they make to society. Their presence helped to raise awareness of building services engineering to many who may not have heard of it before.

YEN volunteer Karen Settle said: 'To be given the opportunity to encourage and inspire young minds, to make them aware of the endless possibilities that come with a career as an engineer, and to possibly



Big Bang... inspiring engineers of the future

To be given the opportunity to encourage and inspire young minds is priceless

find the engineers of the future, is priceless. The pupils and teachers I spoke with were very open to engineering and were fascinated by its diversity.'

The event also hosted the National Science and Engineering Competition, as well as including

shows from Sky television's *Brainiac*, BBC's *Bang Goes the Theory* and the BBC's Wallace and Gromit 'World of Invention' roadshow.

Next year's Big Bang will take place in Birmingham from 15 to 17 March 2012.

For more information visit:
Big Bang and regional events
www.thebigbangfair.co.uk
Young Engineers Network
www.cibse.org/yn

Working with government to make the Green Deal a reality

There has been much discussion in recent months about the Green Deal, which is intended to encourage property owners to improve the energy efficiency of their homes and premises by installing energy saving measures, such as insulation.

These works will be funded through a finance package and repaid out of the energy savings achieved by installing these measures. The 'golden rule' of the

Green Deal is that the projected savings must be sufficient to cover the costs of installation, and if they are not, then there will be no finance.

While the focus of the discussions has been on the domestic Green Deal policy, government also wants small and medium-sized businesses to avail themselves of Green Deal finance to improve their business premises. This will require a

mechanism for assessing the likely savings, specifying the appropriate measures, and for financing them. The Department of Energy and Climate Change is working with industry to identify how these tasks might be carried out, and what further work will need to be done to achieve that.

CIBSE is engaged in the discussions and is seeking to ensure that the proposals will support sound energy

saving measures, and that the processes for assessing buildings and providing advice will be robust and provide reasonable protection for government, financiers and building owners alike.

As further details become clear we will be providing information on CIBSE's Knowledge Bank.

For more information visit:
www.cibse.org

Calling extraordinary employers!

If you're an employer who puts the development of young engineers at the heart of your business, and shows innovation and commitment to developing their skills, make sure you enter the Employer of the Year awards.

The awards, presented by CIBSE YEN, reward organisations that proactively champion young people in the industry.

The closing date for entries is 6 May. Winners will be announced on 7 July at Millbank Tower, London, at an event sponsored by Baxi Commercial Division. For further details and an entry form, visit www.cibse.org/awards

Final fees reminder

Members are reminded that payment of subscriptions was due on 1 January. For those who have not yet paid, they risk being lapsed, and so will no longer receive the benefits of membership.

Anyone who has not renewed their membership before 9 May will not receive the June edition of *CIBSE Journal*, or any future issues, until payment is received.

You can renew your membership online at www.cibse.org/payments, or contact the subscriptions department on **020 8772 3655**.

CIC launches new skills website

The Construction Industry Council (CIC) has recently launched a new skills website.

The site, at www.cicskills.org.uk, includes a range of resources for those looking for information about working in the construction industry, including DVDs for schools and a new careers pack, *A Professional Career in the Built Environment*, which is free to download. The website also provides an employers' toolkit, which offers practical support for educational outreach and career opportunities for young people.

CIBSE has its own careers factsheets, which are specific to the building services industry and are available free from www.cibse.org

CPD continues to prove useful to members

Continuing professional development is thriving

The CIBSE CPD Panel recently sampled a total of 70 CPD returns, following receipt of 683 returns that were received in 2010.

Overall, feedback was positive. Returns that were sampled generally demonstrated a wide range of activities, including e-learning, distance learning, on-the-job learning, private study and reading, mentoring, seminars, formal courses/lectures and giving presentations.

There were, however, a couple of issues identified by the panel.

The majority of individuals had not recorded their objectives for the year; at the start of the year members are requested to identify their objectives – determining the skills and knowledge needed to achieve these, and produce a plan taking into account learning opportunities available, time and resources required, and a date for completion.

These should be recorded in the 'objectives' section.

At the end of the year, members should then

evaluate the learning achieved and whether objectives had been met or were outstanding, giving reasons.

The second issue was that there was no information on the 'employer comments' section of the return form. Feedback from members' employers is useful to establish whether they directly or indirectly support CPD. Employers should

be aware of how CIBSE membership benefits them. Brief information on the background of members (that is, the section of the industry where they work) is also useful.

All CIBSE members, and CIBSE low carbon energy assessors and air conditioning inspectors, are required

to keep their CPD online record up to date. This feedback should help members maintain useful and complete records.

CPD is not difficult to demonstrate and there are a vast range of activities that can contribute to your development.

Returns that were sampled generally demonstrated a wide range of activities

To view an example of a completed CPD record on the CIBSE website, visit www.cibse.org

New course to offer management training to engineers

A five-day course offering higher level management skills for building services engineers has just been launched by the University of Reading.

The open-access course, titled 'Management for Building Services Engineering', forms an MSc module and can be studied as part of the university's full MSc in Intelligent Buildings, or completed as a stand-alone course contributing to an individual's professional development.

The course was developed in response to needs identified by employers, with concern raised that the changing and increasingly multi-skilled nature of the sector requires better, higher-level management skills than those provided by more traditional personnel development routes.

It has been developed with extensive input from industry



The new management course will help meet engineers needs

stakeholders, including CIBSE, SummitSkills, the Electrical Contractors Association, the Heating and Ventilating Contractors Association, EAL, Bovis Lease, Gratte Brothers, and Moving Ambition.

Content includes: important new insights into strategic management; managing stakeholders; project planning;

marketing to customers and building customer confidence; and stimulating staff retention and skills development. The course also includes a site visit where participants will be encouraged to apply what they have learnt.

The first course will start on 6 June. To find out more contact Dr Abbas Elmualim at a.a.elmualim@reading.ac.uk.

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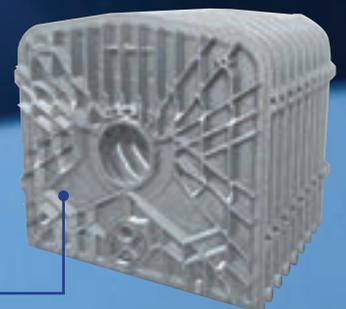
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RISING TO THE

REFURB CHALLENGE

Reducing the UK's carbon emissions to meet the government's 2050 target will require enormous effort, including tackling the energy efficiency of 28m existing buildings over the next 40 years. This year's CIBSE national conference, entitled 'One building a minute – the great refurbishment challenge', threw up many solutions and unresolved issues ahead. **Bob Cervi** and **Carina Bailey** report

Make feedback a contract requirement

CIBSE president Rob Manning told delegates what he believed are the challenges currently facing an industry that is tasked with refurbishing some 25m homes, to meet the government's legally binding carbon reduction target of 80% by 2050.

Manning said a shortage of time, an absence of an established refurbishment industry, a shortage of skills and know-how, a lack of political will and incentives, and the sheer scale of integration needed to deliver retrofitting were the main issues stopping the industry from getting on with the job.

'What we do now is work to a linear process; it isn't joined up as the

'What we do now is work to a linear process; it isn't joined up as the government would like to see it joined up, as I would like to see it joined up'

Rob Manning

government would like to see it joined up, as I would like to see it joined up.

'I think energy efficient refurbishment also needs better integration to reduce energy demand.'

But there is another, even more important factor that needs to be introduced as a matter of urgency, according to Manning.

'Above all, we really do need to make measurement performance and feedback a contract requirement; it's not good enough just to have practical completion.'



Rob Manning



Panel members, left to right: Bill Gething, Ian Meikle, Paul Finch and Terry Wyatt. Kate McCormick is out of view

Clients are looking to buy performance

Industry needs real, properly audited case studies to make green buildings credible, David Frise, head of sustainability at the HVCA, told delegates.

The issue was a recurring theme throughout the one-day event. 'Credibility is a big issue,' said Frise. 'If the industry lacks credibility, we have a problem.'

Credibility is so important because, in the current climate, low carbon refurbishment is 'simply the only game in town'.

We really need to get involved in this in a big way,' according to Frise. 'Clients



David Frise

are increasingly buying the performance, but not the product.

'There's a mass industry out there - some call it the renewables industry, for example - that is actually not delivering.'

For the UK government, said Frise, it's about two things: carbon targets and energy security. But, said Frise: 'We can't deliver what many, many people are asking for, which is an energy generation system entirely predicated on renewables. If people accept blackouts, then we can do it, but nobody's going to do that.'

Frise accused engineers of not valuing what manufacturers do, but he also claimed that manufacturers very rarely put right blatant defects with their products.

'We need to incorporate manufacturers better because they have a huge amount of expertise to deliver on renewables and their people have done all the training.'

Still no answers to some fundamental questions

In the conference's closing session, a panel of experts debated key issues raised by delegates.

Paul Finch from CABE said that the industry should not put all its eggs in one technology-solution basket. 'The idea that we should exclude potential sources of power - such as extracting energy from shale - would be wrong.'

But Terry Wyatt, consultant to Hoare Lea, retorted that it was more important to reduce the requirement for more energy use.

He added: 'I believe nuclear energy is the wrong way forward. We should be going for "dynamic demand management" which, for much less cost, can do a lot better.'

Architect Bill Gething said the industry still lacked the answers 'to some very fundamental questions' when it comes to the performance of buildings.

'The idea that we should exclude potential sources of power would be wrong'
Paul Finch

Ian Meikle from the Technology Strategy Board said it is still very difficult to get feedback from building performance. 'Some buildings are out of control and need managing,' he added.

Kate McCromick from contractor SPIE Matthew Hall said that it was also difficult to get investment for

district heating systems, because potential investors balked at a likely 30-year payback period for such schemes. 'Can we take some of the risk away from them?' she asked.

Sleepwalking into an energy crisis

The UK has been sleepwalking into a national energy crisis, and now has no clear policy to follow to create a firm retrofitting strategy.

Professor David Fisk of Imperial College London gave the stark reality-check to delegates, declaring that the bigger picture was now 'at least as unclear as the small picture'.

Part of the problem, explained Fisk, who is a CIBSE vice-president, was that during the boom years,

not only was too much emphasis placed on new builds, but designers never said that growth was going too fast.

He criticised industry for constructing new buildings that aren't going to be around in 2050 - despite what the figures currently predict today.

'We are an energy importer; we don't use our own coalfields anymore,' said Fisk. 'We are at the moment getting a quarter of our

gas via ships going through the no fly zone in the middle of a Middle Eastern war! And all this we have sleepwalked into.'

He was also critical of how 20,000 heat pumps had been installed into developments, with no recorded performance of how well they work in practice.

'Nothing ever works the first time, but if there's no feedback it will be first time instalments every time,' said Fisk.

No payback for some improvements

'Energy efficiency will come along as a virtue, but it won't come along if you're thinking purely about the economics,' said Simon Harris, of quantity surveyor Cyril Sweett.

He told delegates during a session on cost planning for refurbishment projects that the Golden Rule – the point at which the Green Deal is made economically viable – will determine whether the policy is a success.

He said: 'The Golden Rule is all about savings that are generated from investment, which must be greater than or equal to the investment in that measure – it could become the Green Deal breaker.'

Research on the issue of costing refurbishments has revealed that certain



Simon Harris

fabric improvements made to a building don't pay for themselves, claimed Harris, while renewable measures appear to have a bigger payback, but still not enough to close the gap between initial spend and eventual savings.

'If the Golden Rule is going to be strictly applied, we're going to find only the very bad performing buildings will get funding – the low hanging fruit.'

Feed-in tariffs and the Renewable Heat Incentive will also have a direct bearing on the economic case. Reviews of these tariffs are being undertaken now, and no doubt will be again in the future, which will impact on the business case of undertaking refurbishment projects.

Harris suggested that industry needs to map the drivers for green refurbishment and really understand what they are. He also recommended mapping the costs and the benefits of all the options.'



George Adams

Are engineers really up to 'selling' refurbishments?

Research conducted by contractor SPIE Matthew Hall has revealed that a good business case needs to be established to make clients see the benefits of green refurbishments.

George Adams from SPIE identified key drivers that should help to push the retrofitting agenda. The UK has a larger than average disparity between GDP generated by construction, which is currently around 3% to 4%, and carbon emissions generated by industry and the built environment, which is around 53%. 'In other countries those figures are much closer together,' said Adams.

Power costs are another driver identified by SPIE. Between 2005 and 2009, gas costs rose by 42%, with another 50% to 80% hike likely to be seen over the next 10 years.

A similar hike is expected in fuel prices, with the government officially predicting a 50% increase, while Shell anticipates it will be nearer 300%, caused

by energy growth. Add to this the expected shutting of 25% of the UK's power plants by the UK government, and it will leave the UK needing to source 40% of its energy from renewable sources.

Kate McCormick from SPIE said one idea to drive retrofitting is to treat the engineer as the 'salesman

'One way to drive retrofits is to treat the engineer as a refurb salesman'

Kate McCormick

of refurbishment'.

However, a recent report by the Carbon Trust has confirmed that engineers are simply not getting their message across. McCormick said: 'The report says that just 7% of people believe the green credentials claimed by firms.'

It's time to learn from building users

The industry can make a huge difference to people's lives through good retrofitting – but a great deal of money can also be wasted by failing to learn from users' experiences, insisted William Box, of consultancy Carnego Systems.

'As an industry we don't often think about users,' he said. 'But users are a critical part of the engineering process. It's easy to focus on, for example, building fabric, and to leave users out of the picture.'

A key obstacle to recognising the

importance of user experience is that the industry focuses on what is measurable, said Box.

'We are looking at meeting standards without actually knowing whether the device being fitted can do the job that needs doing.'

People's sense of being in control of their environment is crucial to influencing their behaviour. But we don't help and train them to use control systems in their homes, and we can expect too much of them, said Box: 'People don't understand

mechanical insulation? But then, why should they?'

When it comes to learning lessons from retrofits, the industry is still not collecting all the data that is out there, insisted Box: 'And we need to grab and to use it in real time, not after two years.'

Feedback needs to be provided quickly, and users' views must be taken into account, added Box. 'But in the next few years I predict that we'll see more integration between engineers and psychologists aimed at influencing user behaviour.'

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Social housing offers retrofit lessons

The need to retrofit dwellings is high on the industry's agenda, but social housing providers have been improving the energy efficiency of their properties for years, said Nigel Banks of developer Keepmoat.

Such providers face the twin challenges of fitting the right technology for different types of property and for differing tenant needs, Banks pointed out.

Tenants especially need clear and simple controls systems for the retrofitted technologies, said Banks. They also need support from housing liaison officers and



Nigel Banks

maintenance. Appointing local 'green champions' is also important.

They also need to keep disruption to a minimum when carrying out improvements – such as avoiding ripping up floors while insulating solid walls.

The costs of having to maintain technologies is pushing social housing providers towards adopting a 'passive' approach to retrofits. They also have to 'follow the funding', said Banks, particularly as the government's Green Deal loans systems meant that 'we have to pay for the maintenance'.

Social housing providers are therefore tending to adopt a 'fabric first' approach that focuses on insulation rather than replacing boilers, followed by considering fitting solar photovoltaic panels, which are supported by the feed-in tariffs scheme. The Renewables Heat Incentive will also support the use of air-source heat pumps.

Keepmoat is monitoring the outcomes of some of its retrofit projects and hopes to be able to produce findings later this year, he added.



Jennifer Hardi

Passivhaus still a key challenge for the UK

What exactly is 'Passivhaus' and what relevance does it have to other standards for new-builds and refurbishment?

Jennifer Hardi of research body BRE said that a Passivhaus standard for refurbishment of properties is now available, although it is not a formal standard as yet and so far applies only to dwellings.

Hardi insisted that Passivhaus should not be seen as in competition with the Code for Sustainable Homes, or with BREEAM in the UK.

'These are three different standards, but they can also work hand in hand,' she said, adding that, in her view, 'Passivhaus is about the operating energy performance of buildings, while the Code and BREEAM take more of a holistic approach' to assessing a building.

BRE, which runs BREEAM, recognises that

'refurbishment uses different benchmarks' from new-build, and so BRE is considering developing a separate BREEAM for refurbs, Hardi said.

She rejected the view that Passivhaus standards are very difficult to achieve. The Passivhaus approach simply adopts a 'fabric first' approach that is not wedded to using any particular technologies or renewables, she said.

'Therefore you can have Passivhaus as a fabric-first approach and then embed it into your use of the Code.'

'You can have Passivhaus as a fabric-first approach and then embed it into the Code'

Jennifer Hardi

District energy delivers emissions cut

The benefits of a district energy scheme (DES) for an existing property was outlined by Simon Woodward of engineering group Cofely.

When established local developments such as hospitals, town halls and universities are to be refurbished, the creation of a DES can offer low carbon heating and hot water services.

In Birmingham, Cofely has formed a district-energy partnership

with the city council, Birmingham Children's Hospital and Aston University to develop a DES. The aim is to develop combined heat and power-based district energy across the city centre.

The system is projected to deliver emissions savings of 12,000 tonnes of CO₂ a year, Woodward said.

Woodward admitted that the underground piping for DESs can have heat losses of up to 30%,

but he insisted that good-quality services should provide losses in the range of five to 10%.

Britain is still behind other European countries in the development of DESs because of the long payback period needed to recover investments, which can be 20 to 30 years, stated Woodward.

'The problem is that organisations are fearful of contracting for energy for a period longer than just one year.'

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LET'S LOOK ON THE LESS BRIGHT SIDE



Lighting is under pressure from energy savers and our response simply won't do, argues **Peter Boyce**



There can be little doubt that lighting is under pressure. Most of this pressure is coming from those who are concerned about global warming/sustainability. What these people want to see is a reduction in the use of electricity, particularly electricity generated through the burning of fossil fuels. Their impact is evident in the de facto banning of the incandescent lamp in many countries. But why lighting? Are there no other users of electricity to be considered? There undoubtedly are, but what makes lighting an attractive target for electricity savings are four characteristics.

Lighting installations constitute a major user of electricity; they have a much shorter life than buildings; they are easy to modify in existing buildings, and they are conspicuous, so changes in lighting makes it obvious that the authorities are doing something.

Faced with this onslaught, the initial response of the lighting community is usually to emphasise the importance of maintaining lighting quality.

This is followed by suggestions about how to lower electricity consumption.

There are usually three possibilities suggested: a greater use of daylight, combined with better controls on electric lighting, the development of more energy efficient lighting technology, and a higher proportion of carbon-free electricity generation in the fuel mix. Unfortunately, these three possibilities will not do. They are, respectively, too slow, too uncertain and too expensive. The only honest answer to a demand for rapid and

major reductions in the electricity consumed by lighting is a reduction in the illuminances used in new and existing installations.

Would this be a disaster? The first thing to say in answer to this question is that illuminance recommendations are not set in stone. There have always been differences in illuminance recommendations between countries and, even for the same country, the recommendations have varied over the decades. The second is that, as regards visual performance, illuminance is a second order effect relative to visual size and contrast. This means that if you are concerned that reducing illuminance will lead to deterioration in visual performance, you can always offset it by increasing either the size or contrast of the target details. The third is that for self-luminous computer displays, decreasing illuminance will improve visibility.

The only honest answer to a demand for rapid and major reductions in the electricity consumed by lighting is a reduction in the illuminances used in new and existing installations'



MANUFACTURER'S VIEWPOINT

The introduction of Part L 2010 presents many opportunities for technologies to help cut emissions, writes **Martin Fahey** of Mitsubishi Electric, sponsor of this column

A more serious difficulty is that people like what they are used to, and may consider any reduction in illuminance to be a backward step. This objection might be overcome by ensuring the brightness of the space is maintained, either by choosing an appropriate light spectrum or by light distribution. In any case, it is important to appreciate that the reduction in illuminance need not be very large to have a significant effect on electricity use. The fact is the response of the human visual system to illuminance is broadly logarithmic, while the influence of changing illuminance on electricity demand is broadly linear.

As the Chinese say: 'May you live in interesting times.' We do, and they look like becoming even more interesting. The lighting community needs to consider how it is going to respond to the pressure upon it; to fight for current standards, to accept defeat and take whatever the politicians impose, or to use our knowledge to maximise the benefits of lighting while minimising the environmental costs. You choose.

● Author and academic **PETER BOYCE** is technical editor of *Lighting Research & Technology Journal* where this first appeared as an editorial and is reproduced courtesy of Sage Publishing

LR&T is available free to SLL members at www.cibse.org

The changes to Part L of the Building Regulations, which came into force in October 2010, will continue to have a major impact on the way that buildings are designed and constructed, in addition to the way we refurbish existing buildings. The latest version requires a variety of savings in CO₂ – averaging 18% to 38%, depending on the type of building being planned or extended.

This increase in the standards of energy efficiency is partly a reflection of the increases in performance of modern technology, and places building services right at the heart of the issue. It also reflects changes in the way the main energy sources are calculated, whether fossil fuel-based or renewables.

In the 2006 version of Part L, the CO₂ emission factor for electricity consumption was 0.43kg CO₂/kWh, whereas the 2010 value has risen to 0.517kg CO₂/kWh. Due to this rise, all consumption of electricity is having a detrimental effect upon the overall search for emission reductions.

For a heat pump, for example, this means it must have a higher efficiency to match the same CO₂ level as alternative fuel technologies whose emission factors haven't changed as significantly. It is now vital that the need

requirement by Part L, using them will help significantly towards meeting the aggregate 25% emission reduction requirement. And a renewable element is still likely to be required as part of local council planning permission.

Modern technology can have a key role in helping to achieve the required 25% reduction in CO₂ emissions, and the points of impact vary from the seasonal efficiency of a product, to whether it is ECA (Enhanced Capital Allowance) approved, or appropriately controlled and metered.

Part L 2010 also puts in place the need to control and meter efficient equipment effectively so that the building achieves maximum efficiency and CO₂ reductions. Information and training should also be available to the owner to allow the building to be operated efficiently.

The rise in the CO₂ emissions factor is having a detrimental effect on the overall search for emission reduction

for energy consumption be reduced as much as possible.

Also key is the CO₂ emission factor when generating energy. Electricity can be generated using photovoltaics (PV); and for every kWh produced, it is considered that PV can mitigate 0.529kg CO₂, adding towards reducing emissions and to the renewables on site.

Although the use of renewables is not a

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RIGHT LEVEL

The 'benchmarks' in Display Energy Certificates have recently undergone a major review, resulting in a number of recommendations for change, write **Bill Bordass, Harry Bruhns, Robert Cohen and Phil Jones**

In 2008, a milestone for identifying energy use in buildings was reached in England and Wales: buildings over 1,000 m sq which are frequently visited by the public were required to display an energy certificate showing actual, measured energy use. (This requirement applied only to buildings frequently visited by the public, and it did not apply in Scotland.) The 'A' to 'G' energy ratings shown on these Display Energy Certificates (DECs) have now become widely recognised as important indicators of building performance.

The DEC grade is based on an operational rating which compares actual building energy use to a benchmark. This rating is a linear scale from 0 (true zero-carbon to 100, the benchmark value giving the CO₂ emissions for typical stock median performance levels) and beyond.

The DEC benchmarks cover 29 building categories and are derived from various sources. But there has been some debate about the accuracy of the benchmark figures. To address this, CIBSE set up a group to review the DEC data, in particular the Operational Ratings and to compare actual ratings with the TM46 benchmarks in order to assess their applicability. CIBSE was given access to the 45,000 DECs lodged on the Landmark national register between October 2008 and mid-February 2010. The review has now produced some conclusions and recommendations for revisions – outlined below – for consideration by the Department for Communities and Local Government.

DEC analysis

The DEC benchmarks are based on a rationalisation and considerable simplification of values taken from many sources. A total of 237 different building 'types' are identified in the benchmarks – with each type assigned to one of 29 'categories'. Benchmarks are set at the median level for each category (as far as these were known) for annual use of electricity, fuel and heat, assuming standard hours of use.

The DEC methodology allows bigger benchmarks to be earned where buildings are used for longer, but not just for the presence of technical features such as air-conditioning. Mixed-use benchmarks – for example, for a school with a swimming pool – can be built up using the specific component benchmarks and their respective areas. After excluding a number of DECs from the sample because of factors such as implausible floor areas or ratings, the group ended up with 29,310 DEC records, or 65% of the total.

Overall, the analysis found that the benchmarking system works well for those categories most commonly found in the database where the median of the DEC grade distribution was within 2% of the benchmark – for example, for schools, which made up 52% of our sample, or 15,335 buildings.

The system also seems to work well with the median almost exactly at the D/E boundary – for offices 11% of the sample, or

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3,230 buildings. It also works well for clinics, hospitals and emergency service buildings. We found a good correlation between actual operational ratings and the benchmark figures in 94% of the DEC's included in the analysis.

Findings

Many categories use more electricity and less fuel than the benchmark values, although these often cancel each other out, making the median of the overall ratings closer to 100. This reflects the growth in electrical equipment in most buildings over recent years, coupled with the internal heat gains these create, improvements in insulation, boilers and heating controls, and a warmer climate, all of which have combined to reduce heating demand. In two categories, the benchmarks appeared to be too generous:

- **Entertainment halls and theatres:**

Benchmark data originated from commercial theatres and cinemas, while the DEC data set includes public sector halls, most of which are less heavily used or are using less energy.

- **Dry sports and leisure facilities:** We suspect that the benchmark data was collected from more intensively-used facilities. Sports centres have also received considerable attention to energy saving in recent years.

In the other two categories the benchmarks appeared to be too small:

- **Laboratories and operating theatres:** Here there was little data upon which to base the



Display Energy Certificates are mandatory for larger public buildings such as City Hall, London

original benchmarks. Special energy uses also need to be identified better. Where electrical equipment has high loads it may need to be added to the list of separable uses.

- **Workshops:** These use benchmarks based on relatively lightly-used facilities for semi-industrial buildings. Many of the data set records in this category were for sorting offices with heavy process loads that have not yet been identified as separable energy uses.

Day centres have also proved to have high emissions in relation to the 'schools and seasonal public buildings' category, while hostels are low users in relation to the 'long-term residential' category.

Only 153 DEC's made use of 'separables' – that is, specific energy uses that are not included in the benchmarks because they are unusual or highly variable, but which are

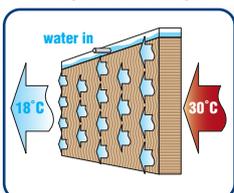
The DEC benchmarks are based on a rationalisation and considerable simplification of values taken from many sources



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The analysis found that DEC benchmarking worked well for buildings such as schools

part of the carbon footprint shown on the DEC. This very low figure probably indicates a lack of sub-metering installed, but perhaps also insufficient awareness of this provision in the methodology. It also suggests that some buildings which currently have poorer ratings would benefit from measurement of separables. There is also a strong case in a number of categories to allow more major electrical equipment as a separable in order to make the DEC Rating more representative.

Commentators have argued for DECs to include allowances for high occupancy density. While obviously important, this was considered when TM46 was developed, but was rejected because of a lack of robust, low-cost methods for collecting accurate density information – without which there would be considerable potential for abuse.

Conclusions

The initial DEC benchmarks and categories were created from data from many sources, which were variable in their date, quality, accuracy and representation of the stock as a whole. Some building types had very little data at all to inform their allocation – for example, crown courts were put in the ‘general office’ category, and prisons in ‘long-term residential’.

It was anticipated that some building types would turn out to be in the wrong category, or might require new ones. In the event, only 10 of the 237 building types appear to be significantly outside their category or benchmark and would benefit from adjustments or re-allocation, representing only 6.2% of the DECs reviewed.

There appears to be a strong case to extend the definition of separables to electrical ‘process’ equipment in a range of benchmark categories. The prospect

of a better DEC rating is likely to drive building owners and occupiers to meter more separables, and the requirement for a report will help them to understand how to improve the performance of technical equipment often outside the understanding of DEC assessors. To define what should or should not be eligible will require more work and industry consultation. It can reasonably be argued that more densely-occupied buildings should have a larger benchmark, but a serious constraint is how to verify the

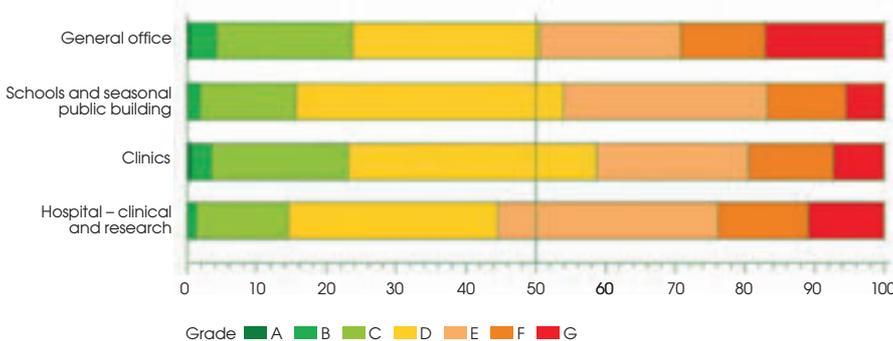
intensity of occupancy over a year. However, in the same way that separables are allowed if properly metered, buildings with good occupant counting systems might potentially be permitted to make allowances. Metrics for intensity of use need to be agreed for each benchmark

A number of commentators have argued for DECs to include allowances for high occupancy density

category – for example, perhaps the number of pupils on roll might be suitable for schools, or person-hours per year for offices with robust information from security access systems. The data could potentially be used to adjust the DEC benchmark, to enable a comparable allowance for intensity of use as is currently available for hours of use. This or a similar process might also enable better account to be taken of unoccupied space.

Following this initial review, the CIBSE benchmarking group is now considering appropriate ways to address the 10 building types and four categories that require adjustment of the benchmarks in some way. CIBSE will be consulting on these once proposals are ready. CIBSE is also in discussion with several sectors about the current benchmarks, and how to collect data to assess the appropriateness of the benchmarks for extending DECs to cover private sector buildings. **CJ**

Percentage grade distribution within benchmarks
Filtered data – 29,320 Ratings count>80 (decv04 15/8/10)



● The full report and table on the study can be found alongside the digital version of the article at www.cibsejournal.com. The benchmarks for operational ratings are published in CIBSE TM46: *Building Energy Benchmarks*, available at: www.cibse.org/bookshop

● **BILL BORDASS** of Usable Buildings Trust, **HARRY BRUHNS** of UCL Energy Institute, **ROBERT COHEN** of Carmco, and **PHIL JONES** of Building Energy Solutions, were engaged through the CIBSE Research Fund to carry out the DEC review.

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Sustaining Infrastructure

HIGHLY OILED OPERATION

The refurbishment of a landmark commercial building on London's South Bank is expected to produce major energy savings. But further improvements are also being recommended. In the fourth in a series of CIBSE-sponsored building-performance case studies, **John Field** and **Alexandros Balaskas** assess the site's progress and prospects

Shell Centre, the London base of the eponymous Anglo-Dutch oil group, was constructed in 1961 and is considered to be one of the capital's landmark South Bank buildings. The complex, which lies close to the River Thames in south-east London, comprises a 107-metre, 27-storey tower, and three 10-storey wings. It has two levels of basement, a 33-metre swimming pool, a sports hall, four squash courts, a theatre that is no longer in use, and four levels of underground parking.

The tower underwent a major refurbishment programme between 2006 and 2010. Last year CIBSE commissioned Power Efficiency, an energy management consultancy, to conduct an assessment of the impact of these improvement measures on the energy efficiency and carbon

footprint of the site. The detailed analyses of the overall energy use and performance of heating, ventilation, lighting and other systems at Shell Centre were undertaken using the CIBSE TM22 Office Assessment Method.

The assessment was one of a number of CIBSE-sponsored investigations into real-life building performance, which have been published as a series of case studies in the *Journal* (see 'Get the full report').

Refurbishment

In addition to the refurbishment programme carried out at Shell Centre in recent years, the on-site energy management team introduced a range of measures and reviews during 2010 (nine in total) aimed



The Shell Centre on London's South Bank has undergone a major refurbishment and energy reviews in recent years

	Initial cost	Annual electricity savings			Annual gas savings	
	Installation	kWh	Cost saving	CO ₂ (tonnes)	kWh	CO ₂ (tonnes)
Swimming pool – new trend control	£3,600.00				33,200	6
Swimming pool – chemical cover	£1,485.90					
Staircase lighting control – SC 1, 2, 3, 4, 5, 6		105,500	£6,120	125		
Plant room lighting control	£5,280.00	23,880	£1,406.52	12.42		
Meeting room lighting control - YB121A,B,C	£3,960.00	11,248	£662.50	5.85		
Sports hall lighting control			£4,024.00	35.53		
Garage lighting control						
Paper towel change over						
Totals	9,240	140,628	12,213	179	33,200	

Figure 1: Energy efficiency improvement measure in 2010, with estimated savings

at cutting waste and improving efficiency in the tower and the three wings (see Figure 1). The changes included improvements to lighting systems and ongoing reviews of heating and plant operations.

The payback periods for these measures varies widely. The most expensive measure, at £5,280, is the plant room lighting control – with a payback period of 2.5 years. Installing a PIR lighting system in the meeting rooms will cost £3,960 and take four years to pay for itself. However, most of the measures centre on relatively low-cost reviews of the efficiency of heating and plant operations.

The estimated annual savings from the eight measures total nearly 140,628 kWh of electricity and 33,200 kWh of gas – providing estimated cost savings of £12,200 a year. The overall cut in carbon emissions is calculated at 111 tonnes of CO₂ per year.

Staircases

The refurbishment also included work on the staircases. Measurements indicated that lighting levels in the staircases of the wings and tower areas were within recommended values of 300 to 400 lux. Although the lighting equipment is reasonably efficient, there is potential to change the installation by removal of fittings to achieve further energy consumption savings. Lighting consumption in the staircases is estimated to be 232,000 kWh of electricity annually. With lighting fitting densities reduced by 50% in the staircases areas while still maintaining normal illumination standards of 300-400 lux, there would be a saving of 105,500 kWh a year. The assessed cost savings are £6,120 pa.

Further action

Power Efficiency recommended a range of further energy saving measures that

Measure	Electricity savings estimate (kWh/yr)	Gas savings estimate (kWh/yr)	Carbon dioxide saving (te CO ₂ /yr)	Cost saving (£/yr)	Guide price (£)	Simple payback period (yrs)
Implemented measures						
Project list 2010	140,628	33,200	82	13,700	9,240	0.7
Sub total	140,628	33,200	82	13,700	9,240	0.7
Shorter term payback measures:						
Staff engagement initiative	296,000	376,000	229	37,990	3,000	0.1
Building management system scheduling and control review	444,000	564,000	343	56,900	35,000	0.6
Sub total	740,000	940,000	571	94,800	38,000	0.4
Medium term payback measures						
Replace T8 with T5 in wing offices	200,000		107	18,000	65,000	3.6
Reduce the PIR delay time in open plan offices, meeting rooms and circulation areas	18,300		10	1,600	6,000	3.8
Sub total	218,300	0	117	19,600	71,000	3.6
Total	1,098,928	973,200	770	128,100	118,240	0.9

Figure 2: Recommended further initiatives with timescales, projected payback periods and expected savings to be made



could be undertaken at the site. These focused mainly on further improvements to the lighting and building-management systems, but also included suggestions for enhancing existing measure to engage staff with the drive for improving efficiency and cutting waste. Estimated energy and cost savings, together with ‘payback’ periods, are also provided with the recommendations – see Figure 2.

Taken together, the measures above would produce estimated annual electricity and gas savings respectively of 1.1m kWh and 973,200 kWh, with a total annual cost saving of £128,100. The cut in carbon emissions would total 770 CO₂ tonnes per year. Payback periods for the £118,240 total cost of these measures range from a few months to three and a half years. Overall, this range of measures would be expected to raise the Energy Performance Certificate rating for the Shell Centre from D to C.

Lighting

The recommendations for further action focus mainly on improvements to lighting efficiency, as follows.

Wing offices: The current T8 lighting fittings have a rated output of 36W and a calculated lighting level of 12.6 W/sq m. If this type of lighting is replaced with T5 fluorescent tubes rated at 28W, this will result in an improvement lighting level of 9.5 W/sq m.

The calculated savings are 200,000 kWh and £18,000 per year. The associated saving in carbon dioxide emissions is 107 tonnes per year.

Controls: The Shell Centre tower is

Additional changes recommended by an energy review included further improvements to lighting systems

Benchmarking Comparison of site’s 2009 energy data

Electricity consumption is recorded by two half-hourly electricity meters. In addition there are 17 non-half hourly sub-meters dedicated to metering the energy consumption of the boilers, chillers, the tower and the wings consumption. Gas consumption is recorded by three non-half hourly meters, one for the boilers, one for the main kitchen and one for the tower kitchen.

Metering data are uploaded to the supplier’s web portal and can be interrogated remotely by the Shell Centre staff with appropriate user name and password.

During Shell Centre Tower renovation, local meters were installed on each floor to monitor the lighting, the small power and the UPS consumption individually. Energy costs for Shell Centre in 2009 were £1,896,000,

comprising £1,332,000 for electricity and £564,000 for natural gas. Energy supplies were 14,800,000 kWh of electricity and 18,800,000 kWh of gas.

The assessment of performance indicates that the building’s emissions figure of 106 kgCO₂/sq m is 47% worse (higher) than the Good Practice benchmark (72 kgCO₂/sq m) and 20% better (lower) than the typical benchmark.



BUILDING SERVICES REFURBISHMENT MEASURES

The energy efficiency features adopted during the refurbishment of the Shell Centre tower in 2010 comprised:

A chilled beam air conditioning system

New energy efficient lift gear and controls

An efficient, PIR-activated lighting system integrated into the chilled beams of the refurbished space that includes a light detector capable of adjusting the lighting levels and exploiting natural daylight

Air-handling systems including thermal wheels to recover energy from extract air

SYSTEMS IN PLACE

HEATING AND HOT WATER: Five low-pressure hot-water gas boilers, 4 MW each

CHILLED WATER SYSTEM: Served by up to six basement chillers cooled by river water. Operated by the building management system (BMS). Water from the River Thames is pumped via a pipeline into the building to act as a cooling medium for the main chiller plant condensers. When the river is cold enough it is fed direct to heat exchangers in the chilled water system to provide free cooling

AIR CONDITIONING: The tower has suspended chilled beams in offices served with circulating pumps located in the basement. The chilled beam system is integrated with heating, cooling and lighting sensors. The wings are served by a ceiling radiant panel system providing heating and cooling to offices

VENTILATION: The tower and wings have air handling units. Ventilation plant is controlled by the BMS



John Field checks the Shell Centre heat exchanger

equipped with efficient PIR controls with motion detectors in open-plan offices, meeting rooms and other areas. The delay time for these controls is 20 minutes. Lighting consumption for these areas is assessed to be 144,000 kWh of electricity per year. Reducing the delay time to 10 minutes would produce a saving of 18,300 kWh per year, cutting the annual cost by just over £1,000. This would also cut CO₂ emissions by 10 tonnes per year.

Other measures

Building management system: A review of the BMS would also yield savings. The aim is to review schedules and settings of the BMS and to update these to provide lean operation without reduction in service levels when the building is occupied. It is expected that information on customer and staff requirements and feedback will be available from the staff engagement initiative (see below). Staff make sure that the plant goes on as late as possible and goes off as early as possible.

A price of £10,000 is budgeted for initial investigation, review and updating of settings in the headings above. In addition BMS system and control interface upgrades are budgeted at £25,000. The BMS schedule and operation review is assessed to yield 444,000 kWh of electricity savings and 564,000 kWh of gas savings – together yielding annual cost savings of £56,000 and payback within one year.

Staff engagement: This is an exercise aimed at training and engaging specific staff to promote and oversee energy efficiency in the use of Shell Centre by its occupants. Increased levels of energy conservation awareness among the staff have been developed, and staff are expected

to switch off lights and monitors once they leave the building. Regular checks are carried out by security staff to ensure that lights and monitors are switched off.

The staff engagement initiative is assessed to save 296,000 kWh of electricity and 376,000 kWh of gas per year, or £38,000 annually. Associated CO₂ emissions savings are 228 tonnes per year.

Voltage power optimisation: A feasibility study into using VOP is recommended. VOP is the managed reduction of voltage supplied to the site, to reduce energy use, power demand and reactive power demand.

Conclusion

The efficiency measures adopted at Shell Centre in 2010 are estimated to produce a major reduction in energy use and carbon emissions (see Figure 1). Additions and enhancements to these action are predicted to significantly further increase these savings (Figure 2).

The findings and recommendations outlined here will, hopefully, provide engineering professionals and low carbon building assessors with insights that will help them to provide effective energy efficiency solutions in future. For CIBSE, the lessons learnt will provide key insights for the wider engineering community involved in the built environment. **CJ**

GET THE FULL REPORT

For the full survey report, go to the digital version of the May 2010 *CIBSE Journal* at www.cibsejournal.com. Previous survey reports can be found with February 2011, October 2010 and June 2010 digital editions.

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1 Green shoots?

Building services professionals are showing more optimism about prospects for their sector in the coming year. But, as our exclusive new survey shows, pay and job security remain major worries



The building services market is slowly turning a corner, according to the latest Hays/*CIBSE Journal* survey of employees and employers in the sector. The findings suggest that confidence is gradually returning to the sector, with employers widely expecting more work on their books this year, and this has spurred a slight increase in recruitment activity in the past 12 months.

Another key indicator that the future looks brighter for the industry is that almost half (49%) of employers say they feel optimistic about their business in the coming year. However, it is clear that challenges will remain. When asked what would impact the industry most over the next five years, the employers' vote was split between recovery from recession (39%) and public spending cuts (39%).

Indeed, falling public spending is already hitting the sector, with 46% of employers reporting a decrease in public work. This said, the sector is showing early

signs of bouncing back, predominantly led by private projects, and this is already translating into a gradual increase in recruitment – albeit often for temporary positions and at reduced salaries.

'Building services has become more positive in the past few months,' says Peter Berry, senior consultant at Hays Building Services. 'A year ago there were hardly any new projects starting but now some organisations, usually in the private sector, have secured large-scale projects, for which they need to hire a whole new team.'

However, the sector is still recovering from a prolonged and severe downturn, during which many employees were let go, and therefore it remains an employer's market. As a result, in the past year the majority of average salaries for professionals being placed in new roles have remained static or, in many

Building services has become more positive in the past few months – some organisations have secured large-scale projects, needing whole new teams



THE SURVEY IN FIGURES

60%

did not receive a salary increase in 2010

60%

say they feel very or fairly secure in their job

30%

see their current work-life balance as good

26%

will change their job in the coming year

46%

would recommend their employer to a friend

20%

have agreed to a salary cut in the past 12 months

Despite the gloom, more than half the employers surveyed expect to take on new staff in the coming 12 months



cases, have decreased – falling by as much as 16% for some.

Companies are unlikely to be able to raise pay levels – and much less so when they are shedding employees, and this is continuing in the sector. The survey found that one third (33%) of employers had let go between 1% and 5% of staff in the past 12 months, and a further 8% of employers had shed at least one in five staff (20%) over the period.

Reducing staff was also the number one cost-cutting mechanism for employers, with 45% citing redundancy as their top means to cut back, and a further 36% citing the use of voluntary redundancy.

More positively, 59% of employers said they expect to take on staff in the coming 12 months, highlighting their growing confidence. However, of these, only 45% expected to recruit permanent staff.

‘Employers are looking more to the long term and beginning to think about permanent appointments, but for now, temporary roles remain popular because it insures you against a lack of continuity of work,’ says Berry.

Talent challenge

While finding new employees is likely to be easier than it has been in the past, holding onto talented employees over the coming years may prove more difficult. The survey found that more than a quarter (26%) of

employees plan to change jobs within 12 months, while a further 31% think they will move within one to three years.

The survey also reveals a degree of dissatisfaction among employees towards their employer: only 47% would recommend their current company to a friend looking for a new job and when asked how they would rate their work-life

balance 45% said average and 25% said it is bad.

Attracting fresh talent to building services has slipped off the agenda to some extent, as companies have been focusing efforts on the fight for survival. When employers and employees were both asked the same question

– ‘Do you think the industry struggles to attract any of the following’ – both groups cited young engineers and women among their top categories.

However, there appears to be a disparity in opinion between employers and employees on the extent of this problem. When it comes to young engineers, 39% of employers and 58% of employees agreed there was a ‘struggle’ in attracting recruits, and for women, where 48% of employers and 57% of employees felt there was a struggle. This may suggest that employers are not as aware as their staff of the age and gender barriers to recruitment that exist in the industry.

As one employee respondent commented in the survey: ‘[Our] industry may be

Employers are looking more to the long term and beginning to think about permanent appointments



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Salary changes

Annual figures for national-average typical salaries of:	2011	2010	% change *
Consultant – associate	44,405	£45,769	-3%
Consultant – principal	39,136	£39,692	-1%
Consultant – intermediate	27,145	£27,408	-1%
Consultant – junior	19,818	£20,823	-5%
Senior M&E contracts manager	39,000	£40,684	-4%
M&E contracts engineer	33,045	£33,907	-3%
Senior estimator	39,818	£40,400	-1%
Estimator	32,409	£32,692	-1%
Contractor – operations director	51,182	£51,700	-1%
Contractor – operations manager	44,364	£45,592	-3%

*The regions from which data are collected have been reduced from 13 to 11 this year, so the salary changes are largely, but not exactly, comparable. (Source: Hays/CIBSE Journal. For full survey tables, go to www.jobs.cibsejournal.com)

➤ perceived as not suitable for women, by both women considering it and some men already working in the industry.’

Berry says that, while the sector has historically been male-dominated, women increasingly are being attracted to the expanding sustainability sphere, which bodes well for the future.

But he adds: ‘We need to keep thinking about the longer term and developing homegrown talent, both male and female, or we’ll face a dire skills shortage when the market picks up.’

Recovery hopes

Both employers and employees, however, agree that the biggest issues that will impact on the construction industry in the coming five years are the UK government’s budget cuts and the pace of economic recovery.

Among employers, 39% pointed to a future recovery and the budget deficit as the main factors. Among employees the figures were 42% for a recovery and 24% for the deficit.

Both sides agree that the third main impact on the industry in coming years is ‘sustainability’ (cited by 23% of employees and 17% of employers). But one employer respondent who added a personal comment on this issue was scathing about the government’s sustainability agenda: ‘[It’s] sustainability for all the wrong reasons – it’s not properly understood and [is] driven by an incompetent government who do not know anything about it!’

Employees’ sense of job security has also been hit in recent times: only 17% said they felt ‘more secure’ compared with last year. And less than half (49%) felt ‘fairly secure’ in their current job.

One respondent to the question commented: ‘Public sector posts are being cut, so job security is not guaranteed – [it’s] no longer a job for life. Also, the lower wages paid in the public sector are no longer balanced against more supportive overall terms and conditions.’ **CJ**

For the full survey tables, go to www.jobs.cibsejournal.com
Also visit www.hays.co.uk/building_services

Salaries Pay stagnation varies by region

Getting a new job in building services over the past 12 months has meant accepting a salary that was at best the same level as the previous year, but frequently it meant taking a drop in salary, the survey found.

While there will be some exceptions, on the whole there have been no salary increases for new starters, regardless of their job role in the sector. This stagnation is mirrored in the salary trends for those who have remained in their job, with 71% of employers surveyed stating that they have frozen pay and 61% of employees stating they have not had a pay rise in the past year; 68% of employers expect salaries to remain static this year.

Looking at the various types of roles within the sector, geographical differences emerge. Salaries for mechanical, electrical and contract engineers, for example, have remained static across the board but there were marked falls in salaries in Wales, the West and East Midlands and Northern Ireland, reflecting the depth of the economic downturn in these areas. The most dramatic decreases were in the East Midlands, where staff saw the average wage for a new appointment fall 14% and in Northern Ireland, where senior staff salaries fell as much as 16%.

In contrast, wages in the South have largely stayed the same,

with typical salaries in both Central London and the South East, remaining at £40,000 and £36,000 in these regions.

For contractors at management level there are even greater disparities, with big reductions in pay packets, by as much as 13% in the South West, Wales and the Midlands, but quite dramatic rises, especially at senior level, where they are up by around 5%, in East Anglia, the North West and North East & Yorkshire. One of the most striking contrasts is the typical salary for an operations manager, which in Central London is now £62,000 compared to around £43,000 in the West Midlands.

Consultants in the sector have seen more average salaries remain stable. Intermediate level design engineers, for example, have seen the average salary in central London remain unchanged at around £34,000, while even in the Midlands pay has remained steady for this role, at £29,600 in the West Midlands and £28,000 in the East Midlands.

But there have been notable salary decreases for junior engineering consultants (by as much as 14%) – the downturn has meant employers are focusing on recruiting more experienced professionals who can hit the ground running and don’t need training.



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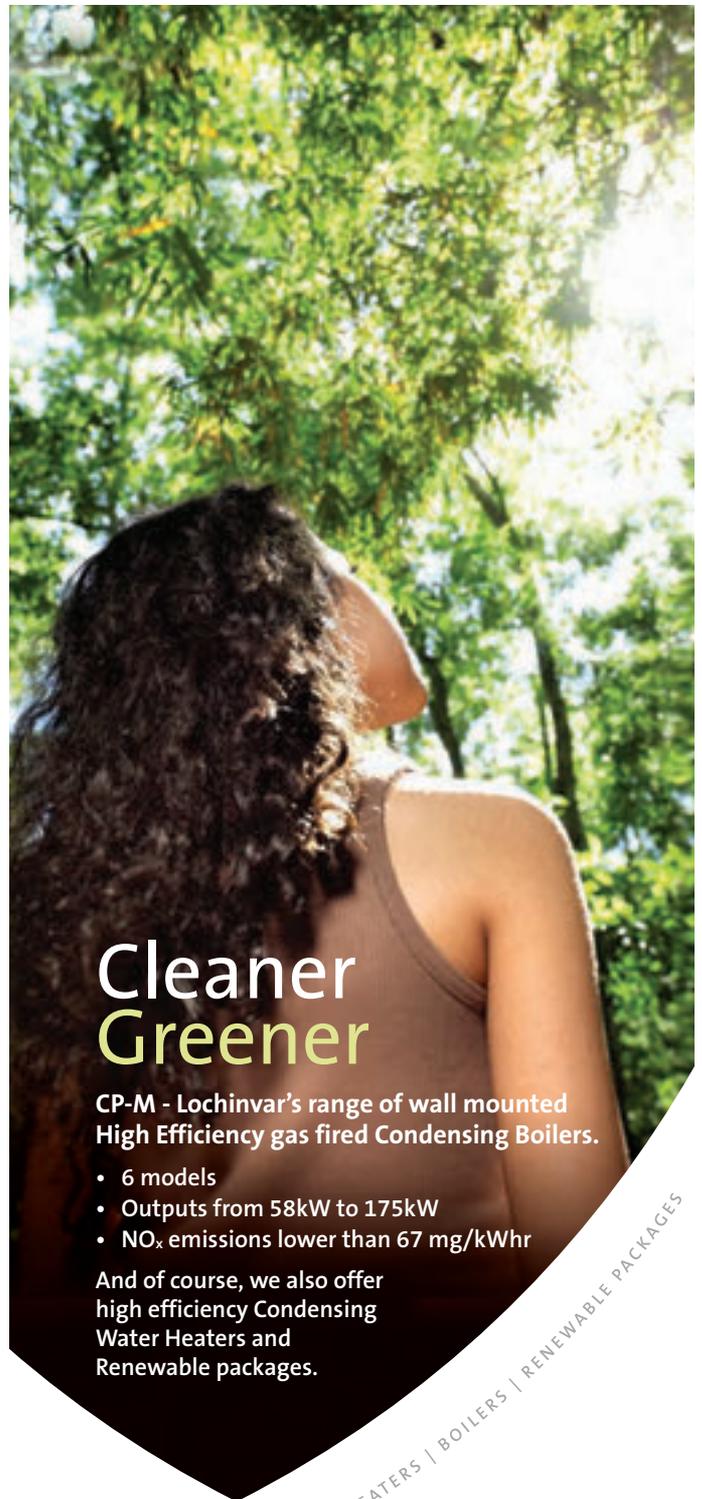


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CHANGING PLACES

Carina Bailey hears from two architecture and building services engineering graduates who describe their journeys of interdisciplinary discovery, thanks to an exchange programme

Engineering consultancy Hoare Lea and architectural practice Broadway Malyan have pledged to nurture the emerging talents of their young blood.

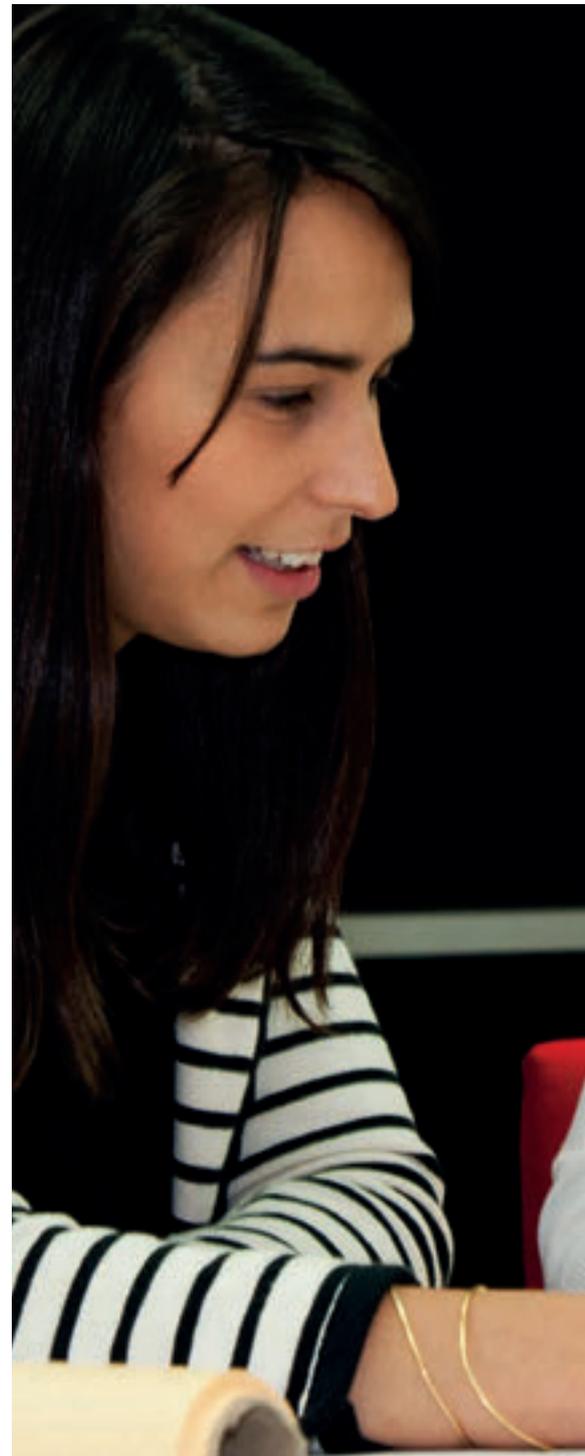
For five years they have run a graduate exchange programme that has seen more than 100 young engineers take part in a two-week secondment at each establishment. Both firms see this as a vital step forward in developing interdisciplinary design training.

The secondments involve active participation in the other discipline; Hoare Lea graduates contribute to design work of an architectural nature, while Broadway Malyan graduates contribute to design work in building services engineering. According to Hoare Lea and Broadway Malyan, this enables graduates to gain an insight into the role and the range of issues that their opposite discipline must consider.

The secondments have overall objectives to promote a well-rounded approach, raise interdisciplinary awareness, and encourage a holistic and sustainable approach to building design. Crucially, they also provide an insight into the culture of a different discipline.

Specific objectives for Hoare Lea's graduates include working alongside an architect on sustainable design features of an interdisciplinary nature, as well as developing some appreciation of an architect's vision for a particular building and how this relates to associated planning constraints. Meanwhile, specific objectives for Broadway Malyan's graduates includes working alongside a building services engineer on M&E systems design, equipment sizing and selection, as well as developing some appreciation of an engineer's overall imperative for functional performance and sustainability.

On the following pages, two participants describe their experiences.





Amanda Clemente
Mechanical engineer,
Hoare Lea

For Amanda Clemente, who spent her secondment at Broadway Maylan, it has been an invaluable experience in developing her understanding of the architectural world.

‘This experience has given me a great insight into the work and culture of an architectural practice. I have certainly learnt a lot over the duration of my secondment, which I have no doubt will be of great value to me as I progress with my career in the built environment.’

Clemente, a building services mechanical engineer by training at Hoare Lea, was tasked with designing a three-bedroom eco family home for a lock keeper. To do this she first had to complete a number of exercises, which started with a site visit.

‘This was a totally new experience for me,’ enthuses Clemente. ‘I had never had to approach a site at such an early stage and evaluate parameters such as sun paths and density of vegetation in my line of work.’

She then spent time conducting a precedent study, and found herself drawn to a certain style, which was very modern, using simple lines, large areas of glazing with a mixture of timber cladding and



THE FINER DETAILS

Specific objectives for Hoare Lea’s graduates include:

Working alongside an architect on sustainable design features of an interdisciplinary nature;

Developing some appreciation of an architect’s vision for a particular building and how this relates to associated planning constraints;

Sitting in on early design stage discussions about the options for orientation, shape and form; and

Observing the critique process for design proposals.

Specific objectives for Broadway Malyan’s graduates include:

Working alongside a building services engineer on M&E systems design, equipment sizing and selection;

Developing some appreciation of an engineer’s overall imperative for functional performance and sustainability;

Undertaking design exercises for space planning and co-ordination of plant rooms and risers with structure and the built form; and

Understanding the nature and importance of engineering calculations.

rendered façade. Next Clemente worked in the planning department – something that she describes as a great experience, readily admitting that her knowledge of this side of the industry was previously limited.

Her next job was to space plan the interior of the house, which involved investigating different plans based on both a single and two-storey building design. As well as looking at the different options for floor plans, Clemente had to consider the orientation of the building, based on the optimal views and approach to the building, while maintaining a sense of privacy.

‘This exercise allowed me to appreciate how much time and consideration is required to simply decide how the building would be orientated,’ adds Clemente. Her experience taught her a lot, says Clemente. For example, she discovered that even things as basic as room sizes require much more thought than she had anticipated.

Clemente explains: ‘As an engineer, I’d previously assumed that architects simply use standard sizes for bedrooms and bathrooms on most projects. I didn’t realise that this is not possible as every room needs individual attention on how the furniture will be laid out, what furniture will be used, where the door will go in relation to the corridor, and how the furniture will conflict with any glazing. These factors have to be considered and factored into the design prior to deciding on the overall size of the room.’

Another important aspect that Clemente had to consider when designing this eco home was the building’s envelope and the low and zero carbon technologies that it might incorporate. But by this time her experiences on the secondment had changed the way she thought about their installation. She explains: ‘As well as looking at the technical aspects of the systems, I also thought about the aesthetical and design integration potential of each. As an engineer I am usually only concerned about the technical aspects, but as I was now looking at this project from a different perspective, I had to be very mindful of the practicality of incorporating and positioning these systems.’

The secondment also gave Clemente a taste for landscape design, another element

that, as an engineer, she’d previously had limited knowledge of. But the experience with Broadway Malyan left her very impressed: ‘I had the task of designing the landscape for the plot around my proposed building. I found this very difficult to begin with, but after looking through some books and photos off the web I gathered some great ideas on how to design the pathways and access ways to identify site boundaries from public paths and some “fun” ideas to

incorporate, such as vegetable patches and a fishing deck.’

By the end of her time with Broadway Malyan she’d learnt that, as an architect, ‘as long as there is a valid reason why you have decided to design something in a

certain way, then the design can work. A few improvements were discussed during this session that I decided would be incorporated into the final design,’ adds Clemente.

The experience has also taught her to look at buildings in a way she never has before, adds Clemente, observing architectural details to which she would previously have been oblivious.

“The secondments aim to raise interdisciplinary awareness, and encourage a holistic and sustainable approach to building design”

Lucy Devereux
Part 1 architectural assistant,
Broadway Malyan

Before embarking on the exchange programme, Lucy Devereux, a Part 1 architectural assistant while at Broadway Malyan, admits that her understanding of what building services engineers actually do was limited.





Young professionals can benefit hugely from learning about other related disciplines

‘I previously had little knowledge of what they actually did. The drawings got sent off and returned full of comments and strategies and solutions, but exactly how they were reached was almost a mystery to me.’

So her experience at Hoare Lea was an enlightening one. She began by looking at the details of air handling units (AHU), power systems and the challenges faced by electrical engineers, as well as learning about how different duct sizes impact on power and sound. ‘I now know why M&E engineers specify *large* ducts!’ she jokes.

She also discovered that selecting a fan is far more complicated than she first imagined, as there are so many types and variations.

As part of her exchange, she was required to observe and take part in a number of projects, including the layout of a rooftop plant room, where she realised first-hand the challenges engineers face when trying to squeeze in equipment, such as AHUs, into tight spaces.

But it was while looking at a schematic for a low temperature hot water heating/boiler room from another scheme that she experienced the kinds of problems that can be caused through a lack of interdisciplinary understanding. Devereux explains: ‘Using an existing schematic as the basis, Amanda [my exchange programme mentor] created a LTHW boiler room schematic for the project and explained how water/gas flows

through the system and the different roles parts have, such as valves and test points.

‘I completed the same exercise for a chilled water plant and chilled beam schematic – but design changes by the architect has made this a relatively long process. Fire protection of beams and structure has meant that the space allocated for pipe-work may now be inaccessible and so the team had to look into alternatives.’

According to Devereux’s experience, space constraints and equipment accessibility appear to be common problems that building services engineers have to face.

Completing the exchange programme, Devereux says,

has boosted her admiration for the work of building services engineers.

She concludes: ‘I now have a much greater appreciation for the complexity of the work building services engineers do and the limitations placed upon their work by basic physics, as well as the equipment available for their specification.’

‘This experience has certainly served me well now that I am completing my diploma in architecture back at university. I have been able to relate much more with visiting building services engineers, and realise the importance of being aware of what they need from our designs, and how important it is to consult with them throughout the design process.’ **CJ**

“ I now have a much greater appreciation for the complexity of the work that building services engineers do and the limitations placed upon their work by basic physics – Lucy Devereux



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GOING FOR

it

Hereford Technology School, Grimsby, is orientated to reduce heating in IT areas



Two new technology schools set a challenge for engineers faced with complex heating and ventilation needs.
Mark Jansen reports

Two specialist technology schools in the same town, both engineered by AECOM, set a challenge for the consultancy when it came to specifying heating and ventilation for schools with high heat-generation from the onsite IT services. Moreover, these HVAC services also had to be geared towards the preferences of the individual school's differing requirements.

The Hereford and Havelock schools in Grimsby have both been designed to the BREEAM Very Good standard. Opened in October 2010 to accommodate 900 pupils, Hereford Technology School has a P-shaped design that has been orientated so that the high-heat IT areas are located on

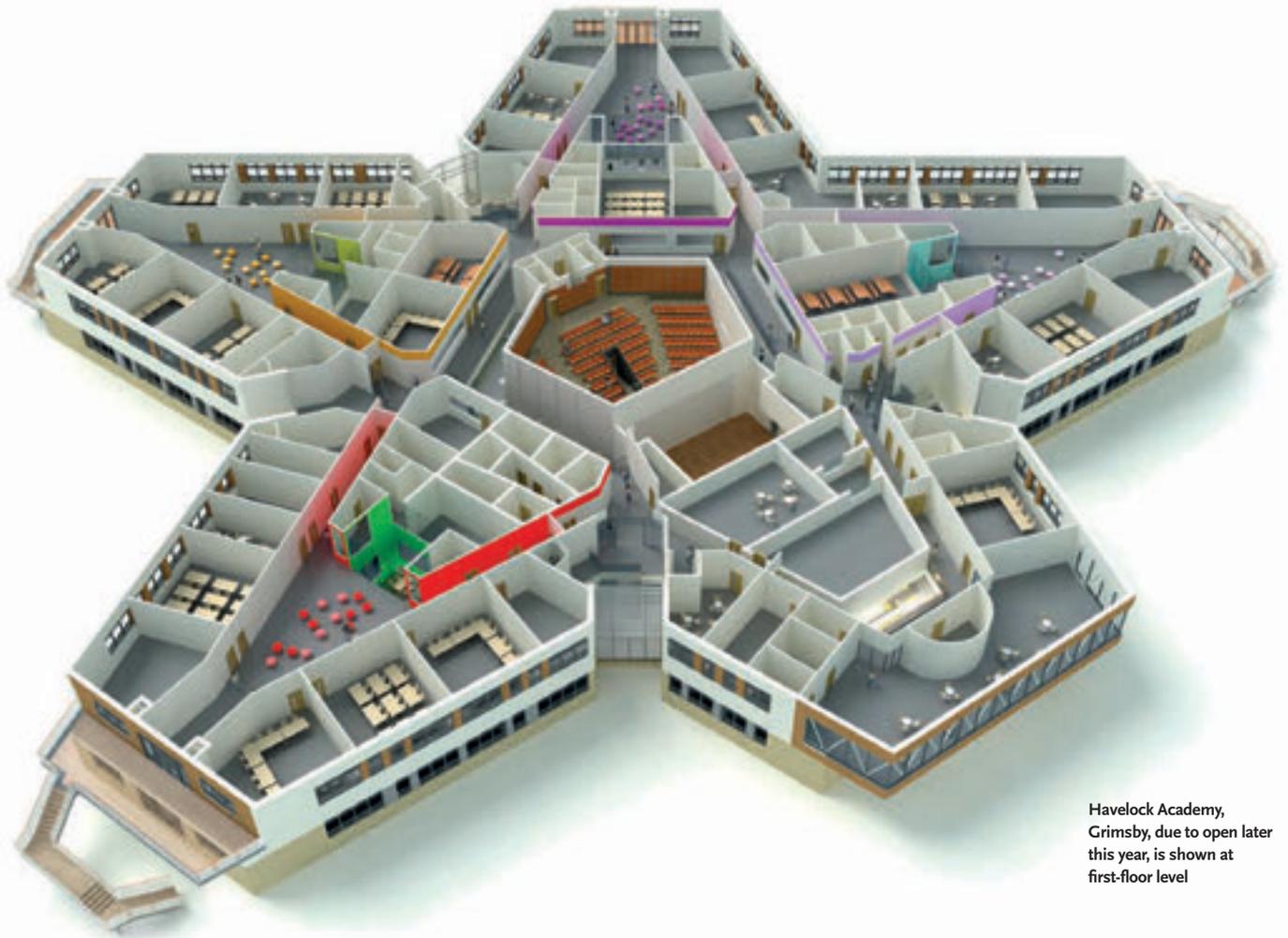
the north façade, to reduce the solar gains and cooling loads of these areas.

The science and music classrooms, which are also mechanically ventilated because of their high-heat activities, have been located on the ground floor, to enable the general-curriculum classrooms to be grouped on the first floor, along the spine of the P. These are naturally ventilated by manually-operated, single-sided windows, which open at the top and bottom (see Figure 1). Around 45% of the building area is naturally ventilated, according to AECOM principal engineer Colin Todd.

The classrooms also feature electronically controlled roof lights for more daylight, linked to temperature and CO₂ sensors within the classrooms. The system provides a purge facility during summer periods and enhances the natural ventilation by enabling cross-flow ventilation. The roof lights can also enable overnight cooling.

Todd says the roof-light controls have been adjusted since the school opened to prevent them from opening when the external temperature is below 16 degrees. The roof lights were opening in response to excessive CO₂ in the classrooms, but this led to excessive heat loss in cold weather. 'If the CO₂ has been building up, it might be that they haven't been using the windows properly,' notes Todd

The naturally ventilated classrooms are mostly orientated east to west, making use of beneficial solar gains. The sun's glare is mitigated by individual blinds on each of the three panes that make up a window, so



Havelock Academy, Grimsby, due to open later this year, is shown at first-floor level

▶ they do not obstruct the air flow.

The main hall, dining areas and technology areas are ventilated by central air handling units with integral heat recovery. The science classrooms and landlocked rooms within the spine of the P are ventilated by local, supply-and-extract heat recovery units, which have an integral plate heat exchanger with a summer bypass. The IT and Learning Resource Centre areas are heated and cooled by fan coil-type VRF (variable refrigerant flow) units. These allow heat to be recovered from an internal cassette when it is in cooling mode and passed to another unit where heating is needed.

The school has an internal courtyard area, or agora, with a barrel vault roof made from clear, UV-protected polycarbonate. To

prevent over-heating the agora has high and low louvres that respond to temperature and CO₂ levels, although an automatic 'weather station' prevents the louvres opening if it is raining or too windy outside.

Space heating is mostly provided by thermostatic-valve controlled radiators. However, some of the mechanically ventilated areas are heated by warm air systems, and the circulation spaces are heated by underfloor heating. These are fed by the central boiler plant, which comprises two gas boilers of 250 kW each and one biomass boiler of 250 kW.

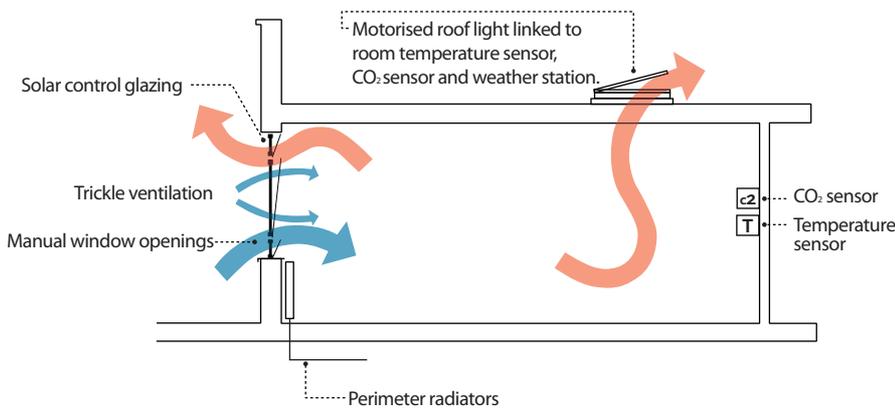
Todd says the biomass boiler can provide half of the total design load of the school and around 90% of the heat demand. The school has joined a public sector purchasing consortium, Yorkshire

Procurement, to source the wood pellets for the boiler. The school's biomass boiler can modulate down to 30% of its capacity and features automatic ignition, so it doesn't have to be left burning all night. Instead, the system can be scheduled to start up at whatever time in the morning suits the operator. 'The feedback we have is that the system is working as intended,' says Todd.

AECOM produced the concept and performance design at Hereford and conducted a peer review of the subsequent detailed design, which was carried out by NG Bailey. The gas, hot water and electrical systems are sub-metred, with the readings connected to the school's Local Area Network, so the pupils can log on to see how much energy each part of the system is consuming. The school aims to use this



Typical first floor classroom ventilation strategy



feature as an educational tool.

Meanwhile, the town's Havelock Academy, currently under construction and due to open this autumn, also shows how school design is changing to suit the needs of IT-focused learning institutions. Havelock will specialise in mathematics, computing and technology. It is proposed that all 1,100 pupils will carry their own netbook portable computer, which they will use throughout their time at the school. Thirty children in a classroom, each with their own portable computer, would ordinarily cause big heat gains that would need to be countered with a powerful ventilation system. But the netbooks will feature 'thin client' technology, which means that all the processing is done on a server in the school, reducing heat output from the notebooks.

AECOM has avoided using air conditioning wherever possible at Havelock. The building will be star-shaped. The ground floor perimeter classrooms are naturally ventilated, with openable strips at the top and bottom of each window. But there won't be any CO₂ monitors to help the occupiers use the windows.

Says AECOM associate director Paul

You can't just be an engineer, you also have to embrace the head teacher's vision

Brumpton: 'The head teacher was very keen that the users of the school could control their own environment, by being able to open a window.' A simple sticker on the wall will advise users on how to get the best out of the natural ventilation system.

The first-floor classrooms are also naturally ventilated, except for the Learning Resource Centre, which will have mixed-mode ventilation. Heat pumps will provide heating and cooling in four IT suites. Internal classrooms will have extractor

ventilation. Brumpton says the ventilation strategy at Havelock draws on AECOM's experience of working on four Sheffield Building Schools for the Future projects, which also featured single-

sided natural ventilation successfully. 'Those were successful and we were keen to adopt the same strategy at Havelock,' he says. Brumpton stresses that Havelock is in a quiet area with low background noise, making open windows feasible.

'As an engineer, I've learned so much about how schools need to operate,' says Brumpton. 'You can't just be an engineer anymore, tightening nuts and bolts and coming up with the calculations. You've really got to embrace the head's vision for the teaching.' **CJ**



FACTFILE
HEREFORD SCHOOL
HVAC SERVICES

Ventilation

Central roof mounted air handling units with thermal wheel heat exchanger

Local ceiling void mounted supply and extract heat recovery units complete with low temperature hot water heater batteries and plate heat exchanger with summer bypass facility

Twin fan toilet extract systems

Bifurcated kitchen extractor fan

Bifurcated fan serving food technology canopy extract

Actuated roof lights to first floor naturally ventilated classrooms controlled by weather station

Actuated low level inlets and roof lights controlled by weather station providing natural ventilation to the agora

Cooling

Local ceiling void mounted supply and extract plate heat exchanger, heat recovery unit with integrated DX VRF heat exchangers.

Air-handling units and local heat recovery supply and extract units configured to maximise free cooling as permitted by external conditions

Heating

Biomass boiler. Wood pellet boiler modulating boiler with automatic ignition

Two modulating gas-fired boilers

Low-temperature hot-water perimeter radiators to naturally ventilated classrooms. Warm air heater batteries to mechanically ventilated science and technology classrooms

Underfloor heating serving ground and first floor circulation spaces

Low-temperature hot-water door curtains at main entrances to provide climate separation and protection to circulation spaces heated by underfloor heating

Ceiling void mounted supply and extract heat recovery unit with integrated DX VRF heat exchanger has been installed



A computer-generated image showing Havelock Academy from a side elevation



The Manchester Transport Interchange Development includes a car park with offset glass panels that facilitate natural ventilation



DRIVING SAFETY

Maintaining air quality while satisfying safety requirements is a key challenge for car park ventilation, writes **Tim Dwyer**

Car park ventilation predominantly centres on the need to maintain acceptable day-to-day air quality. The air is typically monitored for carbon monoxide and nitrogen dioxide levels. The upper limits of the ventilation service will be determined by the need both to remove smoke and heat arising from a fire, and to provide the best means of access for firefighters. A single ventilation design will normally be used to satisfy both requirements.

Satisfying the relevant Building Regulations in terms of fire is likely to be the principal concern when assessing the compliance of a design. (See Approved Document B for England and Wales, DFP Technical Booklet E: 2005 – *Fire safety for Northern Ireland and Technical Handbooks 2010 Non Domestic Fire for Scotland*). Despite its name: *BS7346 – Components for smoke and heat control systems – Part 7 Car Parks*, includes the underlying requirements for ventilation to satisfy air quality needs that are applied to comply

with the ventilation requirements of the Building Regulations. When considering the control of vehicle exhaust pollution, BS7346 provides three different scenarios:

- **Naturally ventilated car parks** – where permanent natural ventilation is available. To be taken as naturally ventilated, there should be an equivalent area open to the outdoor air of at least 5% of the floor area for each car park storey, and at least half of this should be equally arranged between two opposing walls.
- **Mechanically and naturally ventilated car parks** - Where natural ventilation is available through an equivalent area of at least 2.5% of the floor area mechanical ventilation systems should be installed that can provide an air-change rate of at least three air changes per hour.
- **Mechanically ventilated car parks** – where the car park is in a basement or the car park storeys are fully enclosed, mechanical ventilation is required to provide to at least six air changes per hour in the main parking areas. Wherever cars could queue in the building with engines running, ➤



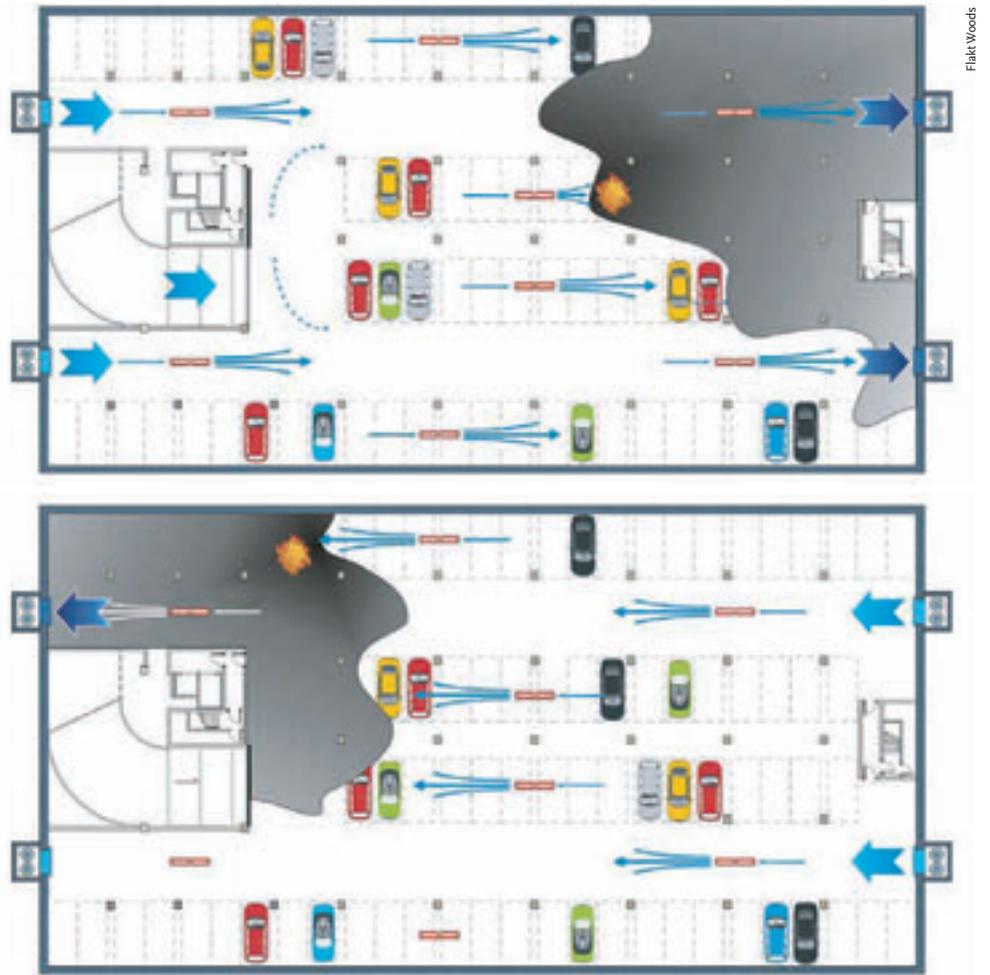
IMPULSE VENTILATION

In the last 10 years there has been a shift from the predominant use of totally ducted car park ventilation systems to impulse ventilation. Impulse ventilation takes the methods traditionally applied in tunnel ventilation (using the tunnel as the 'duct' with a series of high level fans to move the air through the tunnel) to direct air movement through a car park towards the extract fans.

It works in conjunction with the supply and extract points located, typically, at the perimeter of the car park. As the high velocity air moves from the outlet of the units it entrains more air by the Bernoulli effect – this system does not use an array of individual extract grilles to remove the air from the space.

Individual variable speed fan units are suspended from the ceiling of the car park and may be controlled separately to provide localised zoned dilution of contaminants by introducing variable rates of air. The units were based initially on axial flow fans in tubular housings, and these have now been joined by low profile centrifugal fan units that can be mounted in the space between structural members in car parks.

In the event of a fire the impulse ventilation can be used with smoke and heat detectors to accurately pinpoint the source of the fire and then, working as a selective network of fans, direct the smoke most effectively towards the extract position to provide the best opportunity for escape routes and to allow firefighters to access the fire. Apart from physical modelling the only practicable method of predicting the pattern of flow within the car park is through the use of flow modelling software.



Flakt Woods

Working in conjunction with the supply and extract systems, the direction and flow rate of air may be automatically controlled by impulse systems to provide the most effective removal of smoke from the car park

for example at exits and ramps, the local ventilation rate should be increased to at least 10 air changes per hour.

Alternative ventilation strategies can be used, so long as they are proved to limit the concentration of carbon monoxide to not more than 30ppm averaged over an eight-hour period, and peak concentrations, such as by ramps and exits, to not more than 90ppm for periods not exceeding 15 minutes.

The proving of alternative designs is frequently undertaken by computational fluid dynamics (CFD) analysis. These same restricting carbon monoxide limits are reflected in the requirements recommended as meeting the ventilation needs of the building regulations across the UK. If a mechanical system has been designed to meet the requirements to satisfy the demands of the fire regulations (nominally 10 air changes per hour) there

should not be any major challenges in diluting the vehicle exhaust to maintain appropriate carbon monoxide levels.

To both maintain carbon monoxide levels and minimise operational costs, a naturally ventilated system is the ideal solution. This does not automatically mean the concrete

monstrosities that have blighted the skylines of many city centres. The imposing architecture of the Manchester Transport Interchange development uses offset glass panels to obscure the sight of the cars while maintaining adequate

free area so that it benefits from natural ventilation as well as being protected from the weather.

In many car parks (subterranean or enclosed) there is no opportunity to achieve wholly natural ventilation. In such cases mechanical ventilation systems will have traditionally operated at a fixed ventilation rate (typically three to six air changes per

The use of various design tools can help to meet the whole-life needs of car park ventilation



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Ian Simpson Architects

Left: Testing of a car park's ventilation. Right: The Manchester Transport Interchange Development uses offset glass panels to obscure the sight of the cars, while maintaining adequate free area so that it benefits from natural ventilation as well as being protected from the weather

hour) and then, in the case of a fire, ramped up to provide 10 air changes per hour. However even at three air changes per hour the air movement through the extract system is significant, since each equivalent car parking space will require a minimum air movement of approximately 120 cu m/hour.

By employing variable speed fans, controlled using carbon monoxide sensors, the flow rates can be automatically reduced to practically zero at times when there are no vehicle movements in the car park (at night and, for office car parks, mid mornings and afternoons as well as at weekends). This will additionally ease the requirement for noise attenuation of the extract system as, during non-working periods and particularly at night, the extract fans will be running at lower speeds.

The overriding design requirement for

car park ventilation is that of providing the safest environment in the event of a fire. But in meeting this essential need the remainder of the operational period (in fact practically 100% of the time) must not be neglected as this will not only affect the health of operatives and users, but potentially significantly impact on operational cost and resulting carbon emissions.

Through using design tools such as computational fluid dynamics, and a system incorporating distributed sensors and intelligent controls, the application of impulse ventilation in conjunction with appropriate supply and extract systems can provide opportunities to meet the whole-life needs of car park ventilation. **CJ**

With thanks to **ROSS BARRITT** at Flakt Woods for technical information and images

Air quality Impact of carbon monoxide

The principal measure of air quality in car parks is the level of carbon monoxide (CO) level in parts per million. (1ppm = 1.145 mg/cu m and 1mg/cu m = 0.873 ppm). The background levels in remote country areas and across the sea are likely to be less than 0.5ppm (parts per million). Non-smoking healthy humans will breathe out less than 3ppm, and those less healthy or stressed in some way up to around 15ppm. Smokers may exhale up to 30ppm.

Exposure to CO affects the ability in healthy humans to exercise, and those who are elderly or predisposed to angina, or asthma can be particularly affected. The World Health Organisation-recommended levels are based on the carbon monoxide exposures to maintain the effect on blood

carboxyhemoglobin (COHb) for a resting adult at levels deemed safe (currently 2%). And the resulting guidelines are set in terms of short-term peak exposures that might occur, for example, while queuing in traffic in a car park; and for longer periods of one hour (that may be relevant for transitory parking attendants) and for eight hours that is used for general occupational exposures (working full-time in the car park).

The US Environmental Protection Agency is currently reviewing its carbon monoxide standards, but looking to maintain the levels at those shown in the table that were set in 1971. However, this is highly contentious as many cited studies indicate that CO levels with marginal increases above the background (and less than 5ppm) can have significant effects on health, with increased risks of ill health, including respiratory

and cardiovascular disease, from relatively small CO increases and not necessarily correlated with high COHb levels. There is pressure on the EPA to set the new eight-hour standard to no more than 1ppm, and the one-hour standard to no more than 5ppm. This would be a major change in the required levels, and may significantly influence the operation of car park ventilation with inevitable influence on global design.

EXPOSURE PERIOD>>	15 MINUTES	30 MINUTES	1 HOUR	8 HOURS
WHO*	87ppm		30ppm	9ppm
US EPA*			35ppm	9ppm
UK Building Regs	90ppm	60ppm	30ppm	10ppm
England/Wales Building Regs Part F – car parks	90ppm			30ppm

Comparative standards for limiting carbon monoxide levels (*World Health Organisation **Environmental Protection Agency)

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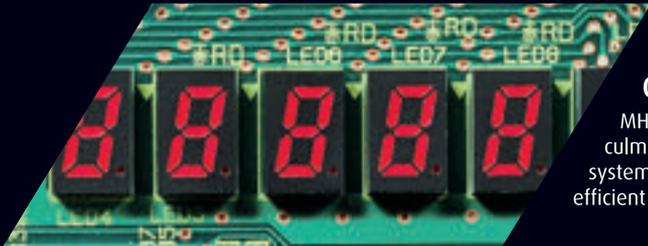


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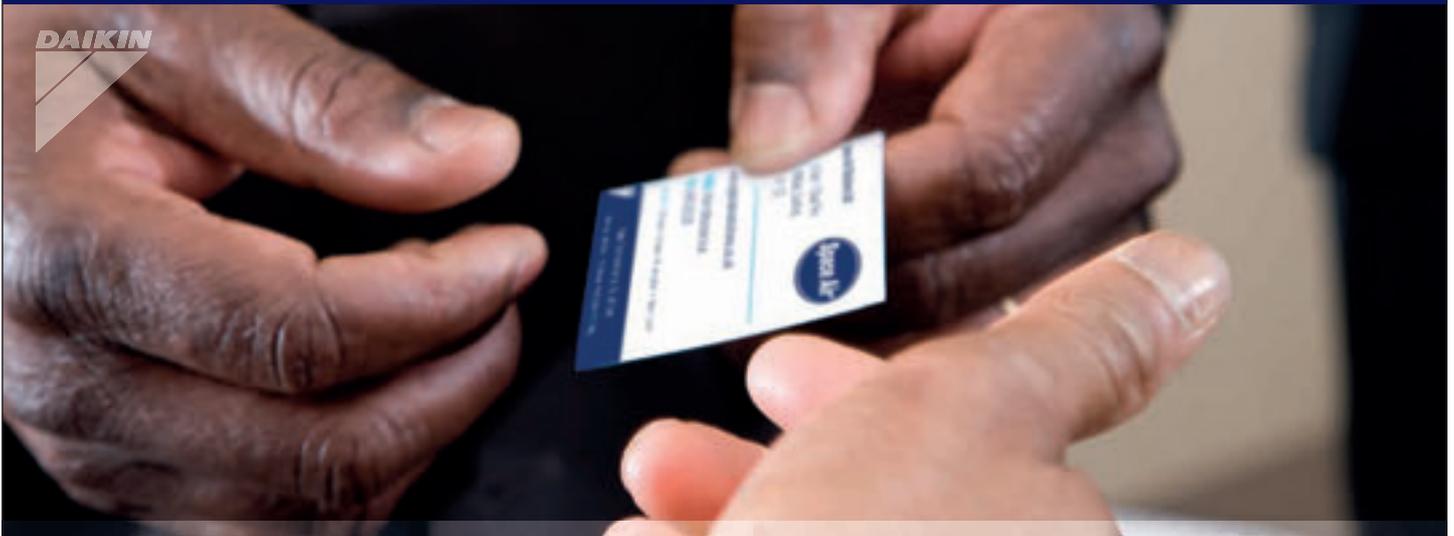
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HEALTHY PACKAGE

Natural ventilation has helped to keep the projected CO₂ emissions for a planned new health service unit to a minimum, according to the project's M&E contractor. **Andrew Brister** reports

The mechanical and electrical (M&E) services applied to a new building are, of course, crucial to its effective operations. But all too often, say some M&E engineers, these services are not sufficiently taken into account during a project's design stages.

Engineering consultancy Atkins has provided the M&E design services for a new Child and Adolescent Mental Health Services unit in Colchester, for client North Essex Partnership NHS Foundation Trust. Atkins argues that the building's designed-for-performance approach is benefiting from its approach of including M&E from the project's inception.

'The importance of the early involvement of the M&E team was crucial if we were to achieve the BREEAM rating,' says James Bourne, senior building services engineer at Atkins and a CIBSE Low Carbon Consultant. The design has received a BREEAM Excellent rating.

'As an M&E team, we demonstrated what

was available, the associated costs and what carbon savings would be achieved if we went for a particular technology,' Bourne adds.

'The overall design plan was to provide a healthy, bright environment that creates a sense of well-being to aid the occupant's recovery treatment.'

The design eschews mechanical ventilation and air conditioning where possible, and the team has looked at all possible ways of utilising renewable technologies.

The building accommodates some external therapeutic areas such as a sports pitch, around which the whole building is structured. Internal courtyards in the two wards allow rooms to be easily naturally ventilated due to the shallow plan.

The natural ventilation strategy uses Monodraught's Windcatcher technology. The design by Atkins and Monodraught covers 95% of the building and has Windcatchers above the building line

A representation of the new Child and Adolescent Mental Health Services unit, which also includes some external therapeutic facilities





PROJECT TEAM

PROJECT: Child and Adolescent Mental Health Services Unit, Colchester

CLIENT: North Essex Partnership NHS Foundation Trust

M&E DESIGN: Atkins

ARCHITECT: KLH Architects

QS AND PROJECT MANAGER: Castons

MAIN CONTRACTOR: ISG Jackson

TOTAL COST: £9.6m (inc all fees)

M&E COST: £2m approx

Projected energy usage and overall savings from renewable technologies and natural ventilation, based upon the design modelling

	Ground-source heat pump (150 kW)	Solar Thermal	Photovoltaics (15 kW)	Natural ventilation	Total reduction from base*
Projected energy saved per year (kWh)	14,352 kWh (Gas)**	12,255 kWh (Gas)***			
Projected energy generated per year (kWh)			14,765 kWh (Elec)		
Projected carbon reduction	6.8%	3.3%	5.0%	20%	35.1%
Projected cut in carbon emissions (kg CO ₂)	11,464	5,457	8,378	40,286**	65,585

*Base = design projections showing the building before any zero and low carbon techniques have been applied, and assumes comfort cooling for some areas. **There is a projected increase in electricity consumption but overall there is a net decrease in carbon emissions with the technology applied. ***The reduction in carbon emissions is compared against having comfort cooling to the treatment and consultation rooms, gym area, bedrooms, offices, dining areas and reception areas.

where the architect has worked with Andrew Stevenson, lead mechanical design engineer at Atkins, to embrace the natural ventilation scheme within the overall building design.

Atkins worked with Monodraught to overcome the problems of air movement that extending the height of the Windcatchers inevitably brought. ‘Raising the height does alter the air flow rates, noise, aesthetics and the cost, so we’ve sat down as a team to come up with the best solution,’ says Bourne. Each of the units in the main corridor and circulation areas is predicted to provide a ventilation rate of 420 l/s at an external wind speed of 3m/s.

According to the design modelling used, there is a projected saving in carbon emissions of 40,000 tonnes a year from using this ventilation strategy, compared with air conditioning in the treatment and consultation rooms, gym area, bedrooms, offices, dining areas and reception areas.

A 150 kW ground-source heat pump supplies the low temperature hot water for the building’s heating and 30 sq m of solar thermal collectors provide the pre-heat for the hot water requirements. High efficiency gas condensing boilers act as a back-up for the heat pump.

‘This may seem a bit belt and braces,’ says Bourne, ‘but the client wanted resilience. This is a 24-hour building and will operate at 75 to 80% of maximum occupancy at all times.’

There are also about 112 sq m of solar photovoltaic panels generating 15 kW of electricity that will be eligible for payments under the government’s feed-in tariff scheme. This will be used to charge up

a battery-powered lift and also to drive fans in those areas that need mechanical ventilation.

‘We’ve opted for what we call sensible sustainability on this project,’ says Bourne. ‘We’ve added to the saleability of the space there and added credibility to the Trust’s corporate social responsibility agenda by providing a green, low-energy building.’

The team has avoided any measures that were considered either too costly or that

may have encountered planning problems, such as combined heat and power. Early designs also considered the incorporation of a wind turbine, but the payback period proved to be too long. In any case, the area is surrounded by trees that are protected

by tree preservation orders, something that dictated the building’s footprint and also limited the space for plant and services distribution routes.

On the electrical side of the project, the team has opted for low energy T5 fluorescent lighting internally. All lamps are daylight linked, coupled with both absence and presence detection to further save energy. Externally, LED lighting was chosen for its low maintenance and improved energy performance, despite the higher capital cost over conventional solutions. The project demanded a new 280 kVA substation on site.

The turf has been cut and the project has moved into the construction stage. ‘The project was tendered as a traditional single-stage tender package,’ says Bourne. ‘This helps to ensure that the building is constructed in a well co-ordinated way and any possible building changes required also incorporate the M&E services.’ **CJ**

We aim to ensure that any possible building changes required also include M&E services

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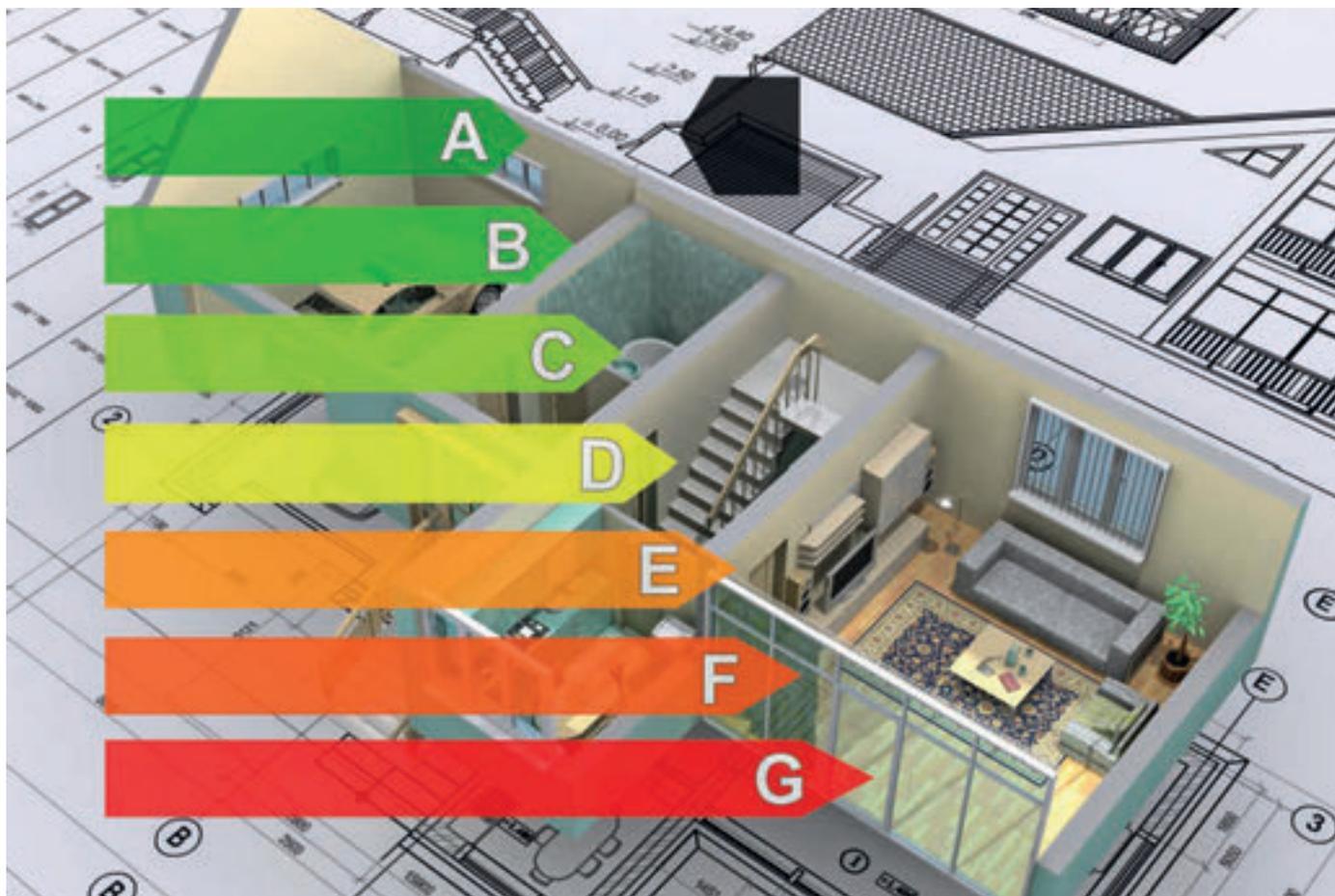
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IN THE KNOW

CIBSE Low Carbon Energy Assessors who produce Energy Performance Certificates must be aware of the 'conventions', writes **Andrew Geens**, who has set a CPD questionnaire for readers on page 64



All Low Carbon Energy Assessors (LCEAs) accredited to produce Energy Performance Certificates (EPCs) must be familiar with the non-domestic EPC conventions. CIBSE Certification is required to verify that they are. In order to help demonstrate understanding of the conventions, CIBSE has provided this briefing and questionnaire on page 64 that may also be of interest to other members – particularly if they are planning to join the register themselves.

The latest version of the EPC conventions for England and Wales is available on the CIBSE Energy Centre website, www.cibseenergycentre.co.uk/assessor-area/epc-conventions.html Amendments for

Northern Ireland are also located here.

This article sets out to explain some of the key elements of this convention document and should be read in conjunction with it. In order to maintain and improve the quality of certificates and inspection reports generated as a result of the Energy Performance of Buildings Regulations 2007 (and 2008 in Northern Ireland), the Department for Communities and Local Government (CLG), has approved the formation of convention groups, one each covering EPCs, Display Energy Certificates (DECs) and air conditioning inspections.

The development of conventions is part of the ongoing work to standardise the assessment process, to ensure a uniformity of

approach, and to assist energy assessors and their accreditation schemes; it is important to note that in some circumstances, following the convention may not be consistent with the judgement of an individual assessor. The guiding principle of the conventions is to remove the variability in assessment that comes from subjective decision-making. If everyone is making decisions guided by the conventions, the rating should always be the same regardless of which assessor produces the rating. The conventions are designed to improve the quality and accuracy of non-domestic EPCs. The conventions will, therefore, supersede any previous assessment guidance process including the iSBEM manual.

It is important that every CIBSE LCEA is familiar with the conventions and follows them when undertaking an EPC, even if there might be good reasons to adopt an alternative approach under some circumstances.

The conventions are presented in a table to reflect the tab structure in the standard iSBEM software, and are accompanied by an implementation date (see web link mentioned above). One important overarching principle to come from the convention group is that default values in iSBEM should only be used as a last resort, and that the reason for not being able to establish an actual figure must be recorded in site notes.

In order to avoid inconsistencies where different terms might mean different things to different people, a Glossary of Terms is provided to reduce the risk of variations in the 'interpretation' of the conventions.

Assessment level decision flow chart

There are three levels of EPC assessment, and their classification has changed since the legislation first came into force, so it is important to be familiar with the flow chart. Briefly, all new build assessments must be carried out by a Level 4 or Level 5 assessor. Assessment of simply heated and naturally ventilated existing buildings requires a Level 3 assessor; more complex buildings (heated using MTHW, HTHW or steam distribution or cooled using air conditioning with central plant) require a Level 4 assessor; and complex buildings (requiring dynamic simulation modelling, DSM, or having any of the features listed in the flow chart) require a Level 5 assessor.

Very few CIBSE LCEAs are qualified only as Level 3 assessors. Level 4 assessors are automatically qualified to assess Level 3 buildings. Level 5 assessors can assess Levels

3, 4 and 5, but only using the DSM software that they are qualified in. If they wish to assess Level 3 or Level 4 buildings using other software, they will need to demonstrate their competence (qualify) in the use of that software. The definitions of features that are significant in classifying a building as Level 5 are repeated after the flow chart.

Dimensions convention

Arguably, the energy assessment criterion with the most scope for variation is the measuring of dimensions, either from plans or on site. Do you include the thickness of party walls, intermediate floors and partitions? How do you measure irregular roof profiles or spaces with irregular geometry? Although probably not exhaustive, the conventions group seem to have produced measuring conventions for most situations that are likely to be encountered.

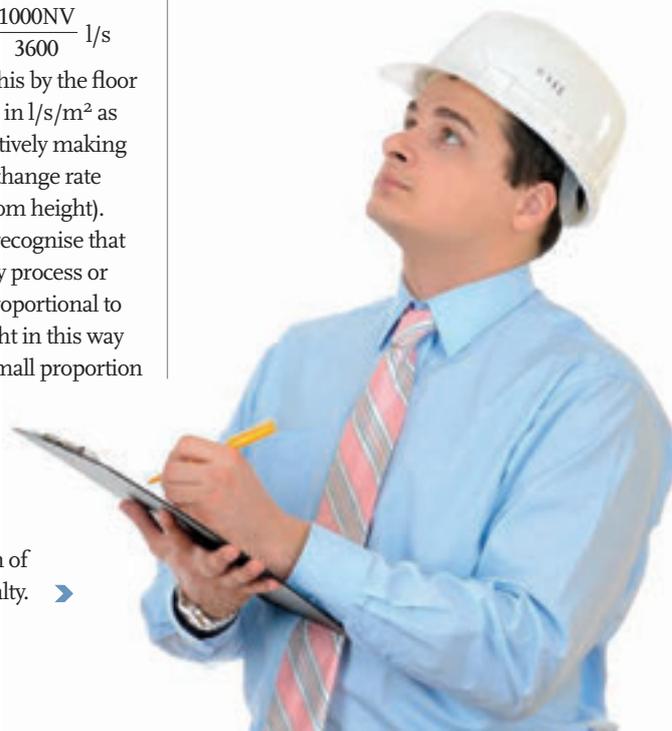
Local mechanical exhaust and ventilation rates

This convention has been developed in response to feedback that in many existing buildings it is difficult to establish local exhaust ventilation rates, and as previously stated, the use of the iSBEM default is to be avoided where possible, generally giving a worst case scenario. Assessors should attempt to use more appropriate figures wherever possible. The convention groups have used a table of air change rates per hour, taken from a number of sources including CIBSE Guides A and B. The intention is that assessors can use the following relationship between volume flow rate (Q) m³/s, room volume (V) m³ and air change rate (N) air changes/hour, to calculate the volume flow rate, that is:

$$Q = \frac{NV}{3600} \text{ m}^3/\text{s} \quad \text{or} \quad Q = \frac{1000NV}{3600} \text{ l/s}$$

The assessor can then divide this by the floor area to give a volume flow rate in l/s/m² as required by the software, effectively making the flow rate a function of air change rate and room height (V/Area = room height). Anyone following this might recognise that ventilation rates are dictated by process or occupancy, which is usually proportional to floor area, so using room height in this way will result in inaccuracy in a small proportion of buildings with unusually high ceilings. This is a good example of the philosophy of the conventions to provide consistency all of the time, although in a small proportion of cases, accuracy may be a casualty. ➤

It is important that every CIBSE LCEA is familiar with the conventions and follows them when undertaking an EPC, even if there might be good reasons to adopt an alternative approach



CPD Questions EPC Conventions

The value of 35 m³/hr/m² for air permeability for existing buildings shall only be used for:

- A Buildings with an accredited air pressure test result
- B Buildings > 500 m² built to 2002 Building Regulations
- C Buildings ≤ 500 m² built to 2002 Building Regulations and buildings built to 1995 Building Regulations
- D Buildings built to Building Regulations pre 1995
- E Buildings that are pre-1995 Building Regulations and where suitable evidence of high permeability exists

Where an electric hot water system has no storage then it should be entered as:

- A An 'instantaneous system' with grid supplied electricity as its fuel and a seasonal efficiency of 70%
- B An 'instantaneous system' with grid supplied electricity as its fuel and a seasonal efficiency of 100%
- C 'Stand-alone water heater' with grid supplied electricity as its fuel and a seasonal efficiency of 70%
- D 'Stand-alone water heater' with grid supplied electricity as its fuel and a seasonal efficiency of 100%
- E 'Air source heat pump' with a seasonal efficiency of 2.5

Which of the following features would trigger a Level 5 assessment for a building?

- A Steam distribution
- B Active chilled beams
- C Automatic blind control
- D A light or sun pipe
- E Display lighting

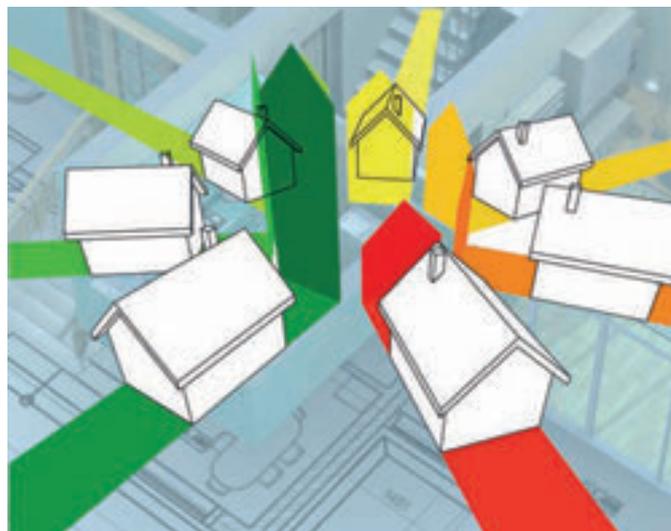
The use of software default values should be:

- A For HVAC plant > 15 years old
- B For construction elements pre-1965
- C For local mechanical exhaust ventilation
- D Avoided where possible
- E Encouraged to ensure consistency

When taking horizontal measurements of a building, the assessor should measure:

- A From the internal face of perimeter walls, the mid-point of internal walls and the internal face of party walls
- B From the internal face of perimeter walls, the surface of internal walls and the internal face of party walls
- C From the internal face of perimeter walls, the surface of internal walls and the mid-point of party walls
- D From the internal face of perimeter walls, the mid-point of internal walls and the mid-point of party walls
- E From the mid-point of perimeter walls, the surface of internal walls and the internal face of party walls

You can post your completed questionnaire to: N Hurley, CIBSE, 222 Balham High Road, London SW12 9BS. Or to complete it online, visit www.cibsejournal.com/cpd



The work of the EPC convention group is ongoing, and there is also a DEC convention group and air conditioning convention group. CIBSE is represented on all of these, so if you are aware of anything that needs standardising in this way, or have any feedback on the existing conventions let us know by emailing Andrew Geens, QA and technical development manager, at ageens@cibse.org

To complete the online questionnaire and demonstrate your understanding of the conventions please go to www.cibsejournal.com/cpd. You can also post it to N Hurley, CIBSE, 222 Balham High Road, London SW12 9BS.

Completing the questionnaire will demonstrate that you have read and understood the conventions. If you do not complete it, we will have to contact you to establish that you have read and understood the conventions. If we are unable to do this we may be unable to continue to accredit you as an EPC assessor.

If you are a CIBSE member, the fact that you have successfully completed the questionnaire will be automatically uploaded into your CPD record. If you are not a CIBSE member you will have to update your CPD record manually to contain this information. **CJ**

CIBSE Guides A and B are available from the CIBSE Bookshop: www.cibse.org/bookshop

ANDREW GEENS is quality assurance and technical development manager, CIBSE Certification

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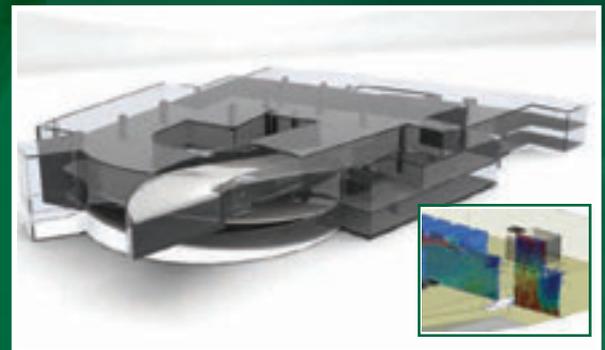
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Variations in thermal transmittance

The 'U value' of building elements are at the heart of all building models. But is the humble U value as straightforward as it appears? What might affect its value, and by how much? Some of these often-neglected issues are discussed below

There are great opportunities to reduce the energy use and carbon footprint of buildings through careful system selection, the use of renewable energy sources and the education of occupants. However, the best way to reduce the environmental impact of buildings through heating and cooling is to create constructions that provide the best opportunity to minimise the building loads.

Whether it be cooling or heating that dominates energy use (although heating predominates in the vast majority of the domestic and small commercial buildings in temperate zones such as the UK), one of the fundamental factors is the thermal transmittance, or 'U value', of the structures that make up the building envelope.

This CPD article will look at how this much-used value of thermal performance may actually vary in practice from the 'standard' calculated value.

The U value in context

In a building there will be a complex pattern of heat flows between not only the

internal and external environment, but also between the walls, ceilings, floors, and so on, that make up the internal environmental space. Even in the simplest of buildings there is a requirement to examine the pattern of heat flows so that a proper judgement may be made on issues such as condensation risk, optimising insulation, heat emitter and plant sizing and increasingly as part of the information needed to model the energy use of the individual spaces and the complete building.

The U value is a measure of the ability for heat to flow from one space, through a solid structure, and into another space and assumes that the conditions stay the same both in the wall and in the spaces. It is used in both simple 'steady state' calculations – as would typically be employed to determine design heat losses, and in conjunction with other parameters (including principally the 'admittance', Y) when evaluating dynamic loads – as would be used for cooling loads when the indoor and outdoor conditions vary relatively quickly.

As the U value increases so does the potential for heat flow. And so, for example, in the England and Wales Building Regulations Approved Document Part L1A for houses, there are maximum acceptable 'back stop' values for the U value of 0.2 W/m²K for external walls, 0.3 W/m²K for a roof and 2.0 W/m²K for windows. However the reality of the predicted U value is not always straightforward and can vary significantly from day to day, as well as over its lifetime. A U value can only be calculated if the materials and thicknesses are known and, importantly, the actual location of the complete structure. It's orientation, whether it is horizontal or vertical, the speed of the air flowing across it and the potential for radiant heat exchange will affect the value. Most building structures are made from more than one layer, and normally from a variety of materials. Each of the layers will have its own thermal characteristics and, to determine the U value, the thermal conductivity and thickness of each individual layer will be required.

► Thermal conductivity and thermal resistance

When considering solid materials, brick, plaster, insulation etc., the ease by which heat flows through is measured by its thermal conductivity, λ . If the temperatures on the two faces of a very large sheet of material are kept constant (but different from each other) then the heat flowing directly between the two faces as shown in Figure 1 will be

$Q_{12} = \lambda/d \times A \times (\theta_1 - \theta_2)$ watts, and where Q = heat flow (W), d = thickness (depth) of block (m), A = area of block (m^2), θ = temperature of surface ($^{\circ}C$) and λ = thermal conductivity (W/mK).

The term λ/d is called the conductance (W/m²K), and the inverse, d/λ , is the resistance, R (m²K/W), with calculations of R to running to three decimal places when establishing the individual resistances of layers^[1]. The R value is frequently used to publicise the insulating capacity of a material of a particular thickness such a insulation boards and mats.

The value of the conductivity for materials may be obtained from tables (that have themselves been developed from laboratory tests) such as those in CIBSE Guide A 2006 – Section 3. Materials with low values of thermal conductivity (below about 0.05 W/mK) being commonly referred to as ‘thermal insulation’

However, the value for the actual installed material will not necessarily be the same as the tabulated λ as it will be affected by its moisture content and, to an extent, its actual temperature.

Moisture content

In broad terms the thermal conductivity will relate to the density of a material. So intuitively a lightweight thermal block will be a better insulator than

Figure 1: A section of a very large plane of material

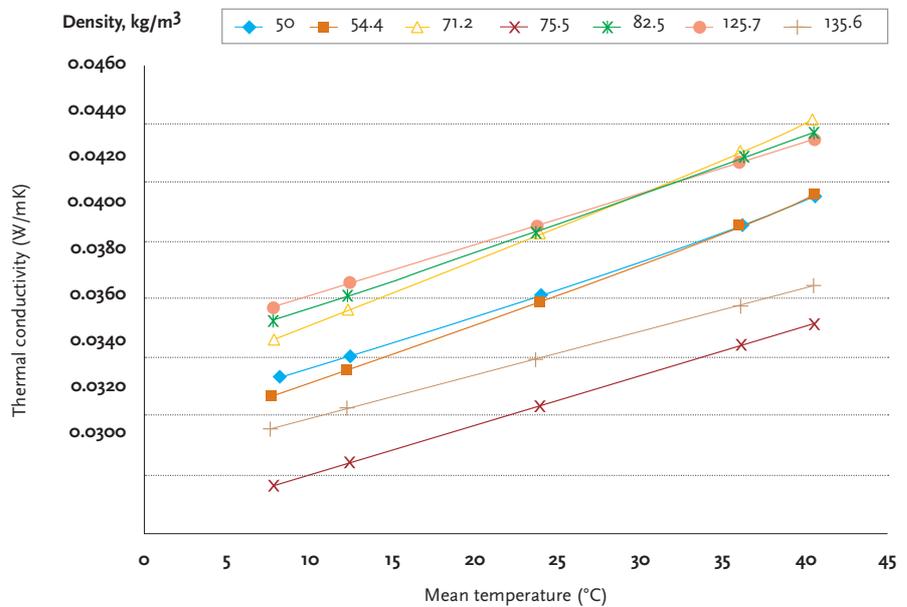
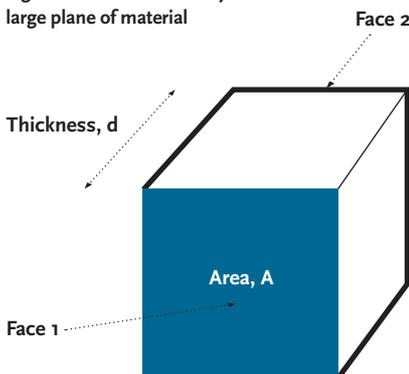


Figure 2: The measured effect of temperature on thermal conductivity of rock wall at various densities

the common (dense) housebrick. This situation can change completely if the materials are allowed to absorb water, as might happen while stored on-site prior to construction. The air spaces will be filled by water, which is a relatively good conductor of heat, and the overall thermal conductivity of the material will be increased. In properly constructed buildings this excess water will dry out. However, where there is poor weathering, or insufficient protection from water rising from the ground, elements may hold large amounts of water, so increasing the conductivity and potentially having significant effects on heat flow through the associated structure. For example, the standard moisture content for a brick protected from the weather (for example, on the inside skin of a construction or covered by tiling) is taken as 1% (by volume)^[2]. If subsequently that same brick is used in the outer face of a wall (or a protective covering fails in an existing wall) the moisture content may rise towards the standard ‘exposed’ value of 5%. Each additional % (by volume) of water content in a brick will increase the thermal conductivity by about 10%, and as in this case it would rise by 20%, so its thermal resistance would consequently fall. So for a 105mm lightweight clay brick with a protected λ of 0.40 W/mK, the R value would fall from $(0.105/0.40) = 0.263m^2K/W$ to $(0.105/0.48) = 0.219m^2K/W$.

Where poor design, or extreme

conditions, lead to condensation occurring in the structure, the water content of the materials will increase, so reducing the thermal resistance. This in turn is likely to exacerbate the condensation problem as it is likely to reduce the temperature of the fabric.

Temperature

The actual temperature of the material will also affect its thermal conductivity. In the range of temperatures typically used in buildings, the thermal conductivity will increase in most materials as temperature rises. Tabulated values of conductivity would normally be based on the material being at a temperature of 10°C. In most cases any variation from this reference temperature is ignored. However, where there are temperatures that significantly vary from 10°C, or for specific materials, there may be a case for examining the effect. The variation in the value of λ with temperature, θ , is difficult to generalise. However, there have been several studies that have measured the impact of temperature on thermal conductivity. For example a study^[3] undertaken in Saudi Arabia measured the temperature effect on the thermal conductivity of a number of insulation materials. The results for rock wool are shown in Figure 2, and indicate an increase in thermal conductivity of more than 10% between the standard tabulated values at 10°C and those temperatures that may prevail when undertaking cooling load calculations.

This magnitude of change is not uniform across all materials. Practical measurements of structural materials in Canada⁽⁴⁾ indicated that some materials, such as (carbonate aggregate) concrete exhibited a significant change in conductivity with temperature, whereas lightweight bricks did not.

Heat flow to and from the structure

The heat will flow to and from a building and between its individual components by conduction, convection and radiation. And for heat to pass through the solid structures it must first enter the structure's surface by heat conducting from the adjacent convecting air to the surface and from the radiant input from all of the surfaces facing it. When considering heat flow from outdoors, the radiant heat flow from the sun and the sky will also be included. For convenient incorporation into the U value calculation, the various heat transfer coefficients are combined to produce the internal surface resistance, R_{si} , and external surface resistance R_{se} , (m^2K/W).

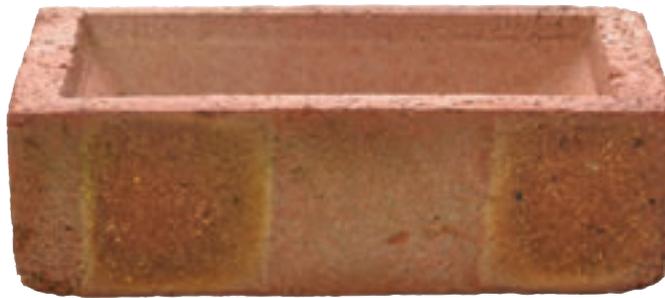
So $R_{se} = 1 / (h_c + Eh_r)$ and $R_{si} = 1 / (1.2 Eh_r + h_c)$ where h_c is the convective heat transfer coefficient, E is the emissivity factor (this takes account of the ability of the surface to radiate heat to its surroundings), and the radiative heat transfer coefficient, $h_r = 4 \sigma T_s^3$ where σ is the Stefan Boltzman constant $5.67 \times 10^{-8} W/m^2K$, and T_s is the surface absolute temperature (in Kelvin, K). The tables (3.8 and 3.9) in *CIBSE Guide A 2006* for R_{se} and R_{si} have been developed using these relationships.

Values of convective heat transfer were determined by Jürges in 1928 for forced convection (that is, external wind or caused by air movement devices in the room) and by McAdams in 1954 for free convection, and these still form the basis of the many tabulated values.

For the external convective heat transfer coefficient CIBSE Guide C 2007 suggests the use of the relationship⁽⁵⁾ $h_c = 16.7c_s^{0.5} W/m^2K$ for the air velocity, c_s being less than 3.5m/s. So, for example

if the wind speed was 1.5m/s the value of h_c would be $16.7 \times 1.5^{0.5} = 20.5 W/m^2K$. If the wind speed subsequently increased to 3.5m/s the value of h_c would increase to $31.24 W/m^2K$.

Radiation heat transfer will be dependant on the temperature of the object(s), the shape and emissivity. Typically dark objects will emit more radiation than lighter ones – they will have a higher *emissivity* and practically most building materials will have a high emissivity (with the maximum value



The thermal performance of a simple brick will depend on its temperature, moisture content and its age'

being 1). However the emissivity of a surface will change as a material becomes coated in particles of soot and dust in the air. The relationships that define the radiant heat transfer from a surface are very complex (a good discussion is provided in CIBSE Guide C 2007) and the equations used have been simplified and generalised for conditions that would be typical in building constructions. The

value of the radiative heat transfer coefficient h_r is dependent on the relative temperature of the surface to its surroundings; however, to accurately predict variations in this is extremely complex.

The emissivity factor, E, will vary directly with the emissivity of the

surface and so is more straightforward to enumerate. This can be illustrated most markedly when considering, for example, a bitumen flat roof that has been coated with aluminium paint (as a means of reducing solar gain) that, when freshly applied, would have an emissivity of around 0.3. As the roof ages and accumulates particles from pollution, flora and fauna its emissivity will rise, depending on the condition, towards the emissivity of the original dark bitumen roof (0.9) so increasing the radiant heat loss from the

surface. The emissivity factor will also be significantly affected by the surrounding surfaces, as there will only be radiant heat flow from the surface if there is a suitable surface to absorb the radiation. (This receiving 'surface' may in practice be the massive heat sink of a very cold, clear night sky). Practically the radiant surroundings may change as vegetation alters around a building or adjacent buildings and landscaping are changed.

To combine the two effects of the variation of the values of h_c and Eh_r (simply to illustrate the point and not as a specific design example) the value of R_{se} for a 1.5 m/s air speed passing over the surface with an emissivity of 0.3 would be $0.045 m^2K/W$. For a 3.5 m/s air speed passing over that same surface with an emissivity of 0.8, the value of R_{se} would be $0.028 m^2K/W$. If the wind speed had stayed the same and the surface's emissivity had risen to 0.8, the value of R_{se} would still have reduced to $0.039 m^2K/W$ compared to the original value of $0.045 m^2K/W$.

Practical implications

This article has touched on some of the variables in the thermal performance of building constructions in use. Combined with the challenges of calculating a representative U value for building elements that are made of several layers of 'non-homogenous' (varying) materials means that a pragmatic approach to heat loss and energy calculations is required. No matter how 'accurate' the subsequent thermal model may be, there must be a realistic understanding that the underlying U value cannot be considered an absolute constant.

© Tim Dwyer

No matter how 'accurate' the thermal model may be, there must be realistic understanding of the U value



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Module 28

May 2011

1. What is the limiting maximum U value for external walls in England and Wales Building Regulations Approved Document Part L1A?

- A 0.1 W/m²K
- B 0.2 W/m²K
- C 0.3 W/m²K
- D 0.5 W/m²K
- E 2.0 W/m²K

2. If a material that is just classified as an insulator has a depth of 50mm, what is its thermal resistance? (This requires a calculation.)

- A 0.050m²K/W
- B 0.500m²K/W
- C 1.000m²K/W
- D 10.000m²K/W
- E 100.000m²K/W

3. What is the normal reference temperature for tabulated values of thermal conductivities of building materials?

- A 0°C
- B 5°C
- C 10°C
- D 15°C
- E 20°C

4. Referring to Figure 2, which of the densities of rock wool (in this example) provides the best thermal insulation?

- A 50kg/m³
- B 54.4kg/m³
- C 71.2kg/m³
- D 75.5kg/m³
- E 135.6kg/m³

5. What would be the value of the inside surface resistance for a surface of 20°C, where hc is 2.5 W/m²K and the emissivity factor is 0.9? (This requires a calculation.)

- A 0.012 m²K/W
- B 0.085 m²K/W
- C 0.115 m²K/W
- D 0.165m²K/W
- E 0.215m²K/W

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Yorkshire County Council chooses Weatherite for kitchen upgrades

Weatherite Building Services (WBS) has upgraded the ventilation and gas systems at four schools and an elderly person's home as part of North Yorkshire County Council's programme of kitchen and gas safety works. The projects represent an excellent example of Weatherite's ability to offer a 'one-stop shop' for all aspects of building services and project management. WBS carried out the projects at Boroughbridge and Sherburn High, Fairburn Primary and Mowbray Special Schools and at Springfield Garth Elderly Persons Home.

● For more information call Robert Boswell on 0121 665 2266 or email rboswell@weatherite-holdings.com

Oventrop quality gets into church

High quality product design and a reputation for reliability resulted in a range of Oventrop valves being specified by Pasion Star, consulting engineers of Worthing, for the new heating systems in Christ the King Church, Cockfosters, North London, recently. To serve the two floors there are 60 radiators, all equipped with AV6 TRVs and Combi four lockshield valves, and 12 fan convectors. One plant room is on the ground floor and there is a small one on the first floor.

● For more information call 01256 330441 or email sales@oventrop.co.uk



Waste not want not – Dimplex heating warms compost facility

A Veolia composting facility in East Sussex that recycles green waste into organic soil conditioner is using Dimplex electric heating and solar thermal hot water to optimise efficiency. In addition to five full-time staff based at the Woodlands Centre at Whitesmith, the site receives up to 60 visitors a week, including members of the public, schools, and local authorities from across Europe, all coming to investigate environmental best practice – so a comfortable environment is vital and Dimplex's electric heating offered an ideal solution.

● For more information call 0845 601 5111 or visit www.dimplex.co.uk



Colour panel for BPT two-wire door entry system

Access solutions specialist BPT Security Systems has launched an addition to its X1 two wire video entry system: the Lithos colour video entry panel with integral intercom. For use on single dwellings or small apartment blocks, Lithos comes with the option of one, two or four push buttons, which are quick and easy to replace without the need to remove the surround. An intercom function is incorporated into Lithos, without the need for a supplementary power supply.

● For more information call 01442 230800, visit www.bpt.co.uk or email sales@bpt.co.uk



Radiant ceiling panels from MHS Radiators are ideal heating solution

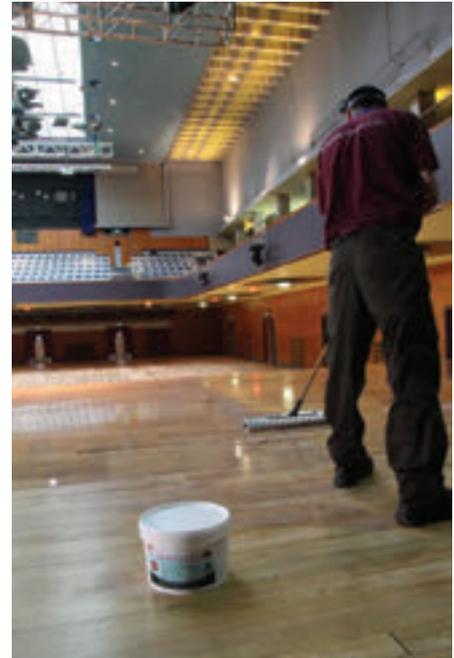
Moduline from MHS Radiators is a low-cost, lightweight and discreet alternative to traditional heat emitters. These radiant ceiling panels can operate at lower running temperatures (typically 30C lower than convective systems) that can deliver energy savings of up to 30%. Moduline panels distribute temperature evenly across the whole space and are ideally suited to schools, hospitals, offices or where wall space is at a premium. To make installation easy Moduline panels are designed to fit in standard T-bar suspended ceilings.

● For more information visit www.mhsradiators.com

Elta investment packs a punch

A new investment from the Applied Technology division of Elta Fans has significantly increased the production capacity at its engineering and manufacturing site in Fareham, Hampshire, with the introduction of the latest in sheet metal punching technology. A Trumpf TruPunch 2020 punching machine marks the newest addition to Elta's already extensive manufacturing hardware and software, providing greater productivity and flexibility in the manufacture of fans and ancillary equipment employed in a wide range of building services applications.

● For more information call 01384 275800 or visit www.eltafans.com



Beaver Floorcare makes sure Wolverhampton Civic Hall doesn't slip up!

35,000 serious slip accidents occur in workplaces across Great Britain every year. Ensuring floor surfaces meet health and safety standards for slip resistance can be a big concern for businesses. The wooden floors at Wolverhampton Civic Hall had been maintained with a regular scrub and dry, and an application of wax. Floors such as this are prone to very low levels of slip resistance. Beaver Floorcare was asked to assess the problem floors and offered a complete service to produce the most slip resistant floor surface.

● For more information call 01773 541177 or email info@granwax.com

ENER-G launches next generation building energy management system

ENER-G has launched a new tamper-proof building energy management system (BEMS) – E-MAGINE – that is pre-engineered to provide fast installation and commissioning, assured lifetime delivery on energy costs and carbon savings. ENER-G estimates that E-MAGINE can reduce energy usage by up to 25% and save costs on capital purchase, commissioning and on-going maintenance. 'We have tackled two major system flaws that prevent many building energy management systems from delivering their projected cost and carbon savings over their lifetime,' said Cedric Rodrigues, managing director.

● For more information visit www.emagine-controls.com or www.energ.co.uk



Gripple behind the scenes at the new BBC Drama Village

Not only did the size of the new BBC Drama Village in Cardiff Bay raise many significant construction challenges, including acoustic insulation, but the quick start and tight schedule made it an ideal project



for Gripple Hanger solutions. The village has nine studios and is the size of three football pitches. Each of the nine studios required 1,000 fixing points. This would have normally taken nine weeks. Equipment hire and installation time was slashed to under half this though, to just four weeks, using the Gripple method.

● For more information visit www.facethefacts.org.uk

Visitors 'in the green zone' at Climatizacion 2011 trade fair

Visitors looking for something a bit unique at Climatizacion 2011 were treated to Hitachi Air Conditioning and Refrigeration Group's special green zone. The green zone, organised by Hitachi ARG on its stand at the trade fair, was a welcome attraction for those committed to a sustainable environment. It provided a focus on renewables, with a detailed insight into energy-efficient products. This included Hitachi's award-winning S-Series SX8, which is the most energy efficient unit on the market, with a coefficient of performance (COP) of 6.13 and EER of 6.0.

● For more information call 01628 58394 or visit www.hitachi-aircon.com



Mitsubishi Electric announces two new strategic partnerships

Mitsubishi Electric has appointed two new value-added resellers following the company's growth in market share in all areas of business, during one of the toughest periods for the industry for decades. The appointment of Logicool Air Conditioning Distribution Ltd, of South Derbyshire, and Intra-grated Solutions Ltd, of Peterborough, vindicates Mitsubishi Electric's decision to expand its product portfolio into renewable technology, with the addition of more heat pump-based air conditioning and the expansion of the Ecodan air source heat pump heating range.

● For more information visit www.logicool-ac.com or www.intra-gratedsolutions.co.uk



Heating engineers choose Vaillant

A Vaillant geoTHERM ground source heat pump is the heat source of choice at the purpose built new premises of heating engineers, R&M Wheildon Ltd, based at Lower Bentham, near Lancaster. Director Roger Whieldon and his team have been installing Vaillant boilers for many years, and when Vaillant launched renewable technology, they were among the first to embrace it, being firmly convinced of the excellent quality of the company's products.

● For more information call 01634 292300 or visit www.vaillant.co.uk



Schneider Electric launches HVAC dedicated drive

Schneider Electric, the global specialists in energy management, is expanding its range of Altivar Variable Speed Drives (VSDs)

with the introduction of the ATV212, specifically engineered for building HVAC (heating, ventilation and air conditioning) applications. With 50% of all energy used for HVAC operation in a typical building, the new ATV212 helps organisations to address the energy consumption of dedicated pumps and fans, improving the performance of the system. The new device features energy adaptation technology, which optimises energy usage.

● For more information call 0870 608 8608 or visit www.schneider-electric.co.uk



Fire alarm system with smartphone app

On-site fire alarm fault finding is now more convenient following the development of smartphone connectivity from Static Systems Group (SSG). Remote access is not new and SSG technical teams have, for some time, been providing service support for its fire alarm systems through IP-enabled technology. However, with the phenomenal rise in the use of smartphones, the latest enhancement is welcome news to those responsible for on-site fire systems. This application will help to speed up decision making and first-line diagnostics.

● For more information call 01902 895551 or visit www.staticsystems.co.uk

Titon enhances its ultra-efficient HRV Q Plus MVHR units

Titon's HRV Q Plus whole-house ventilation (with heat recovery) units have been enhanced to include new controls that will make commissioning for the installer much easier. The controls have been designed to enable simple compliance with the newly amended Part F Building Regulations. The new controls include a three-speed fan control that can be independently set. The timer has been made easier to set, controllable by four finger adjustable potentiometers (pots) and a PCB-mounted, three-way slide selector switch.

● For more information call 01206 713800 or visit www.titon.co.uk



Project helps turn ideas into reality to create skydiving facility

Twenty ambitious young engineers recently enjoyed a learning experience at Flakt Woods in Colchester, turning their creative engineering ideas into reality in a Dragon's Den-type challenge. The group of students spent the day discovering their potential by meeting the challenge of designing a commercial skydiving training facility for up to four people. The project was demanding as it involved fast-track learning on the principles of keeping people suspended in an airstream while consuming the least amount of energy – therefore being the most commercially attractive proposition.

● For more information call 01206 222555 or email info.uk@flaktwoods.com



Euroheat launches new training courses and website for renewables

For installers looking to take advantage of the renewables revolution, training is imperative. In answer to this growing requirement, Euroheat, a leading wood biomass training provider, has introduced an extended range of courses. Courses range from end-user and product-specific training, to HETAS qualifications for installers, engineers and specifiers. All training is delivered at Euroheat's state-of-the-art exhibition centre, in Bishops Cleeve, Worcestershire, which boasts some of the best facilities currently available in the UK.

● For more information visit www.euroheat.co.uk/training



Sika provides waterproof seal at Southwark development

For the £5m retail and residential development

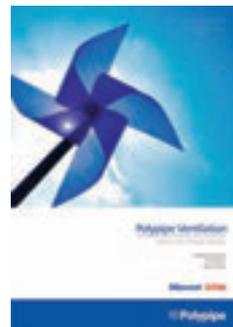
at Gedling Mission Hall, Southwark, a waterproof and airtight seal was of paramount importance. To achieve an impenetrable seal around the many joints and junctions of the windows and facade, Sika Universal Membran, from global building product manufacturer Sika, was specified by specialist contractors, Aquatech Contracts. The project comprised of the design and build of ground floor commercial units and a total of 38 residential units across the six floors of the semi high-rise development.

● For more information call 0800 1123863 or visit www.sikaconstruction.co.uk

Swegon secures new air conditioning solutions and increased sales in 2010

Swegon has come through the global economic crisis unscathed and posted a small profit for 2010. 'The 2010 revenues show growth from 2080 million kr in 2009 to 2153 million kr in 2010, and we were able to grow our market share in many countries,' summarised Örjan Ahlgren, chief financial officer of Swegon AB, at the ISH Aircontec Exhibition in Frankfurt. He added: 'It is particularly pleasing for us that Swegon recorded significant growth in established markets. For example, sales in Germany and France each grew by around 30% in 2010.'

● For more information visit www.swegon.com



Polypipe ventilation catalogue makes specification simple

Polypipe Ventilation is pleased to announce the arrival of a new catalogue detailing its full range of market leading energy-saving

domestic and light commercial ventilation systems. This is the first catalogue from the company to incorporate not only Polypipe and Domus product offerings, but also the Silavent range of fans acquired by the group last year. So much more than just a product guide, the new catalogue provides customers with simple-to-use navigation tools for complete ventilation system specification.

● For more information call 08443 715522 or visit www.polypipe.com/ventilation

Cylinders with EC-Eau credentials from Dimplex offers a different heating solution

Dimplex now offers not only the complete renewable space heating system, but the launch of the new EC-Eau range of unvented water cylinders, for heat pumps and solar thermal, delivers a complete renewable water heating solution. Made from 60% recycled materials, the range has been designed with environmental sensitivity and efficient performance in mind, to deliver mains pressure hot water from renewable sources. The cylinders feature heat exchangers with a corrugated surface, which maximises surface area while maintaining a high useable volume of water.

● For more information call 0845 601 5111 or visit www.dimplex.com





IBD provides high-end residential cooling solution

When the owners of Woodview House were looking to install air conditioning into their Ascot home, they contacted locally based specialists Eco Comfort UK to review the options available to them. The requirement was not only to provide comfort cooling during the summer season, but to also offer energy-efficient heating that would complement their gas-fired central heating system. Following discussions with IBD Distribution, Eco Comfort UK, the locally based specialists in renewable technology and HVACR systems, opted for a complete solution using products supplied by IBD.

● For more information call Ian Smith on 01202 825682 or visit www.ibd-distribution.com



New Honeywell water controls guide helps you find ideal products for each installation

The new *Honeywell Water Controls Guide* is a non-technical 24 page booklet which helps you find ideal valves and accessories for each water installation. It includes valves for pressure reduction/regulation, thermostatic mixing, backflow prevention and automatic system balancing, as well as filters and strainers. They range from brass-bodied plumbing products to large cast iron valves for the water mains supply.

The well-illustrated Guide is a valuable reference resource, showing application advice, product features and guidance on compliance with relevant Regulations.

● For more information call 01344 656172 or visit www.honeywellukwater.com



Air management product manufacturer enters hospitality sector

Sirius has announced its entry into the hospitality air management market with the launch of an environmentally friendly and technologically advanced range of products. Encompassing canopies, odour control equipment and energy management, Sirius' new products have been designed to enhance commercial kitchen hygiene and efficiency. All offer a significant improvement on current technology. Environmental awareness and energy efficiency are central to Sirius' new developments. Traditional companies using traditional paper, cardboard and metal filters send tonnes of waste to landfill every year.

● For more information call 01707 385434, visit www.siriusproducts.co.uk or email info@siriusproducts.co.uk



SE Controls expands despite UK's tough economic climate

The last couple of years have proven to be very difficult for many businesses in the construction industry. With falling orders and a general slowdown in new business, it feels like a slow strangle hold is being taken on what is one of the UK biggest industries. But SE Controls, a progressive and fast growing market leader in smoke and natural ventilation systems, both in the UK and worldwide, continue to expand through partnering with some of the major providers of fenestration systems in Europe.

● For more information call 01543 443060 or visit www.secontrols.com

Intensse air curtains at St Barnabas House perfect healthcare solution

JS Air Curtains has supplied four designer air curtains to St Barnabas House hospice in Worthing. Two 1.5m and two 2m Intensse air curtains are preventing cold air from entering the reception of the £13.5m healthcare development. The Intensse air curtain has an oval design, strip lighting, a built-in fragrance option and germicidal UVC lamp to eliminate airborne viruses and micro-organisms, making it ideal for healthcare environments. A casing encapsulates the mounting arm to give a seamless finish.

● For more information call 01903 858656 or email sales@jsaircurtains.com



Istanbul Sapphire sparkles

Standing at 261 metres, Istanbul Sapphire is Turkey's tallest building and one of its most environmentally friendly buildings. When it came to specifying, the fact that this is a mixed use complex encompassing a residential area, leisure zone and a large shopping mall meant that it needed to be designed to meet a wide range of different comfort levels. The contractor chose to work with a single pump supplier that could meet all the heating, cooling, wastewater, drainage and potable water demands – Grundfos Pumps.

● For more information call 01525 850000 or email uk-sales@grundfos.com

Launch of VES Direct Ireland

VES has a long tradition of supplying ventilation products and solutions in Ireland. Membership for VES Direct has grown significantly to several hundred users. Feedback from our UK customers has shown many of them prefer to just browse our VES Direct store or desk catalogue and order their kit for delivery direct to site. We are proud to announce the opening of VES Direct in Ireland. We believe customers in Ireland will find VES Direct the ideal way to purchase their ventilation products and systems.

● For more information visit www.vesdirect.ie





Research shows Purmo changes indoor climate for the better

Radiators are still the best choice for delivering comfortable heating evenly, silently and cleanly, research commissioned by leading radiator manufacturer Purmo has shown. The most significant find was the fast, even distribution of warmth within the room, due to the combination of radiated and convected air patterns that radiators produce. Especially when operating at lower temperatures, they also provide a healthier atmosphere, avoiding the burning of airborne dust, which can generate unpleasant odour and a dry atmosphere. Another advantage is their silent operation.

● For more information call Suzanne Todd on 0845 070 109 or visit uk@purmo.co.uk

Durapipe settles into Northampton and Kettering care homes

A host of Durapipe pipework has been specified within a number of new build care home projects in Northamptonshire. The new build projects of Cliftonville and Elm Bank are based in Northampton and Kettering respectively and are being built by leading care home developer Avery Healthcare. Based on previous good experiences, the contractor Metcalfe Engineers was already familiar with the extensive product offering from Durapipe UK and therefore specified Friatherm pipework in sizes 22mm to 75mm.

● For more information call 01543 279909 or visit www.durapipe.co.uk



New solar thermal collectors from Dimplex

Dimplex is expanding its solar thermal water heating range with the launch of three products: a flat plate collector, a high performance evacuated tube option and single branch pump station. The options give Dimplex improved flexibility to offer a solution



for every solar thermal installation. With the anticipated introduction of the Renewable Heat Incentive later this year, the solar products will help to meet demand and add flexibility for specifiers, creating a choice of solar collectors and hydraulic packs carrying the Dimplex name.

● For more information call 0845 601 5111 or visit www.dimplex.com



PCM-based passive cooling system

Phase Change Materials (PCM) store and release thermal energy during the process of melting and freezing, and the latest range of PCM solutions between -100°C and +885°C offer new application opportunities. For example, the cool energy available overnight is stored in the form of +27°C PCM containers within the building, and later the stored energy is utilised to absorb the internal and solar heat gains during daytime for an energy free passive cooling system.

● For more information call 01733 245511 or visit www.pcmproducts.net



Elta Fans collaborates on largest-ever NHS project in Scotland

Kingswinford-based manufacturer, Elta Fans, has supplied fans and equipment to the largest NHS construction project ever undertaken in Scotland. A new 'acute hospital' for NHS Forth Valley, is currently under construction in Larbert, a small town near Falkirk. Equipment supplied by Elta Fans included two Powerduct SPD fans, a Multiflow SMB, six SmokeVent LCS fans, a Quietflow Twin, two JetFlow fans, along with 20 special centrifugal fans sourced from Fans & Spares Ltd, Glasgow.

● For more information call 01384 275800 or visit www.eltafans.com

BACnet natural ventilation control from TITAN Products now available

The CCM-204-NV provides energy efficient control in buildings by controlling the natural ventilation on demand and improving the environmental conditions through the control of temperature and CO₂ levels. The CCM-204-NV can control two separate zones and when used in conjunction with TITAN Products temperature sensors, CO₂ sensors, rain detectors and window controllers the CCM-204-NV can create an extremely flexible multi-zone natural ventilation system. This advanced application specific controller with automatic seasonal adjustment will increase ventilation as CO₂ and temperature levels increase.

● For more information call 0161 406 6480 or visit www.titanproducts.com



Nuaire celebrates fifth contract win with major housing developer

Nuaire, the market leader in the design and manufacture of energy efficient domestic ventilation systems, has completed its fifth successful project with



Orchard Homes & Developments. The project involved the supply of MRXBOX95 wall units for 14 new build properties in a new Regency House development in Southampton.

Nuaire introduced the MRXBOX95 range in 2009 to help property developers meet their building regulation requirements and provide healthy living environments for their occupants. The units are lightweight, easy to install and are available in a variety of sizes.

● For more information call 029 2085 8200 or visit www.nuaire.co.uk/residential

TA HYDRONICS

TA Hydronics heralds an engineering advance in HVAC efficiency

Wasted energy within the HVAC sector has inspired the recent formalisation between three major HVAC companies: Pneumatex, a specialist in pressurisation and water quality; TA the world-leading brand in hydronic balancing solutions, and Heimeier, a leader in the manufacture of thermostatic controls, to create one superbrand. Operating under the new name, TA Hydronics, the integration will raise the standard in HVAC system optimisation. Under one banner, TA Hydronics reinforces its position as the leading global expert in hydronic distribution systems.

● For more information visit www.tahydrionics.com

PRODUCTS & SERVICES

Telephone: 020 7880 6206 Email: darren.hale@redactive.co.uk

Classroom ventilation units

Aircraft Air Handling's 260mm-high classroom ventilation units: silenced to nr25; plate recuperator 60% efficient; air volume 0-500 litres. Heating: LPHW/ELECTRIC. Cooling: CW/DX. Larger air volumes and bespoke units are available.

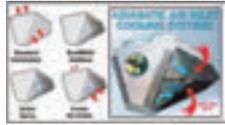
● For more info visit www.aircraftairhandling.com



EcoMESH adiabatic air inlet cooling

The EcoMESH concept is based on intermittently spraying water onto a mesh placed in front of the heat reduction surface, thus reducing power consumption by as much as 30-40%. It improves the performance of air cooled chillers, dry coolers and condensers and refrigeration plants. EcoMESH is a unique mesh and water spray system that improves performance, reduces energy consumption, eliminates high ambient problems, is virtually maintenance free and can payback in one cooling season.

● For more information call 01733 244224 or visit www.ecomesh.eu



Havells Sylvania retains Best Interior Luminaire crown at Lighting Design Awards

Concord, part of the global lighting manufacturer Havells Sylvania, has been honoured with the Best Interior Luminaire crown for the second year in succession at the Lighting Design Awards, the heart of the architectural lighting industry. The Concord Beacon LED range, including the Beacon Muse, impressed the judges in a Dragons' Den-style interview process, which added a new level of difficulty to even reach the short-list. The judges said: 'The Concord Beacon has a fantastic optical performance and is set to become a professional spotlight classic.'

● For more information call 0870 606 2030 or email pr.uk@havells-sylvania.com



Belfry benefits from long-lasting relationship with Atlantic Boilers

The Belfry Hotel has been the scene of the 2008 British Masters and four historic Ryder Cups. More than 20 years ago the boiler plant was provided by Atlantic Boilers. After two decades of satisfactory operation, Atlantic has supplied two GX-500D high output commercial twin-wall cylinders. The inner vessel is fabricated from chrome-nickel-molybdenum stainless steel, fitted with dished ends, argon-arc welded using the tungsten inert gas process, then de-stressed and surface treated. Each vessel can produce up to 3,255 litres of hot water per hour at 60°C.

● For more information visit www.atlanticboilers.com or email info@atlanticboilers.com



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Facilities Management

The University is one of the UK's top 20 research-led universities, and in its drive to support research excellence and enhance the 'Student Experience' is re-structuring the Facilities Maintenance team to improve service levels and enhance its service capability in support of a newly created *oneFM* Helpdesk. We aim to recruit a number of well-motivated individuals to help deliver the step change in the performance that we are seeking.

Engineering Maintenance Manager

£36,862 - £46,696 pa

You will lead a team of Mechanical and Electrical Technicians in providing a customer-focused comprehensive maintenance service for all aspects of the operation and maintenance of the building services and engineering infrastructure of the University, to agreed performance standards, through efficient control and deployment of both direct and contract labour, by optimising processes and working practices, and by developing human resources to maximise performance. Educated to degree level (or equivalent professional experience) and having corporate membership of a relevant professional institution, you will have a successful track record of consistently delivering high levels of customer satisfaction and have extensive engineering maintenance management experience in a large complex organisation. Job Ref: A-574807/CIBSE

Facilities Engineer (Specialist Contracts/Minor Works)

£30,870 - £35,789 pa

You will be responsible for the specification, procurement and management of specialist engineering maintenance contracts, such as those relating to lifts and refrigeration equipment, and for the delivery of mechanical and electrical minor maintenance works and projects, using Consultants and Contractors appointed under the University's Framework Agreements. You will have a strong customer focus, with a good working knowledge of M&E systems, plus demonstrable contract and project management experience, and be qualified to HNC level or higher in a relevant technical discipline. Job Ref: A-574809/CIBSE

Project Engineer (M&E)

£30,870 - £35,789 pa

Working as part of the in-house Design Group, you will have considerable experience of designing and procuring both mechanical and electrical building services, ideally with a strong bias towards successful project management of new mechanical installations in complex and highly serviced environments, such as research laboratories. You will have the ability to establish effective working relationships with a wide range of stakeholders and be able to foster a culture of project delivery excellence. Additionally, you will co-ordinate the work of the University's Framework Consultants and Contractors in ensuring that all projects are completed within the agreed budgets and timescales, and that they meet the initial design brief objectives. You should preferably be educated to degree level (or equivalent professional experience) in a relevant engineering discipline and a corporate member of a professional institution. Job Ref: A-574808/CIBSE

Closing date for all posts: 20 May 2011

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DCC/11/9021

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UNIVERSITY OF LEEDS

Faculty of Engineering
School of Civil Engineering

Lecturer/Senior Lecturer in Building Physics

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You should have an excellent research track record with the vision and drive to tackle new challenges and develop research collaborations within academia and with industry. You will join one of the two research institutes in the School, Institute for Resilient Infrastructure (IRI) or Pathogen Control Engineering Institute (PaCE), and you should be able to demonstrate how your research complements the activities of one or both of these institutes.

In addition to developing an active research portfolio you will make a significant contribution to teaching building physics and building services engineering mostly at undergraduate MEng/BEng level, including supporting Architectural Engineering design projects. A strong feature of teaching at Leeds is the extensive use of design project work and you would be expected to bring enthusiasm and preferably practical skills to this area of the curriculum.

University Grade 8 (£36,862 - £44,016 p.a) or 9 (£45,336 - £52,566 p.a) - dependant on experience.

Informal enquiries to Professor Stephen Garrity, Hoffman Wood Professor of Architectural Engineering, tel + 44(0)113 343 5388, email s.w.garrity@leeds.ac.uk or Professor Nigel Smith, Head of School of Civil Engineering, tel + 44 (0)113 343 2268, email n.j.smith@leeds.ac.uk

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Job ref ENGCV0003 Closing date 6 May 2011

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CVs are invited from experienced individuals seeking to develop their careers which should be sent to: charlotte.powell@appliedenergy.co.uk



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Sustainability Engineer

£30-£38k +benefits, London

Our client has been established for more than 50 years and employs over 160 staff in 7 offices across the UK. As a result of growth they are looking to add a sustainability engineer to their team. The successful candidate will be a registered low carbon consultant, possess a mechanical engineering background, and have a thorough understanding of EPC's, BREEAM, LEED, sustainable engineering, and energy assessments.
BAR606/JA

Electrical Engineer

£35k +benefits, Hertfordshire

We are sourcing candidates for an Intermediate Design Engineer position on behalf of a multidisciplinary consultant. Candidates will be required to carry out all necessary design functions including lighting layouts and calculations, cable sizing, containment routing, data and fire alarm systems. Calculations will be completed using both manual methods and the Cymap suite of software. Applicants must be degree qualified and preferably be a member of a recognised Institute such as IEE or CIBSE.
BAR547/PA

Snr. Mechanical Engineer

£35p/h, Middlesex

Our client is a market leading practice of multidisciplinary building services consulting engineers. They currently require an engineer to oversee the detailed design of the mechanical aspects of a data centre project. The successful candidate will be responsible for the design, technical delivery, quality, and management of the mechanical services relating to the project and should have previous experience working on mission critical schemes.
BAR618/PA

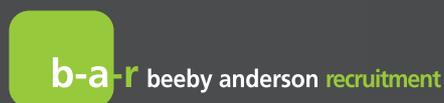
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Candidates for this role should have a broad range of experience in electrical engineering up to 33kV, including the design, specification and construction of industrial or public service distribution systems to UK standards, Electricity at Work, and Health & Safety Regulations. The right candidate will be expected to support business development opportunities and should have good client liaison skills. The ability to lead, support and develop other electrical engineers within the team is also important.
BAR608/CB

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Senior Mech Engineer – Data Centre Performance | London | £NEG! | ref: 6497

The role will encompass a variety of tasks including detailed CFD analysis, design management, bidding, mentoring and business development.

Electrical Design Engineer | Surrey & Hertfordshire | £NEG!! | ref: 4175

We are looking for electrical engineers with good laboratory and life sciences experience from within the industrial or pharmaceutical industry.

Elec Design Engineer – Critical Facilities | London/Surrey | £NEG! | ref: 6412

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Electrical Design Engineers – Rail | London | £NEG!/Contract | ref: 7378

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Team Leader - Electrical Design Engineer

Ref: 11730

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Their projects range in value from £100k to £40m. They seek a talented Design Engineer who will be managing the production and hand over of bespoke, high specification Building Services designs within Commercial, Healthcare and Manufacturing/Pharmaceutical facilities.

We have been instructed to source, with an immediate start if possible, an individual who is prepared to cover the extra mile required to maintain this company's recognised standards of deliverables.

As Team Leader you will be required to take a project management role on major Electrical design contracts, primarily scientific and research facilities.

This client boasts an established, modern working environment. They value the importance of a healthy work/life balance, apparent by their high staff retention. A fantastic working environment with unique work ethos await the candidate in this role.

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Events & Training

NATIONAL EVENTS AND CONFERENCES

CIBSE AGM and Presidential Address

5 May 2011, London
CIBSE's new president is inaugurated and presents his address
www.cibse.org/yen

The Facilities Show

17-19 May 2011, Birmingham
Seminars, products and more
www.thefacilitiesshow.com

Institute of Domestic Heating & Environmental Engineers conference 2011

26 May 2011, Hatfield
Focus on government policies
www.idhee.org.uk

Building Services World Cup 2011

11 June 2011, Liverpool
Teams competing for the CIBSE World Cup
www.buildingservicesworldcup.com

SOCIETY OF LIGHT AND LIGHTING

SLL Masterclass – the low carbon challenge

19 May 2011, London
Including a look at the ultra-efficient lighting and designing for efficient visual comfort
www.sll.org.uk

SLL presidential address, launch of LG5 and SLL awards

24 May 2011, London
Launch of new *Lighting for Education* guide, and new SLL president's address
www.sll.org.uk

CIBSE REGIONS

SoPHE Northern Dinner

06 May 2011, London
The inaugural northern dinner for all SoPHE engineers and industrial associates based in the north of England
www.cibse.org/sophe

Daylight Group AGM

11 May, UCL, London
Including a presentation by John Mardaljevic graham.phillips220@nitworld.com

Winnersh Triangle – Borehole Water

12 May, Reading
Home Counties North West Region visit to new water borehole plant
m.goodwin@dunwoody.uk.com

A Night at the Museum

13 May, Cardiff
South Wales Region dinner, with Big Band at Cardiff National Museum
jno@neiloliver.plus.com

Construction Excellence Dinner – CENE Awards

13 May, Newcastle
North East Region Dinner
derekgriffiths@bes-c.co.uk

Society of Façade Engineering Factory Visit

18 May, Lancashire
Visit to Pilkingtons Factory to see glass production
sfe@cibse.org

Society of Façade Engineering Factory City Walk

16 June, London
Annual guided walk around London
sfe@cibse.org

Young Engineers Network STEM Ambassadors Scheme Launch

10 May 2011, London
Come and find out more about being a STEM ambassador, on a boat trip up the Thames
www.cibse.org/yen

CIBSE/OTHER TRAINING

CPD Part L update for LCEAS

9 May 2011, London
www.cibsetraining.co.uk

Air conditioning inspection for buildings

16 May 2011, London
www.cibsetraining.co.uk

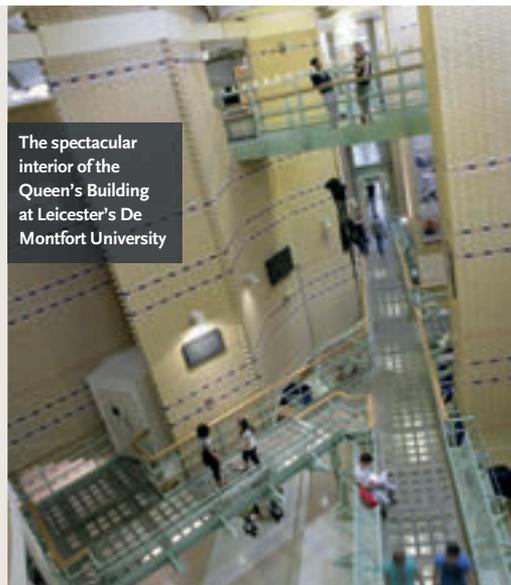
LCEAS EPC Training

18 and 19 May 2011, Birmingham
www.cibsetraining.co.uk

Getting technical

CIBSE is holding a Technical Symposium, in association with De Montfort University, on 6 and 7 September at the University's Queen's Building, Leicester.

The event will showcase research and technical developments to CIBSE members and a wider audience. The deadline for papers has passed, and 124 abstracts are being reviewed. The aim will be to select a range of papers that represent the full range of technical areas covered by the industry. For more information visit www.cibse.org/events



The spectacular interior of the Queen's Building at Leicester's De Montfort University

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GENERAL INTEREST

Mechanical Services Explained
16 May 2011, Birmingham

Mechanical Services Explained
15 June 2011, London

ELECTRICAL SERVICES

Electrical Services Explained
10 May 2011, Birmingham

Introduction to 11kV distribution and protection
16 May 2011, London

Electrical Services Explained
21 June 2011, Birmingham

Electricity at Work Regulations Explained
24 June 2011, London

BUILDING REGULATIONS

Gas Safety regulations explained and designing for compliance
28 June 2011, London

ENERGY EFFICIENCY AND SUSTAINABILITY

Low and zero carbon energy technologies
10 May, London

Low carbon buildings and energy infrastructure for local authorities
16 June, London

FACILITIES MANAGEMENT

Preparing FM and maintenance contract
09 June 2011, London

Introduction to Facilities Management
30 June 2011, London

FIRE SAFETY

Part B (Fire Safety) of the Building Regulations
05 May 2011, London

Emergency lighting to comply with fire safety requirements
02 June 2011, London

MECHANICAL SERVICES

Design of heating and chilled water pipe systems
11 May 2011, London

Design of Ductwork Systems
12 May 2011, London

Practical air distribution system design
17 May 2011, London

Practical controls for HVAC systems
19 May 2011, London

Variable flow water system design
25 May 2011, London

Air conditioning basics 3: air conditioning
31 May 2011, London

Fans in the 21st century, Parts L, F and all that
8 June 2011, London

Mechanical Services Explained (3 days)
15 June, Birmingham

PUBLIC HEALTH AND WATER

Variable flow water system design
25 May 2011, London

Sanitary and rainwater design using BSEN 12056:2000
26 May 2011, London

BUSINESS SKILLS AND MANAGEMENT

Practical project management in construction and building services industries
04 May 2011, London

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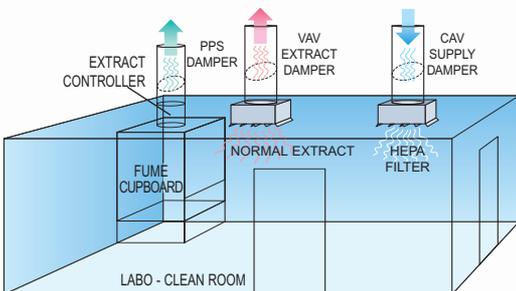


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