

CIBSE

JOURNAL



The official magazine of the Chartered Institution of Building Services Engineers

June 2013

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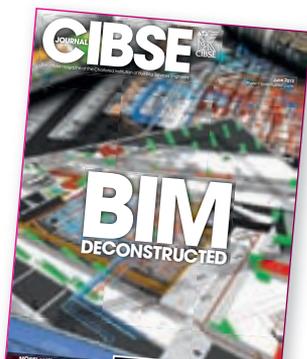
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Cover: Dean Farrow



Telling the truth

An important software tool that aims to close the building performance gap is officially launched this month. Backed by CIBSE and RIBA, CarbonBuzz is an online platform that encourages clients, contractors and consultants to share case studies, advice and performance data with their fellow professionals.

Users keen to share knowledge and experience are free to upload data and projects, while those nervous of revealing performance data have the option to upload information anonymously.

The site, even in beta mode, has already gained traction. It is being piloted by local authorities, government portfolio managers and investors among others, and the supplementary planning document of Islington council is encouraging the use of CarbonBuzz for all projects.

With 400 projects already uploaded, the scale of the performance gap is becoming apparent – most buildings are consuming between 1.5 and 2.5 times the energy predicted at design stage.

As clients realise that poor performance is costing them money, they will look to building engineers to close the gap, and will expect better functioning buildings. More consultants will have to sign up

to performance guarantees and face the risk of buildings missing their targets.

“ Consultant engineers can’t be expected to take on the risk of achieving building energy performance targets with no financial incentives

Firms can’t be expected to take on the risk of buildings achieving energy performance targets with no financial incentive. The news that Mitie and Emcor are pulling out of the M&E sector because of low margins is a stark warning for clients (page 8). If they want buildings that perform, they will have to pay to ensure high quality engineering, and proper commissioning in the form of Soft Landings.

It is encouraging to hear of clients who understand the benefits of delivering high performance buildings. Camden Council, for example, is predicting a saving of £500,000 on energy costs as a result of moving staff from old, energy inefficient sites to a brand new, low energy tower in King’s Cross. The building will include two swimming pools, partly paid for by the savings, so energy efficiency can have a friendly public face too (see page 51 for details of the chiller specification).

BIM is the great hope for the better delivery of buildings. Starting on page 33 we look at some of the major issues for engineers, and examine how BIM is helping Grimshaw and Balfour Beatty deliver Heathrow Terminal 2B.

Alex Smith, Editor
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DECC doubles renewable heat payments

● Scheme to provide better incentive while industry awaits the domestic RHI

The Renewable Heat Premium Payment (RHPP) grant scheme for domestic installations is to be 'significantly increased' – in some cases payments will double – according to the Department for Energy and Climate Change (DECC).

RHPP funding is designed to plug the gap before the introduction of the full domestic Renewable Heat Incentive (RHI), currently scheduled for the spring of 2014 after several delays. It supports solar thermal, ground and air source heat pumps and biomass boilers.

Gaynor Hartnell, chief executive of the Renewable Energy Association (REA), welcomed the increase, but urged the government to stick to the timetable for launching the RHI. 'We hope this will be the last time this stop-gap measure is needed,' she said.

The REA also reminded the government it was five years since the RHI was announced and urged it to provide 'policy certainty'.

Payments received from the RHPP will be deducted from any subsequent RHI finance a project receives. Only properties with loft and cavity wall insulation (if practical) and which have had a Green Deal assessment, are eligible. Installations must be carried out by MCS-certified installers.

Meanwhile, the RHI operations director has urged

applicants to take more care over the details of their applications. Jacqueline Balian told the latest Building Controls Industry Association (BCIA) conference that 96% of all applications for RHI payments [under the scheme for the commercial sector that is already up and running] had to be returned to the applicant because of missing or poor quality information.

She also said only £9m has so far been paid out of the available £860m funding – so there is 'lots in the kitty'.

About 70% of applications do not include information about the system capacity – 'you wouldn't think that was so difficult', said Balian. And 50% need to provide more meter information, while almost 30% need to provide more accurate schematics.

The RHI is being revamped and will include: simpler meter arrangements; new air quality restrictions for biomass installations; and a requirement for life-cycle greenhouse gas savings of 60% from each installation.

However, currently 40% of renewable installations in the UK are working 'well below their performance potential', according to CIBSE vice president John Field.

'We can't afford to fit and forget; people need to be told how to operate their systems properly,' he told the BCIA conference. 'We also need to ensure clients are getting the right incentive payments, because that will ensure their installations are working properly.'

In brief

17% OF PROPERTY 'UNFIT FOR LET', SAYS WSP

At least 17% – and possibly as much as 35% – of British commercial buildings could be unfit for renting out in five years' time because of their poor Energy Performance Certificate (EPC) ratings.

Under the terms of the Energy Act, by 2018 commercial properties with EPC ratings lower than E will have to be taken off the rental market until they have been brought up to standard. The government may also decide to include premises with E ratings, which would push the figure up to 35% of all commercial rental properties in the UK.

Consultant WSP reached these conclusions after analysing more than 4,000 EPCs. However, it warned the figure could rise even further as standards within the Building Regulations improve.

WISE AWARDS OPEN

The 2013 WISE Awards has opened for nominations. The organisation promotes the employment of women in science and the awards look to reward those who have done the most to inspire and encourage women to join the STEM industries. WISE is seeking nominations until 31 July from the construction and built environment sector in their 10 awards categories, which include a female innovators class, apprentices and mentors. www.wisecampaign.org.uk

BUSINESS TO BE PAID FOR REDUCING ELECTRICITY USE

Government has announced it is to create a financial incentive for businesses that permanently reduce the amount of electricity they use. The Department of Energy and Climate Change said it has put forward amendments to the Energy Bill to enable incentives to be delivered through the capacity market. The announcement was made as part of the government's response to the Electricity Demand Reduction consultation, launched in November last year. A pilot may be held to test the approach.

'Women are an important part of our industry's future,' says chairman of new WiBSE network



A panel of female speakers at the top of their fields inspired more women to get involved in engineering at the official launch of the Women in Building Services Engineering (WiBSE) network last month. The speakers entertained the audience with anecdotes of their experiences in industry during the networking event, staged in London.

Sarah Davis, WiBSE chairman, said women are an important part of our engineering future, adding: 'We want to inspire more women to lead in our industry.'



In brief

CBI CHIEF CALLS FOR CLARITY

CBI director general John Cridland has predicted a brighter future for the UK economy based on improved manufacturing exports.

Speaking to the ICOM Energy Association annual meeting in London, he predicted 1% growth this year followed by 2% in 2014.

'This year will see a modest uptick in the UK economy,' he said. 'The overall growth figures remain disappointing, but exports outside Europe are up - 33% higher than the first quarter of 2007.'

However, he said lack of certainty about the structure of the Energy Bill was damaging and urged the government to clarify its approach.

Cridland also said that improving infrastructure was helping UK businesses to grow and make them more competitive. The 0.3% growth recorded in the first quarter was organic and that's the first time that has happened for years'.

LOCHINVAR AND RUSKIN CONFIRM AWARDS BACKING

Lochinvar and Ruskin Air Management has confirmed its sponsorship of the CIBSE Young Engineers' Awards for the second year in succession.

Taking place on October 9 at the Institution of Mechanical Engineers (IMechE) in central London, the awards scheme combines the CIBSE ASHRAE Graduate of the Year and CIBSE Employer of the Year awards.

For more information, or to enter, visit: www.cibse.org/yea

TOWERING DATA PLAN

Energy consultant Carbon 2018 has upgraded and expanded energy data collection at Tower 42, the first skyscraper to be built in the City of London. The 600 ft building now has more than 150 sub-meters connected to an automatic meter reading (AMR) system. It is designed to support the energy efficiency strategy implemented by BNP Paribas Real Estate's building management team through greater visibility and control of energy usage. The detailed data allows problems, such as high night usage, to be pinpointed to specific equipment and areas.



ED ROBINSON/ONERED EYE

New mindset needed for BIM

● CIBSE Patrons host debate into design 'revolution'

The industry needs to change its mindset and attitude to building information modelling (BIM), according to leading engineering and government figures.

BIM has the potential to be a powerful agent for delivering the long-awaited reform to the whole process, said Rob Manning, of the Construction Industry Council.

However, he told a debate hosted by the CIBSE Patrons that 'the government client can only do so much and now it needs the industry to pick this up and run with it.'

'BIM can help to produce better "social" outcomes by providing more facilities and by demanding a focus on how hospitals, prisons and other important facilities operate. These are high level social aspirations, but why shouldn't

they happen?' said Manning, who is working with the Cabinet Office to help deliver the Government Construction Strategy.

Level 2 BIM will be required on all centrally procured government projects by 2016. The project team will have to work with a federated set of models, and this will require

'The government client now needs the industry to pick this up and run with it'

a move to more integrated working arrangements, the Patrons heard. However, former CIBSE president Graham Manly said the government was being naïve in not addressing contractual reform alongside the roll-out of BIM.

Jeff House, marketing and applications manager for Baxi Commercial Division, said

manufacturers were looking for greater clarity: 'We are making progress, but we will need to pick up the pace to meet the 2016 deadline.'

BIM could also transform the industry landscape for young engineers, according to Neil Thompson, principle BIM integrator for Balfour Beatty.

Thompson, who is a member of CIBSE's BIM Group, said many young engineers felt thwarted when looking to introduce change to the traditional contractual process. The digital revolution was an opportunity to sweep away restrictive practices, he said.

Some professional institutions were asking the wrong question about BIM because they were focusing on who would be responsible for the different parts of the process.

'They should be asking what they need to do for their members to help them engage with it,' he said.

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Two M&E giants quit UK market

● Firms refocus on markets with more potential for growth

Major contractors Emcor and Mitie are pulling out of the UK mechanical and electrical market, it has emerged.

Mitie said it was leaving because its M&E business was producing 'margins well below the group average'. The closure of its division will cost the firm £22.1m.

It said it wanted to reduce its 'exposure to cyclical markets'. It will, instead, focus on 'markets where we see potential for growth that meet our margin targets'.

Emcor, which employs 3,600 people in the UK and has a turnover of £340m, said it was leaving to focus on

facilities management, but would complete its current projects. It blamed 'construction market conditions'.

The company said its focus would be better placed 'in areas where it can more fully leverage its knowledge and strength to positively impact customers' businesses'.

These two high-profile departures follow the loss last year of MJN Colston, Airedale and parts of Rotary.

Mitie Group chief executive Ruby McGregor-Smith said: 'We have reshaped the business to focus on long-term facilities management opportunities, as well as higher margin healthcare provision and energy consulting. We expect outsourcing opportunities will grow, with a trend towards more clients seeking to access integrated services,' added McGregor-Smith.

In brief

PICKLES ATTACKED OVER TWO-STREAM ENERGY POLICY

Communities Secretary Eric Pickles has been accused of implementing European energy policy in an 'incoherent' way by British MEPs.

They object to his introduction of separate standards for public and private sector buildings, which they say was never the intention of the EU Energy Performance of Buildings Directive.

Currently, private building owners are only required to display Energy Performance Certificates (EPCs) showing theoretical energy consumption, while the public sector uses Display Energy Certificates (DECs) that indicate actual energy use.

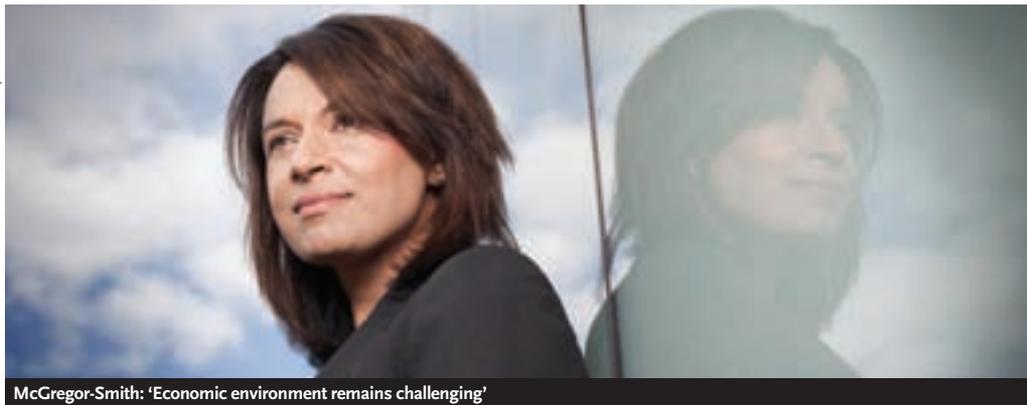
BANKS DRAGGING FEET OVER MIS-SELLING

Banks are being put under pressure to speed up compensating the building services firms suffering financially as a result of taking out loan products to guard against interest rates going up.

UK regulators in January ordered banks to review sales of the policies, known as interest rate swaps. They are required by the Financial Conduct Authority to compensate customers not given relevant information as part of the sales process.

Daniel Fallows, a director at Seneca Banking Consultants, which is handling a number of claims for developers and businesses across the property supply chain, said: 'Action needs to be taken as a priority.'

ED ROBINSON/ONEREDBYE



McGregor-Smith: 'Economic environment remains challenging'

MP raps industry's 'geeky' language

A senior figure at the Department of Energy and Climate Change (DECC) has urged the building services industry to change the way it communicates with end users.

Laura Sandys, parliamentary private secretary to Energy Minister Greg Barker, said the way energy efficiency was presented was too 'geeky and ugly' so consumers didn't see it as desirable.

However, she said the

government was putting energy efficiency at the heart of its policy-making and remained committed to making the UK 'the most energy-efficient country in Europe'.

She told the CIBSE Patrons annual lunch meeting at the House of Lords that new incentives would be forthcoming to motivate commercial property owners currently demotivated by lack of responsibility for their building's energy bill.

She said there would also need to be a major 'psychological' change in the British public to improve energy behaviour if targets were to be reached.

Sandys also defended the decision to charge 6.9% interest on Green Deal loans by saying it compared favourably with mortgage rates and that it represented a good investment prospect for homeowners.

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In brief

UNITED STATES ENJOYING MARKET SURGE

The US building services sector will enjoy healthy growth throughout the rest of this year and 2014, according to the country's leading industry bodies.

The Manufacturers Alliance for Productivity and Innovation said the heating, ventilation and air conditioning sector would increase by 4% in 2013 and 7% in 2014, while the National Association of Home Builders forecast residential construction would grow 30% in 2014 on top of 22% growth this year.

The commercial building sector will leap by 5.2% during 2013, according to the Associated Builders & Contractors body, and architects are experiencing the strongest growth in billings for almost six years as tracked by the American Institute of Architects.

CONTROLS SECTOR REJECTS ENERGY BLAME

Controls systems unfairly get the blame for many buildings failing to hit their energy-saving targets, said the president of the Building Controls Industry Association.

Speaking at the association's annual conference, Ian Ellis said too many control systems were not used properly. He urged the building engineering sector to provide better information to their clients about building operation.

Building Energy Management Systems should be used to deliver reports, but these need to be 'meaningful to the end client with information delivered in a way that is useful'.

RAMBOLL BUYS GERMAN CONSULTANT

Ramboll Group has acquired German consultant Atelier Dreiseitl for an undisclosed sum. The Überlingen-based firm also has offices in Singapore and Beijing. It employs 80 staff specialising in urban water projects.

The company provided sustainable water strategies for the Potsdamer Platz in Berlin; the city of Singapore; the Bishan-Ang Mo Kio Park; and the blue and green features in the Tianjin Cultural Park, near Beijing.

Heat pump vision flawed, says ICOM boss

● Association questions government policy

The government's plans for heat pumps to replace gas-fired heating across the country are unrealistic, according to ICOM Energy Association director Ross Anderson.

He said the Department of Energy and Climate Change (DECC) 'wants gas to play little or no part in the UK heating industry by 2050', but questioned the ability of the National Grid to meet the increased level of electricity demand millions of heat pumps would create.

'They would have to re-wire the country,' Anderson told members at the association's annual meeting in London.

He said it was increasingly difficult for manufacturers to know which technologies to develop for the future in the face of apparently conflicting political statements.

The election in two years' time may also create further uncertainty over energy policy, Anderson said.

'ICOM is being forced to become more political. We need to work with



Heat pumps 'could create an unrealistic demand for electricity'

the government to try to predict what we must do to meet its vision, but at the moment it is a vision with very little substance,' said Anderson.

However, David Pepper, chairman of ICOM's commercial boiler and water heater group, cautioned against reading too much into political statements.

'Experience shows that the government has only a flimsy grasp on energy policy and a nasty habit of veering off-course at short notice,' he said.

'The renewables market is

growing, but at a substantially slower pace than the government hoped and not nearly fast enough to plug our looming energy gap,' added Pepper, who is managing director of Lochinvar and a former ICOM President.

'We do need to be planning for the future and examining our product options, but that has to include the generation of highly efficient gas-fired boilers and water heaters we have already developed to reduce energy consumption and carbon emissions.'

Green Deal makes 'modest' progress

Almost 19,000 Green Deal (GD) assessments were carried out between the launch of the energy efficiency scheme in January and the end of April – but just 942 organisations have signed up to carry out the installation work.

Following the release of the latest statistics, Energy and Climate Change Minister, Greg Barker said: 'The Green Deal market is showing healthy signs of growth ... with 18,816 GD assessments carried out by the end of April. That's more than double the number undertaken by the end of March. It's still early days for this long-term initiative, but this is a clear sign of growing interest from consumers.'

By the end of April there were 55 authorised GD providers, 1,274 individuals registered to carry out assessments, and 942 organisations signed up to carry out installations.

However, industry observers remain cautious.

'It is not a bad start, but at this rate it will take about 100 years to assess 10 million properties and there are 26 million properties in the UK,' said Paul Reeve, director of business services at the Electrical

Contractors' Association (ECA). 'The number of assessments is still modest in the context of the massive overall challenge.'

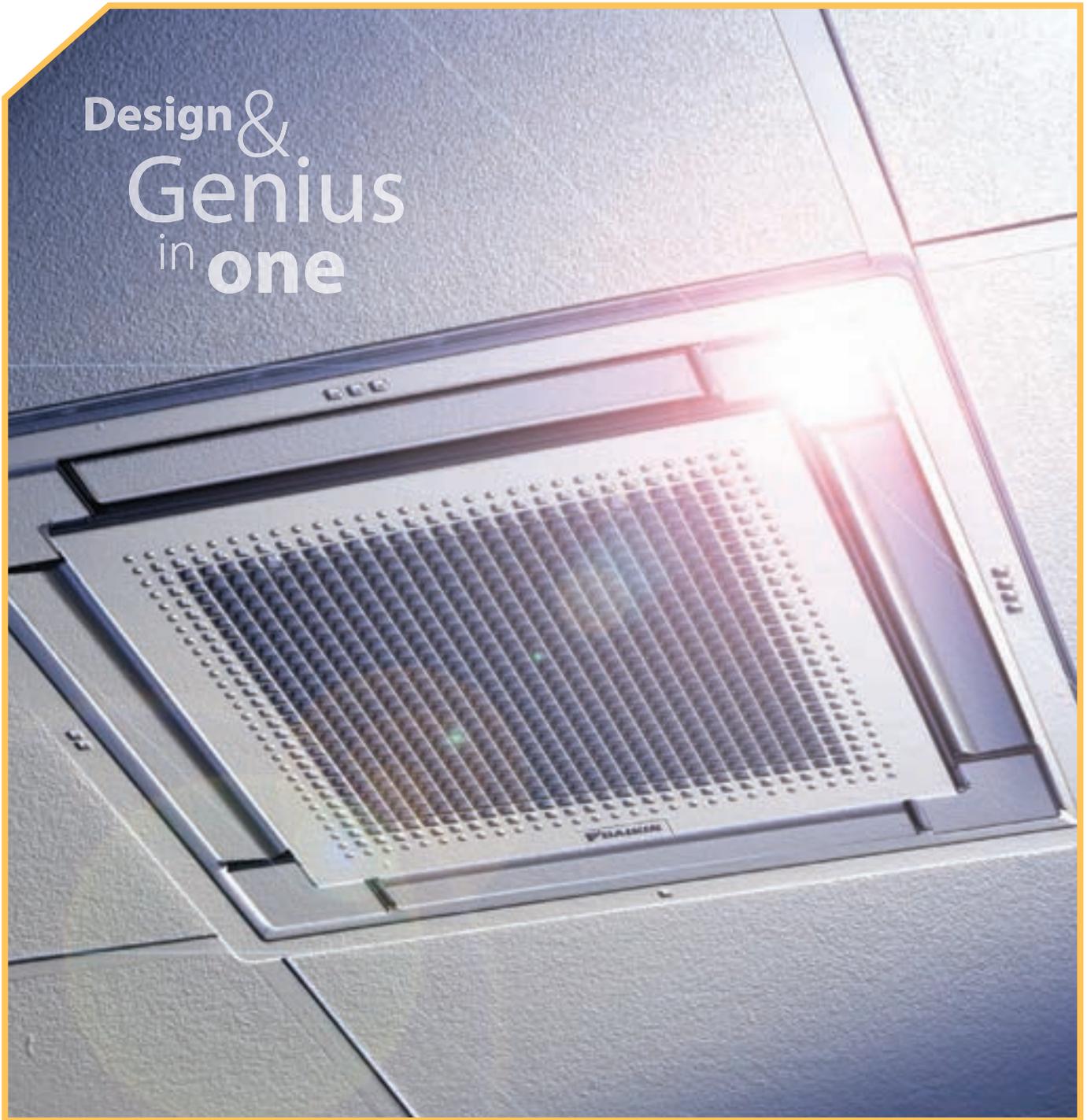
Reeve also questioned the lack of official figures covering the number of completed installations, which he said would be the definitive indicator of progress. 'The government has made a big issue of the Green Deal – one would expect them to have their finger on the pulse already,' said Reeve, speaking at the Building Controls Industry Association (BCIA) conference.

He also questioned the wisdom of imposing such a high interest rate (6.9%) on GD repayments – pointing out that the German equivalent scheme only charges 3%. However, he encouraged mechanical and electrical contractors to prepare for 'big opportunities in the commercial sector' for GD-financed and other energy performance projects.

'The business case for energy efficiency is increasingly compelling – with or without the Green Deal,' said Reeve. 'Although overall savings are not guaranteed, as energy prices rise, the GD will start to look more attractive.'



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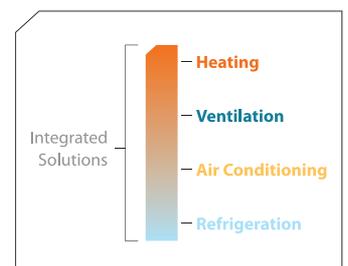
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SEASONAL EFFICIENCY
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Commissioning module now live

CIBSE has added a 12th module to its online learning portfolio, exploring the Commissioning and Testing of Electrical Services. Examining BS 7671: 2008 (2011) (The IET Wiring Regulations), it presents guidelines for the testing of completed electrical installations.

Most equipment manufacturers provide guidance for commissioning major items of electrical plant and supporting electrical services. However, as an aid to this guidance, the module also outlines the commissioning processes for a number of electrical systems and plant items, including: fire alarm systems; structured cabling; high and low voltage switchgear; and generators.

This unit follows on from the Commissioning and Testing of Mechanical Services module, featured on page 13 of April's *Journal*. The course is available for members at £150 + VAT, and non-members for £200 + VAT.

For further information on either of the commissioning modules and full course outlines, visit www.cibsetraining.co.uk/online-learning

Time for tee

CIBSE's BTU golfing society is set to stage two events this summer. The Captain's Day will be held in early June, with another event at the Royal Blackheath Golf Club on 10 July.

The group was formed in 1926 by members of the Institution of Heating and Ventilation Engineers.

Recognising the health and social benefits of playing golf – keeping body and mind active while providing an opportunity to meet like-minded people – the society arranges a number of events throughout the year. UK members can take part via the local branches and help to raise funds for well deserving charities.

For more information email mdown@madasafish.com or visit www.btugs.co.uk

Marking 80 years of support

Our focus on the CIBSE Benevolent Fund's 80th anniversary continues. Here we take a look at its work



Mike* left school in 1962, began an apprenticeship before becoming a teacher and, following a period of study on the South Bank Poly diploma in the mid 1970s, he began delivering lectures on building services but, following a slipped disc, his ability to move around became progressively more limited. By 1996 he was unable to work.

The Benevolent Fund has subsequently allowed Mike to have a more reasonable retirement. The fund enabled Mike to maintain his osteopathic treatment, which was particularly important after he developed spinal arthritis. He reflects that he 'cannot imagine what we would have done or how we would have coped' without the fund's help.

The fund touches those who have served all facets of the industry – some whose work reaches back to before the Second World War. From leaving school at 18, Robert* worked for Haden Young, studying to become a member of the Institution of Heating and Ventilation Engineers (IHVE) and, having been a pilot in the Fleet Air Arm during national service, returned to work on prestigious projects such as the West London air terminal

building, which contributed to his becoming a fellow of the IHVE.

Sadly, his health then began to deteriorate and, after being wheelchair-bound for some time, he passed away aged 49. His wife is particularly thankful for the 'constant help and guidance of all the district almoners who have given their time and expertise' since her husband's death.

The benevolent fund is not just for those who have worked for many years in the industry. Young engineer Paul* died tragically in a road accident in 2004, leaving behind a wife and three daughters under 10. The almoner's role was to understand the family's needs and to determine how the Benevolent Fund could provide support, initially prioritising outstanding financial commitments to relieve the anxiety of debt.

The fund has continued to support the family financially, assisting with school trips and one-off specific expenditures.

To get involved with the fund, contact 020 8675 5211, or visit www.cibse.org/benfund

*All names have been changed

CIBSE Building Performance Awards 2014: Call for judges

By Hywel Davies, chair of the judges panel

The construction industry attracts many awards, but the unique feature of the CIBSE Building Performance Awards is that they recognise the businesses, teams, products and projects that deliver outstanding performance in the built environment.

The CIBSE awards focus on actual measured performance, not design intent or performance

specifications. Entries are open to any organisation – both within the UK and internationally – that is responsible for the design, commissioning, construction, installation and operation of low energy buildings and the manufacturers who supply the energy efficient products.

We are currently looking for experienced built environment

professionals to join our 2014 judging panel. To be involved you will need to help generate entries, evaluate written submissions and take part in a day of judging on Thursday 17 October 2013 in central London.

If you have what it takes to spot innovation and excellence in building performance, please go to www.cibseawards.org to apply.



Obituary

Grahame Gibbs

It is with sadness that we report the passing of Grahame Gibbs, a founder of the CIBSE ANZ region, a past chairman, holder of both a Bronze and Silver CIBSE Medal and regional almoner for the CIBSE Benevolent Fund.

Grahame had a lifelong involvement with the building services industry. He was in consultancy throughout a large part of the 1950s and 1960s with Donald Rudd & Partners, firstly within their London branch and then, in 1957, Grahame moved to Australia, helping to set up the Donald Rudd & Partners' Sydney office.

Grahame's passion was contamination control and controlled environments, and he worked for a period with the Australian filtration manufacturer, Email Westinghouse. As colleague Daniel McCaffery recently observed on LinkedIn, Grahame was 'brilliant, passionate and innovative, a pleasant and enlightening team leader who set a lot of steps in action at Email Westinghouse that set us apart'.

Grahame moved back into consulting and, at a time when many might consider retiring, he started his own company. He also took up lecturing, running a number of courses at the University of Technology Sydney.

As an industry we owe a lot to Grahame; he sat on a number of Australian Standards boards, and was a Standards Australia delegate to the International Standards Organization (ISO), attending meetings in London, Dusseldorf, Berlin and Sydney. He was a member and foundation honorary secretary of the Australian Contamination Control Society and a member of the International Society of Pharmaceutical Engineering. Grahame was also very active in the Australian Institute of Refrigeration Airconditioning and Heating (AIRAH), where he served as a NSW chairman and an AIRAH board member.

During his tenure as CIBSE chairman, he drove the formation of a New Zealand chapter, so cementing the ANZ region. He pushed education, delivered two groundbreaking international conferences, and helped get the Masters in Building Services Degree off the ground at Sydney University.

Our industry is all the better for his immense contribution, and all the poorer for his passing. Our condolences go to his wife Shirleyann, who herself has given much to CIBSE, and his family.

New members, fellows and associates

FELLOWS

Cheuk, Kim Tang

Lam Tin, Hong Kong

Tang, Sher Kin Kelvin

Tseung Kwan O, Hong Kong

Thompson, Andrew Paul

Hull, UK

Twiss, David

Manchester UK

MEMBER

Altan, Hasim

Sheffield, UK

Appleby, Gavin John

Dubai, United Arab Emirates

Brittle, John Paul

Nuneaton, UK

Chan, Chi Kit

Tuen Mun, Hong Kong

Chan, Tsz Kwan

Shatin, Hong Kong

Chan, Shing Yip Jason

Kowloon, Hong Kong

Cheung, Cheuk Lam

NT, Hong Kong

Dainard, Dan

Belmont, Australia

Fewdsdale, Carl

Gillingham, UK

Hamilton, James Millen

Birmingham, UK

Joshi, Girish Mohanlal

West Drayton, UK

Kardos, Thomas Nicholas

London, UK

Kinnear, David

Bristol, UK

Kuo Lin, Cristina

Wanchai, Hong Kong

Kwan, Kwok Hung

Tsing Yi, Hong Kong

Lam, Chak Hung

Kowloon, Hong Kong

Li, Fook Yuen Kenneth

Sham Tseng Hong Kong

Lin, Hoi An

City One Shatin, Hong Kong

Luk, Wai Hang

Kowloon, Hong Kong

NgPo Shan, Judy

Hung Hom, Hong Kong

NgChi Wing

Diamond Hill Hong Kong

NgWai Yee

Tsing Yi, Hong Kong

Oguaka, Anene Basil C

Yaba, Lagos Nigeria

Ritter, David

Yangpu District, People's Republic of China

Roberts, Katherine Augusta

London, UK

Spyrou, Ilias

McLean, USA

Strangeways, Michael

Solihull, UK

Tse, Wai Yip

Chai Wan, Hong Kong

Wajda, Mariusz Andrzej

Bath, UK

Wong, Joseph Koon Hung

Fanling, Hong Kong

Wong, Wing Lim

New Territories, Hong Kong

Yeung, Chau Wah

Tuen Mun, Hong Kong

Yordanov, Rumen Deyanov

New Territories, Hong Kong

ASSOCIATE

Abdullah, Qutaiba

Muscat, Oman

Craig, Robert Arthur

BELFAST, UK

Lo Snie, Sabah

Malaysia

Tiernan, James

Bristol, UK

LICENTIATE

Chambers, Giannini

London, UK

Darko, Joshua Van

Chelmsford, UK

Faro, Robert David

St Austell, UK

Faulkes, Ryan Jamie

Driffield, UK

Govey, Christopher Kenneth

Ongar, UK

Kelleff, Peter David

Hooton, UK

Middleton, Paul

Wallingford, UK

Mohammed, Abdul Hadi

Maidenhead, UK

Palmer, Timothy Bernard

Kent, UK

Smee, Adam Glynn

Kent, UK

Spencer, Christopher Philip

Perth, Australia

Sutton, Jeff

Pembrokeshire, UK

FELLOWS



Andrew Thompson

is an operations director with Balfour Beatty. He has more

than 27 years of experience in the industry, covering design and construction management,

both in the UK and overseas. He is currently working on the construction and commissioning of the new Terminal 2B at Heathrow Airport, due for handover later this year. He is passionate about his work and has embedded many Lean Construction systems into the T2B project, through his focus on safety, quality and efficiency.



David Twiss

is an associate director at Arup, leading a team of mechanical, electrical

and public health engineers in the North West to deliver iconic national and global

projects. He has broad expertise in all aspects of electrical design, supplemented by an in-depth knowledge of airport specialist services and sports stadia. He has worked on a portfolio of high-profile projects, leading teams in the Far East, South East Asia, USA, Europe and the UK, including Manchester City Stadium.

ADAPTATION OF CITIES KEY TO ENERGY EFFICIENCY

The expertise of building services engineers will be needed to respond to the impact of climate change and rising energy consumption, says CIBSE's new President **George Adams**

The rapid growth of cities represents the greatest challenge facing building service engineers over the next 50 years, according to CIBSE's new president George Adams.

With the world's population predicted to be over 9bn by 2050, and with 70% of people expected to live in cities, Adams said tackling the energy efficiency of the built environment was of vital importance.

'We need to move to a world where buildings are continuously improved to make them more energy efficient,' said Adams, who was speaking at his Presidential inauguration at the Royal Society in London last month.

In his address 'Whole Life Thinking', Adams warned that some climate change models were predicting rises in temperature of 4-6°C if current energy behaviours were to continue.

With 40-50% of energy use related to the built environment, Adams said CIBSE members had a key role in tackling energy waste and hence their skills would be in demand.

'We need better information on energy performance in use, so we can benchmark our true performance in relationship to energy investment opportunities,' he said.

The refurbishment of existing stock is a major challenge that should be spearheaded by building services engineering, said Adams. He said CIBSE should work with others to offer guidance on how adaptation of cities to mitigate against climate change can be achieved.

'There is a big job to be done. I am clear that CIBSE is gearing up to provide thought leadership in all aspects of the

built environment – advising engineers and technicians at all stages of their careers and creating a platform for a new energy engineering conscience incorporating Women in Building Services Engineering (WiBSE), Young Engineers Network (YEN) and diversity networks,' said Adams.

The new President, who took over the badge of office from David Fisk, said engineers needed to look holistically at the built environment and be prepared to look beyond building services when addressing the impact of climate change and energy consumption.

As an example, Adams referred to a number of research projects that were looking at how cities can be adapted to influence summer peak temperatures, and he referenced a paper presented by Dane Virk at the CIBSE Technical Symposium: *Developing and expanding current CIBSE design guidance on urban climates*.

'Studies of urban planting on a strategic scale have indicated that heat island temperatures could be reduced by 3°C,' said Adams. 'The studies suggest it is also commercially viable and seems to have a relatively quick payback. This is an area that CIBSE could embrace.'

Adams said no one strategy to tackle climate change would suffice. He spoke of the potential of renewables such as concentrated solar power in Africa, and highlighted the German achievement of over 22GW of electricity from PV on one day last year – the equivalent of 30% of all electricity demand. He sounded a warning note on the embodied energy contained in some renewables, and noted that concrete, which provides support



David Fisk passes the Presidential Medal to George Adams



Honorary Fellows

Immediate past president David Fisk presented medals to David MacKay, Peter Sheaves and Robin Nicholson OBE. MacKay is the chief scientific adviser at the Department of Energy & Climate Change and known for his book 'Sustainable energy – without the hot air' (see The Real game changer on page 17). Sheaves was managing director at Oscar Faber and worked on the original CIBSE governance task group, which introduced the new structure of the board and advisory council. Architect Nicholson is a senior member of Cullinan Studio and is convenor of the Edge think-tank, which debates cross-disciplinary issues.



for wind turbines, was responsible for between 5-10% of carbon emissions. This debate must be concluded.

BIM could help building services engineers to improve project delivery, said Adams, who drew attention to the strength of CIBSE's BIM Group. 'The new initiative, BIMTalk, should be of interest to all of you. The application of BIM is catching on fast and can help new building delivery,' said Adams.

Adams said he was keen to promote engineering to young people during his presidency. 'It is important to encourage young people to consider engineering. It's an exciting place to be, though often a tough one,' said Adams, who described the 'amazing enthusiasm' he experienced when he attended the YEN annual event in Liverpool.

Adams said membership of YEN had risen to more than 5,000 young engineers in 77 countries. CIBSE was developing its strengths through the Diversity Panel and the new WiBSE network, said Adams, both of which were formally launched recently with WiBSE already attracting over 300 members. 'Young engineers, WiBSE and diversity groups are fast becoming a new face of CIBSE,' he said.

Societies need to involve people in addressing climate change and energy consumption through education, social interaction and a greater share of knowledge, while government should encourage and support an increase in research and development to help tackle energy waste in buildings, said Adams.

'Communities are growing and becoming more complex. Research into energy behaviours will be hugely useful to assist further policies and strategies,' said Adams.

'We only have one ship to sail,' Adams concluded. 'It's a huge challenge, but one I think we can tackle.' **CJ**





THE PRESIDENT'S MANIFESTO VISION

- CIBSE will promote the significant role our memberships play in creating great and efficient buildings
- Engineering will be integral to development through diversity, collaboration and the adaptation of cities to mitigate against climate change
- Encouraging CIBSE members to inspire young people into a career in engineering for the built environment
- Promotion of engineering in the built environment as a desirable career for people from all social, ethnic and economic backgrounds
- People will become much better represented within the profession through a CIBSE relationship which embraces engineers and technicians at all stages of their careers
- The operational stage needs engineering expertise to work. Here there is an opportunity for CIBSE to increase training, provide information and potentially engage new members



David Fisk and David MacKay



Peter Sheaves



Robin Nicholson

“ Societies need to involve people in addressing climate change and energy consumption through education, social interaction and a greater share of knowledge
George Adams ”

Your letters



RHYS ASPLINDH

This month: How we can learn from America when it comes to legislation, and how negativity over Europe can affect trading

Europe is not your enemy

We are a small building services consultancy where European business accounts for around 30-50% of annual turnover. I fear the current debate on leaving the EU may already have had a negative effect on our business.

Our business developed by surfing the economic benefits of the 1990s' 'big bang in the city'. We were able to do this because of the common market and the harmonisation of regulations and standards, which in building services are now pretty much universal.

Language at client level is English – at contractor/trade level it takes more effort but is no barrier to entry. It is notable that we can bring considerably more experience to a project on legionella prevention measures and Energy Performance of Buildings

Directive issues than our European competitors. We – and the country as a whole – are trying to trade our way back to growth. As Europe is the UK's biggest trading partner, there is little doubt that continuing negativity on Europe will only make the situation worse.

*Adam Blinch
Managing director, Tuckers Consultancy*

Learning our lessons

The article on tankless water heaters in the April issue of the *Journal* highlighted the potential discrepancy between efficiency in a test house compared with that in operation. The Gas Technology Institute of Chicago concluded that water heater performance dips in situ, with tankless water heaters likely to suffer more than other technologies.

The US is castigated as a nation that isn't interested in fuel conservation. However, I believe it has made big strides in boiler and water heater efficiencies. All parts of the supply chain made the change, and manufacturers now produce a range of heating, ventilating and air conditioning (HVAC) products. The article highlighted the detail organisations

provide to give users a complete picture.

This is a lesson the UK could do well to learn. Our strategy for cutting energy use is reliant on legislation, which has many flaws, one of the biggest being the 'tick box mentality' – meaning system design is not always based on engineering principles. Furthermore, European test methods for product certification throw up anomalies. The comparison between instantaneous and storage water heaters is a good example of where the system falls down.

European legislation originally set out to address this disparity, although the plan to deliver it was not well thought out, and the original goal is now in danger of being sidelined.

Our American cousins do not have to deal with anything like the same amount of legislation. Studies help engineers, contractors and end users make informed decisions based on that good old fashioned engineering principle of saving money by using fuel more efficiently.

*David Pepper
Managing director, Lochinvar*

There are many flaws with the legislative route, and one of the biggest is the creation of a 'tick box mentality'

CIBSE Journal welcomes article proposals from any reader, wherever you are – whether it be letters, longer opinion pieces, news stories, people or events listings, humorous items, or any ideas for possible articles.

Please send all letters and any other items for possible publication in the *CIBSE Journal* to: editor@cibsejournal.com, or write to Alex Smith, editor, *CIBSE Journal*, CPL, 275 Newmarket Road, Cambridge, CB5 8JE, UK. We reserve the right to edit all letters. Please indicate how you wish your letter to be attributed, and whether you wish to have your contact details included.

EURO REALIST NEWSLETTER



UKIP's Nigel Farage wants UK out of Europe

From the forums

A selection of threads from www.cibse.org/ linkedin

- Would you trust a watch that's accurate

once every 24 hours?

- The Green Deal: another bonus for bankers?
- REVIT: Lighting calculations (for regular areas)
- Renewable heat premium payment gets a boost



THE REAL GAME CHANGER

We need to cast aside our prejudices about energy generation and consider the cold, hard facts, says the Young Energy Performance Group's 'Hot Air' board game supporter, **Adam Poole**

When it comes to stirring the energy generation debate, there's an abundance of prejudiced attitudes fighting for our attention: the older brigade with a technical background appear predisposed to favour nuclear power over renewables or gas, while the converse is also true.

Most energy texts suffer from being polemical, but somewhere along the line we, as engineers, have bought into the idea that the drier and more technical we can make our arguments, the stronger they will be and the better able we will be to hide our prejudices.

David Mackay's landmark 2009 book, *Sustainable Energy – without the hot air* (available as a free download from www.withouthotair.com) turns this logic on its head. Written by one of CIBSE's newest Honorary Fellows (page 15), this conversational book presents the evidence but not the opinions, and was used as the basis for a game devised by the CIBSE Young Energy Performance Group (YEPG).

I was invited to present the prizes at this aptly named 'Hot Air' game, and it was such a socially and intellectually rich affair, I think more of us need to sit up and take notice.

The game was designed by Buro Happold's Emilia Melville. It is about a group of people using negotiation to arrive at both a reduced carbon footprint and a new or preserved view of how society will function within that footprint. It is played out on a grid that is overlaid with a series of proportionally-sized tiles that reflect energy production and consumption.

As in real life, the object is to adjust what we produce and consume and to explain why the axe should fall in some places rather than others. What makes it interesting is that the various tiles are given to different players, creating, in a sense, a veto. If a particular player does not like what is proposed, he or she has the final say. It is, as is said about most good games, easy to learn but hard to master.



Into the energy mix: members of the YEPG thrash out the issues during a round of Hot Air

We have bought into the idea that the drier and more technical we can make our arguments, the stronger they will be

The event was held at Arup and involved a room full of people representing the cream of British engineering. They were put into cross-company teams and asked to negotiate their way through an 80% cut in UK CO₂ emissions, explaining what the UK will look like and how it will function.

While the event was utterly fascinating as a spectacle – seeing people with different views and negotiating styles attempting to have both their way in their groups and be enough of a team player to give their group a chance – it also seemed to be useful, in at least three respects:

- Firstly, negotiation is everything in our industry, in big things like contracts but also in important things like design and attitudes to risk. It is not clear where we hone our skills or get the chance to experiment. This seems to be a purpose-made vehicle, and one where you win by the strength of your vision for society.
- Secondly, we often struggle to sell sustainability, finding it difficult to lift it from an expensive add-on. This sort of exercise gets us thinking about future scenarios and the attendant numbers (all the numbers

that are relevant to a particular scenario). For the emergent generation to be able to talk about sustainability with reference to possible scenarios, with the numbers at their fingertips, would be a step forward.

- Finally, there is scope to make a market here. We, the collection of firms embraced by the YEPG, agree on the need for sustainability but disagree on the manner in which it could be achieved. The way we distinguish ourselves with the latter can drown out the importance of the former. This sort of exercise aims to correct this. We embrace differing opinion and feed it into scenarios. The case for sustainability is made stronger by this process because the message to the client is not the detail of a particular solution, but an approach that is flexible enough to cope with a range of futures; the totality is richer because people from so many different starting points have contributed.

Well done YEPG. Let's sit up and take notice.

● **ADAM POOLE** is an analyst at Buro Happold, a member of the Green Construction Board Routemap Group, and a member of the Edge.

TIME TO EMPOWER ENGINEERING

Government is due to publish its response to last year's Part L consultation, with the Housing Standards Review to follow shortly. **Hywel Davies** says the changes are an opportunity to create national technical guidelines and banish conflicts between planning and building regulations

By the time you read this, the government response to last year's consultation on proposed changes to Part L should be published. It should set out whether government intends to change the carbon emissions targets for either domestic or non-domestic buildings.

The original proposals set out a range of options to reduce carbon emissions, with an analysis of the capacity to deliver those reductions by increasing the efficiency of the building envelope and services, and the need for renewables to meet the targets.

This prompted significant comment on the relative merits and feasibility of more stringent fabric standards and the costs of renewables. It also stimulated renewed debate about the merits of SAP and SBEM. Whatever the faults of these tools, they at least set targets and allow experienced users to optimise the contribution of fabric and system efficiency and renewables to achieve compliance at a reasonable cost. Within the constraints of the tools, the decisions on how to balance these are within the control of the engineer.

If it is more cost effective to improve the fabric and not install renewables (and that complies), Part L can be



One house – two sets of technical requirements

satisfied that way. The targets are set, and the design team can work out a solution that complies with Part L in England. In Scotland, compliance with Section 6 takes a similar route.

All that satisfies the needs of Building Regulations and Building Control. However, that is not the whole story. The proposed project also has to obtain planning permission. At this point, a Part L compliant design may face a further challenge. Under various pieces of regulation, on either side of Hadrian's Wall, the planning authority may seek to impose requirements for

We should have a single set of national technical regulations, so that everyone knows the score

renewables. The Merton Rule requires 10% of energy demand to be met from renewables. Section 72 of the Climate Change (Scotland) Act requires 15%.

The objective of these rules is to drive the uptake of renewables, to provide a market pull for wider uptake of these generally newer technologies.

However, an unintended consequence is a proliferation of regulations; you can comply with the technical requirements of Part L, but fall foul of planning rules. This creates two sets of technical requirements, managed by two separate processes and enforced

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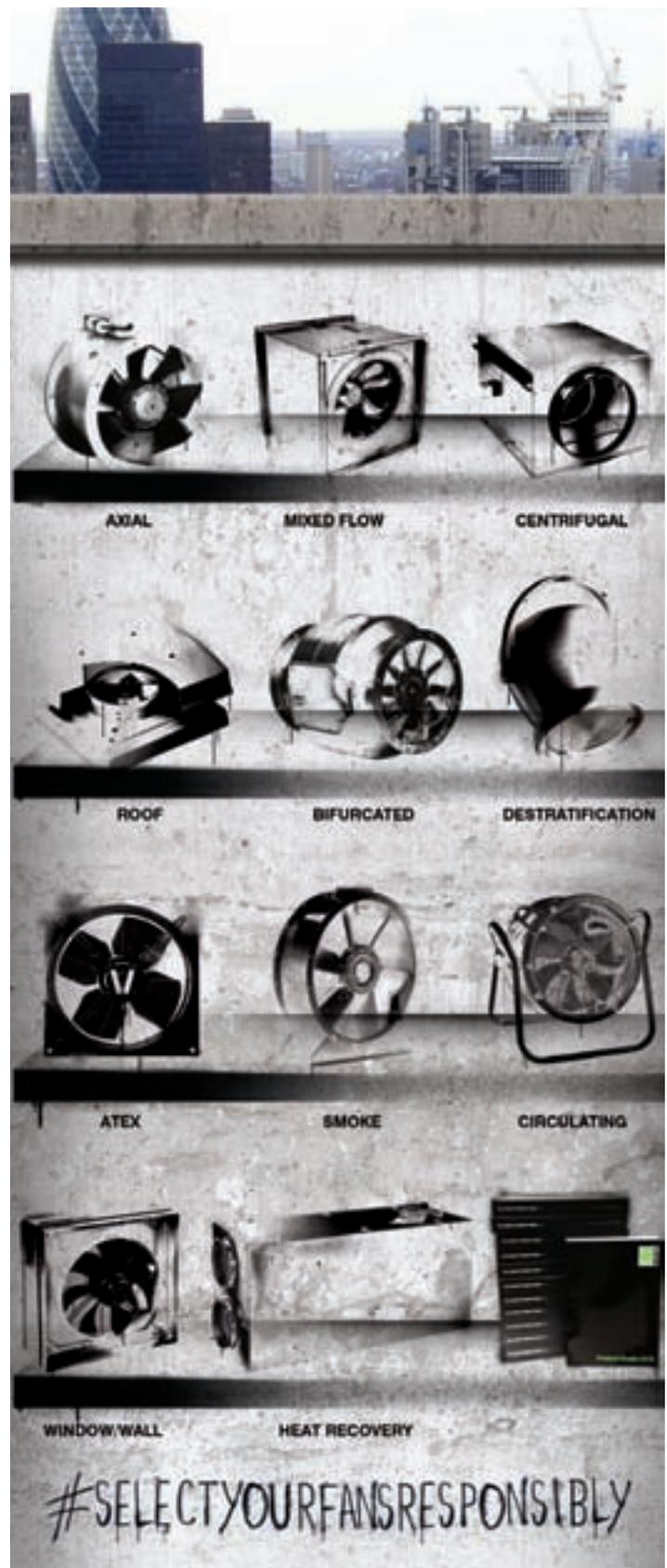
Building Regulations cover the whole of England, Wales, Scotland or Northern Ireland. There is an established cycle of review, consultation and amendment. Interestingly, when now deposed Building Regulations Minister Andrew Stunnell asked industry for views on how to improve the Building Regulations, there was widespread support for the structured approach to consultation and revision.

But under the planning regime, each planning authority can set its own requirements. This means that each planning authority can adopt a different approach to the incorporation of renewables into projects. Unfortunately, this means that each planning authority can set its own engineering requirements, overlaid onto the relevant national building regulations.

And this, in turn, means that the optimised Part L compliant solution may now have to be altered, or sub-optimised, to comply with the planning rules. The net effect is sub optimal engineering, cost penalties in both capital and operating budgets, and economic misallocation. It also leads to cost penalties for the supply chain, which has to cope with a plethora of technical requirements, not a single set of national technical regulations.

Surely it is time that we clarified this. We should have a single set of national technical regulations, so that everyone knows the score. If the planning authority wants to specify technical requirements, it should be limited to using those regulations, not supplementing them. The Housing Standards Review offers an opportunity to achieve this for domestic regulations. If successful, then it can be extended to the non-domestic market. We shall soon know whether Ministers wish to take that opportunity. It would be good to see them rationalising the engineering and compliance requirements into a single set of technical requirements for minimising energy use and carbon emissions from buildings.

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



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LOST IN TRANSLATION



We must spell out the benefits of our engineering expertise or risk losing clients to less qualified non-engineers who possess better communication skills, warns **Steve Hale**

How can we improve our industry? In the building services profession we are blessed with a large collection of brilliant minds, but there are undoubtedly areas where we need to become better, especially if we are to achieve the level of recognition and financial return our skills deserve.

In my view, aside from the ongoing shortage of young people coming into our profession, the most important area we need to develop is the way we communicate, which is key to tackling many of the issues we face.

By and large, we are brilliant on the technical side, but too often we are not good at explaining our activities to clients, or implications of decisions we make on their behalf. We have created a complicated industry language, largely due to our technical training, but this prevents clients from understanding us – and how engineering solutions vary – so they may pick the cheapest solution, often to their detriment.

We also have an unfortunate tendency to say: ‘we’re doing it because the regulations demand we do so’, and give the client no further explanation. We need to capitalise on our understanding of the regulations and explain how our solutions will meet them in the most cost effective way. If low carbon measures will save the client money on their long-term energy bills, we must make this absolutely clear.

Appreciating a client’s needs, and tailoring our solutions to increase revenue, is also key. For example, consider a residential property developer constructing a block of flats in central London. If we devise an innovative solution that means the plant equipment will take only 900ft² rather than 1,800ft², the developer may make an additional £2m as they will have space for an extra



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The engineering solution may be brilliant but clients will lose interest unless the upsides are convincingly explained

We have an unfortunate tendency to say, ‘we’re doing it because the regulations demand we do so’, and give the client no further explanation

apartment. We all frequently create these kinds of benefits, but somehow they get lost in translation, which leads to our engineering services being undervalued.

We need to become more business savvy and get the message across to our clients that there is no such thing as a ‘bog standard’ design. We should be able to show how our design will benefit their product, and how it will save or make money for them.

We are beginning to see areas where engineering expertise is being taken on by niche players offering services such as sustainability. Many of them are employing humanities graduates rather than engineers, who are often better at expressing themselves – to the detriment of our profession. They are usually not as well qualified to provide sustainability advice. How many times have we all been faced with reengineering a scheme where planning consent has been granted on the basis of a report by a ‘specialist’ niche player? We have had to resolve problems that have arisen due to their lack of technical engineering expertise.

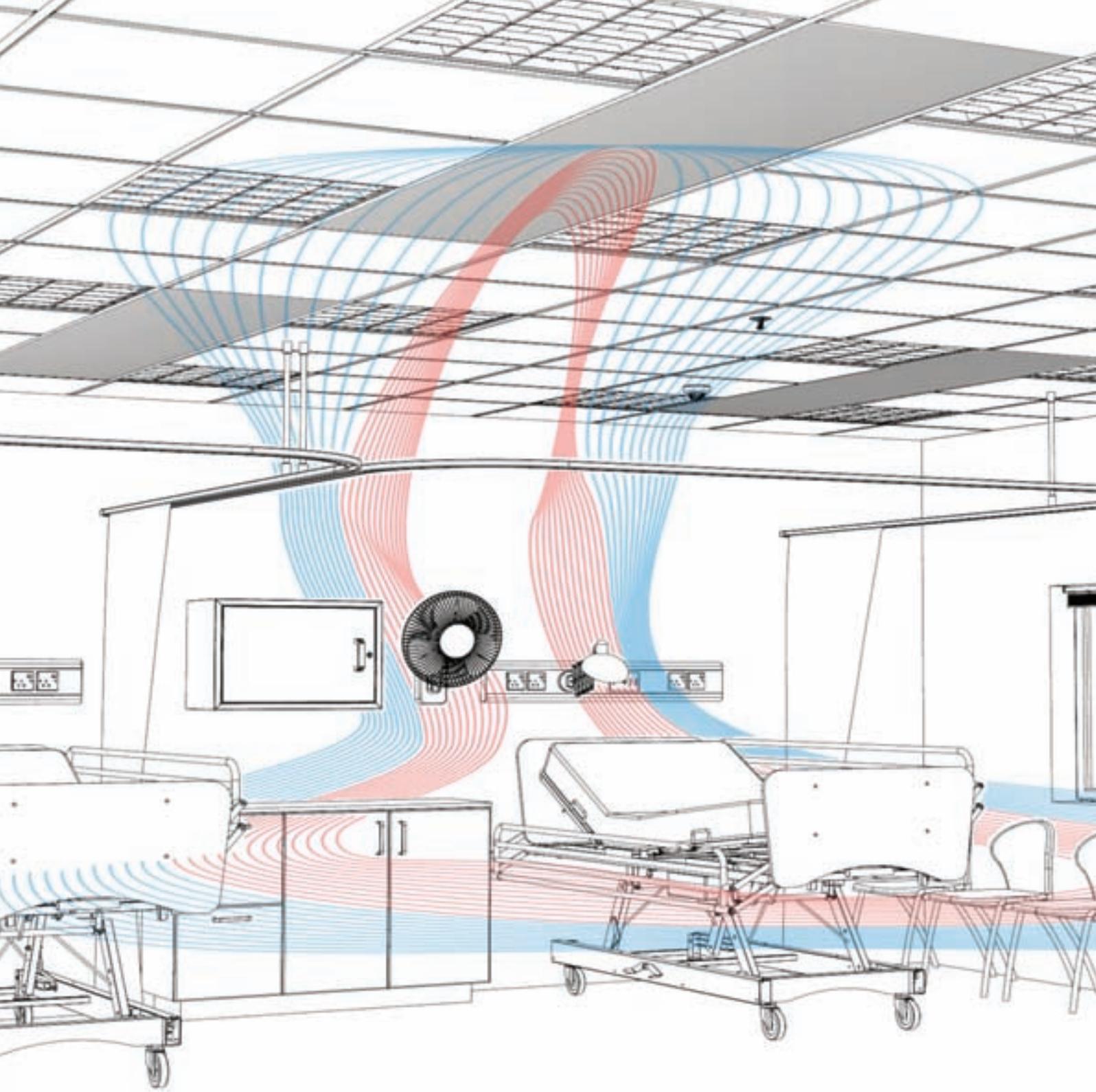
If our industry is to address these issues, we need to start by making

changes at university level. Part of an architectural student’s training involves critical assessments that sees them taking briefs and presenting their findings, giving them ‘client side’ training from an early age. This is not the case with engineering degrees, which need to focus on more than just the technical side.

Heads of building services firms also need to change their mindset to ensure there is a strategy to improve communication from the top down. They should be careful to employ people with a strong technical ability, but also with strong business awareness. This ensures clients understand an engineer’s value, and receives a service that directly benefits their operation. It also helps building services firms expand because business-savvy people are more likely to go out and win work.

If the building services industry improves the way it communicates, clients will become more aware of the advantages we bring to the table, justifying our fees and bringing real value to our clients’ businesses.

• **STEVE HALE** is managing director of engineering services consultancy, Crofton



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CarbonBuzz will help the design community and property industry understand why the gap between predicted and operational energy use exists, and aims to help close it by publishing evidence, advice and case studies

There is growing evidence that current legislation is not delivering the expected reductions in the actual energy use of buildings and, if anything, can have significant unintended consequences. Large portfolio holders in particular are taking notice of commercial risks associated with new, supposedly low carbon buildings and refurbishments falling short of performance expectations.

The issue of the performance gap is so fundamental that the RIBA Sustainable Futures Group and CIBSE Benchmarking and Energy Performance Groups are campaigning for the disclosure of data and targeting measured energy use rather than more legislation on relative improvements. The professional bodies want their members to share lessons learned from monitoring completed projects via the RIBA/CIBSE crowdsourcing platform, **CarbonBuzz.org**.

Both institutions are also spearheading the publication of a project's energy consumption data in their annual awards, making it a part of their evaluation criteria.

CarbonBuzz is an online platform for the design community and property industry, to help them understand why the gap between predicted and operational energy

use exists, and to help close it by publishing evidence, advice and case studies.

We see it as 'disruptive technology' created by young professionals recognising that legislation is not delivering real-term carbon reductions – nor is it providing much-needed data and evidence to underpin investment in low energy measures. Being social media savvy, they opted for 'crowdsourcing' – offering built environment professionals a simple and quick way to upload, share and benchmark building energy use data. Most of the 800 or so members manage their data and benchmark it anonymously, but users can showcase their expertise by publishing projects and data.

A key feature of the website is that energy consumption is displayed as an easy-to-read 'energy bar' that shows annual consumption in either kWh/m²/yr or kg CO₂/m²/yr equivalent. The bar can display either fuel consumption or, where the data is available, energy use apportioned to heating, cooling, auxiliary power, lighting and small power loads. The website has been piloted extensively by local authorities, government portfolio managers, developers, landlords, investors, architects, engineers and facilities managers.

The revamped CarbonBuzz online platform gives designers and clients the opportunity to share data on the predicted and actual energy use of their buildings. **Judit Kimpian** says councils and developers have embraced the tool and are using the data to understand and tackle the performance gap



S REALITY

A user-friendly interface allows portfolio holders and building owners to track the energy consumption of their estate, as well as improvements in performance. For example, British Land told the CIBSE Technical Symposium that it had achieved a 39% reduction in the energy consumption of its London office portfolio (www.cibse.org/content/cibsesymposium2013/snoxall.pdf). And the Better Buildings Partnership, an alliance of commercial property firms, together with Transport for London, is developing new benchmarks for energy use that rate landlords' services separately from tenant consumption.

In its Supplementary Planning Document, Islington Council encourages post-occupancy evaluations and CarbonBuzz for all projects. Bath and Somerset County Council, which uses a regeneration model based on the whole-life cost of its estate, is setting measured energy use targets on its flagship Keynsham Regeneration project, instead of opting for BREEAM or other sustainability ratings, which still rely on compliance metrics to plan for low-energy operation.

Many engineering and architecture practices, including Aedas, Architype, Atelier Ten, Feilden Clegg Bradley and

aeom view the focus on operational energy use as an opportunity – it makes a clear case for design features that help buildings adapt to long-term changes in climate, demographics and occupancy patterns, and cut operating costs. The type of energy literacy advocated by CarbonBuzz sets a level playing field and makes the Soft Landings process more robust and accountable. Using CarbonBuzz, architects and engineers can, for the first time, log how energy consumption targets are met at key project stages – and demonstrate that investment in low energy measures have brought about the expected returns. What a revelation that will be...

With nearly 400 projects uploaded to CarbonBuzz, it is already beginning to provide feedback to industry about the scale of the performance gap. Analysis of the data demonstrates that, on average, most buildings consume between 1.5 and 2.5 times that of the declared design stage calculations and, in the case of offices and education buildings, this anomaly largely arises from increased electrical energy use.

Other studies, such as a report by Jones Lang LaSalle, demonstrate similarly little correlation between Energy Performance Certificates (EPCs) and operational energy



Screenshot from CarbonBuzz comparing the calculated energy use of a retail building with the measured performance

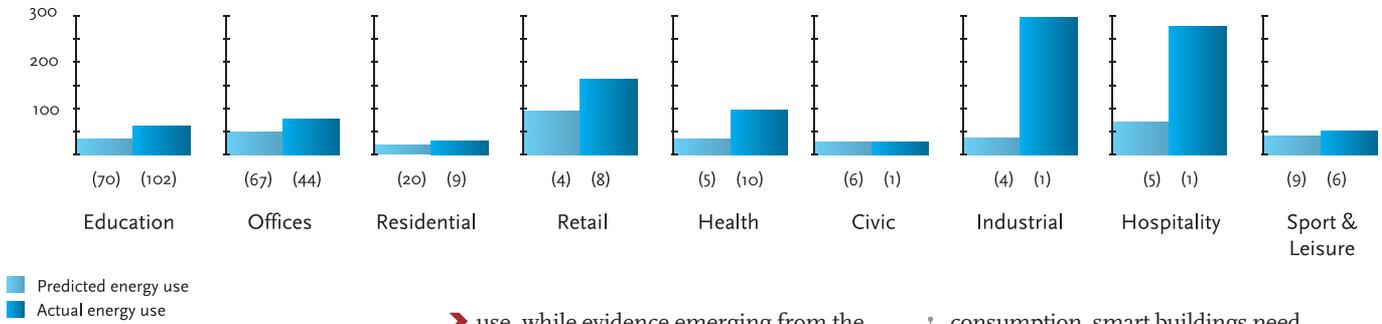
Data from CIBSE's Building Performance Awards winner The Hive, and the Pool Innovation Centre (main picture) will be available on CarbonBuzz.org



The new CarbonBuzz platform is being launched on 6 June at City Hall, London. To feature your building or for more information go to www.carbonbuzz.org

CarbonBuzz data shows buildings in use consume, on average, 1.5-2.5 times more energy than expected

kg CO₂/m²/yr



Figures in brackets indicate number of buildings in each sector on the CarbonBuzz database

use, while evidence emerging from the Technology Strategy Board’s (TSB) Building Performance Evaluation programme is showing the same conclusions.

At the root of the performance gap is that, to comply with Building Regulations or (in Scotland) Standards, designers only need to assess a building’s energy consumption potential. This is done using calculations that are not rooted in statistical evidence. Instead they evaluate designs under idealised operating circumstances, without taking into consideration ‘value engineering’, rushed contractors, poorly trained building managers or unpredictable occupiers. Yet CarbonBuzz surveys show that built environment professionals and policy makers assume compliance is a reliable way of improving energy use.

Moreover, current legislation rewards complexity in both systems and controls, even though these were shown to present a major risk to operational energy use decades ago (as explored by Bill Bordass, et al). In the ongoing TSB Building Performance Evaluation programme, most building users have struggled with building management systems, impacting on maintenance costs and, often, occupant comfort and productivity. While technological solutions offer a great potential to reduce

consumption, smart buildings need smart owners, occupiers, designers, and contractors – and even smarter operators.

Clearly, more needs to be done to target low operational energy use. CIBSE is developing a new technical memorandum that provides a more robust framework for predicting operational energy use in buildings. It aligns with the CarbonBuzz methodology of ‘counting everything’ and identifying risk areas early on.

As part of a CarbonBuzz survey, many respondents raised concerns over liability. Can architects and engineers be sued if a building consumes a lot of energy in use? That seems unlikely for now. However, newly emerging procurement models targeting operational energy use, will reward those with a track record in achieving better value for their clients.

With post-occupancy evaluations soon to be incorporated into the procurement of all public projects, the productivity benefits of lower energy and maintenance costs will become more pronounced. For now, CarbonBuzz has achieved what few thought was possible – knowing what your building consumes is the ‘new cool’. **CJ**

JUDIT KIMPIAN MA(RCA) PHD, ARB, RIBA is director of sustainable architecture and research at Aedas.

CIBSE TM54 – Evaluating Operational Energy Use at the Design Stage – is due out in September and will be available from the CIBSE Knowledge Portal

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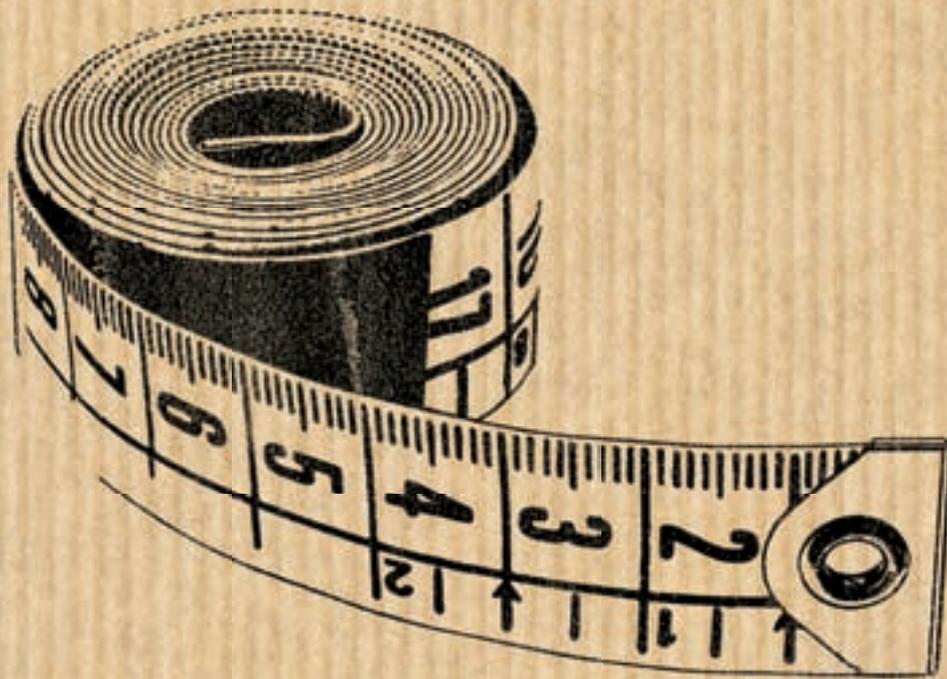
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ZERO

OPPORTUNITY?

Under the Code for Sustainable Homes, it is easier to design 'zero carbon' mansions than one-bed flats, says **Dr Ralph Evins**, who blames calculation methods for the bias



Homes are getting smaller. The average new home in England is now 76m² compared¹ to the average for all homes of 85m².

In order to protect what's left of Britain's countryside, planners now prefer high-density urban housing to suburban sprawl and developers are happy to oblige, as it enables them to sell more homes on the same-sized plots.

As well as losing out on living space, those living in 'hobbit homes' will also find it more expensive to upgrade their property to 'zero carbon' status than those living in more spacious abodes.

Because of the way 'zero carbon' is calculated in the Code, smaller dwellings have a harder renewable energy target than bigger dwellings. It means that, to build or upgrade to 'zero carbon', as defined under the Code, is disproportionately more expensive for smaller houses.

The standard for low-carbon dwellings in England and Wales is the Code for Sustainable Homes². This area covers nine aspects, of which energy and CO₂

emissions are the most heavily-weighted. To be classed as 'zero carbon', for stamp duty purposes a dwelling must achieve a CodeLevel 6, which includes a mandatory CO₂ emissions requirement.

This corresponds to net zero emissions when energy for internal uses – like appliances and cooking – is offset by renewable energy generation.

This requirement is assessed using the Standard Assessment Procedure (SAP), the same as for Part L compliance. An additional calculation (SAP Appendix L2 and L3) is used to find the predicted energy use for appliances and cooking, which is not included in normal Part L compliance calculations. Appliance energy use is based on floor area and occupancy; cooking energy use is based solely on occupancy.

The occupancy assumptions in SAP are based on floor area, but are highly non-linear, as shown in Figure 1. For example, 60 m² gives an occupancy

“ The larger house uses six times more energy for internal appliances in total, but only a third as much if measured per floor area



Figure 1: Occupancy by floor area, as assumed by building regulations.

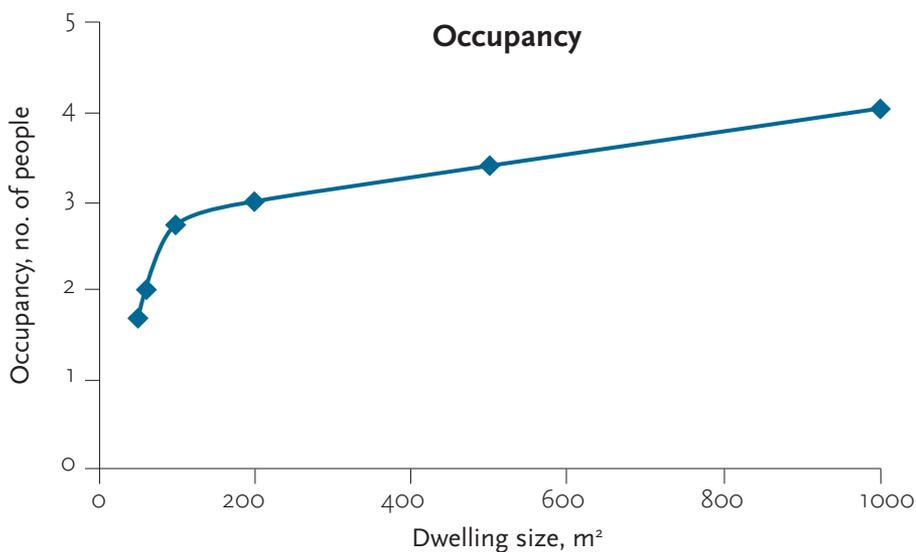
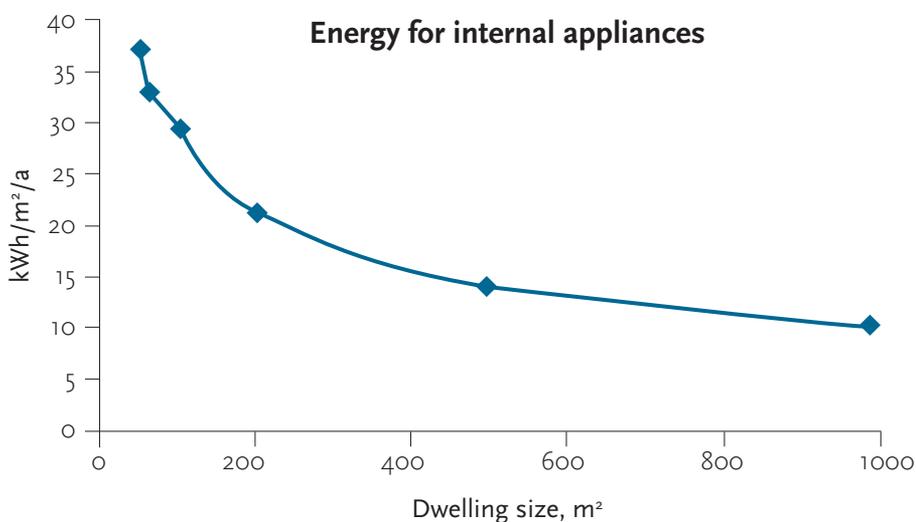


Figure 2: Energy for internal appliances by floor area, as required for 'zero carbon' status



value of two people, 200 m² gives three people, but 1000 m² gives only four people. The average dwelling size in the UK is around 80 m² and the average number of people per household is 2.4, so the SAP assumption holds for the average case. For large dwellings, however, the assumed occupancies seem unrealistically low. The average family has two children, so four occupants, but the average family house is not 1,000 m².

The effect of this assumption is that large dwellings have substantially lower occupancy-related energy uses than small dwellings when expressed by floor area, as shown in Figure 2: Energy for internal appliances by floor area, as required for 'zero carbon' status. This means that small dwellings have a much harder target for renewable energy generation to achieve 'zero carbon' status.

'zero carbon' status is difficult to achieve, since renewable electricity must be generated on-site. Biomass boilers, combined heat and power plants and heat pumps cannot achieve zero emissions alone, since they all have positive emissions. Energy-efficient fabric and passive design measures can reduce heating energy requirements to zero, but electricity will still be needed for pumps and fans, lighting, and internal appliances. Renewable electricity must therefore be generated, and for most buildings this means photovoltaic (PV) panels, since other renewables like wind turbines and hydroelectric turbines are highly site-specific.

On small dwellings and multi-storey apartment blocks, there may be too little south-facing roof area to incorporate enough PV to generate the higher per-square-metre requirement. To generate

Case studies illustrating 'zero carbon' calculations for small and large dwellings

		Small	Large	factor
Floor area, m ²		50	1,000	20
Number of occupants		1.7	4	2.4
Appliance energy use	kWh/a	1,685	10,444	6.2
	kWh/a/m ²	34	10	0.3
Cooking energy use	kWh/a	175	236	1.3
	kWh/a/m ²	3	0.2	0.1
Total	kWh/a	1,860	10,680	5.7
	kWh/a/m ²	37.2	10.4	0.3
CO ₂ emissions target (DER)	kg CO ₂ /a/m ²	-20.9	-5.6	0.3
PV needed (125kWp/m ²)	m ²	22	125	5.7
Proportion of roof		44%	13%	0.3

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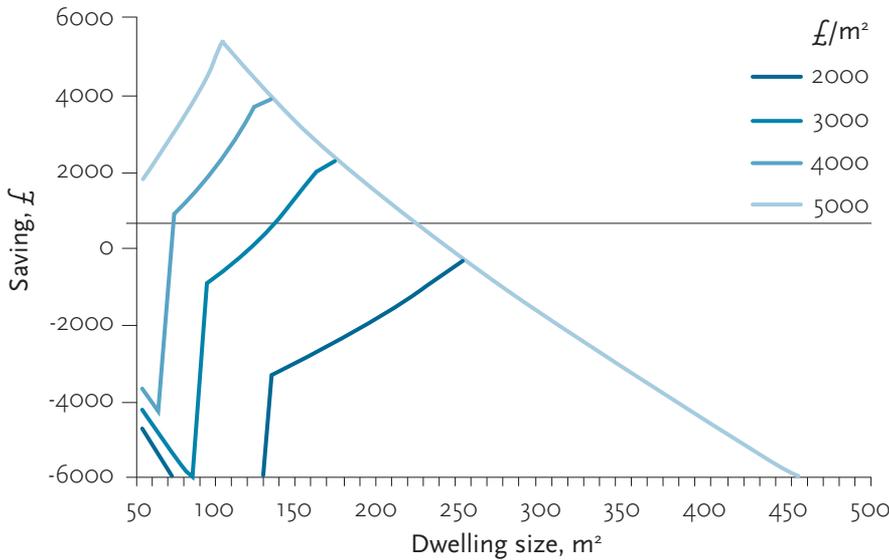
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Figure 3: Stamp duty savings for different house prices



CARBON EMISSIONS: METRICS AND TARGETS

This highlights wider issues regarding carbon emissions assessment. Should carbon emissions be measured by improvement over a building of the same size (the current method), on a per-floor-area basis (the 'zero carbon' Hub proposed approach), or by total emissions? The current system permits huge dwellings with very high emissions, since the target is based on a building of the same size. Imagine if the argument that 'it's bigger, therefore it must have a higher target' were applied to cars: small city cars would find it much harder to achieve proportional carbon savings than large off-road vehicles.

It is also worth considering whether 'zero carbon' emissions are the most appropriate target. The most cost-effective way of reducing emissions is not through renewable energy, but through passive measures. There are many 'quick wins' that reduce emissions for minimal cost, but eliminating them completely is much more expensive. It costs more to build one 'zero carbon' dwelling than to halve the emissions of two dwellings, achieving the same overall reduction. The majority of the housing stock must be brought up to a reasonable standard, particularly by ensuring that all new dwellings require much less energy to heat. Only then will it be worth reducing emissions to zero by incorporating renewables.

more electricity it might be necessary to add PV to non-south facing roofs, or to use very expensive high-efficiency PV cells.

The table on page xx outlines the calculation for a small and a large dwelling. For a house 20 times larger, the increase in occupancy is just over double. The larger house uses six times more energy for internal appliances in total, but only a third as much if measured by floor area. To generate enough electricity, the small dwelling must use nearly half the roof for PV; if it was part of a two-storey block, there wouldn't be enough south-facing roof.

Small dwellings suffer a financial premium for 'zero carbon' status, due to the higher proportional energy target and the difficulty of incorporating renewables. If the sales price increase available through attaining 'zero carbon' status is a percentage of the total, large 'zero carbon' homes become more financially viable



Should energy for appliances and cooking be related to occupancy or floor area?

It is obvious that bigger houses need more energy for space heating. However, for internal energy uses, the correlation is less clear since there are so many factors to consider. In large houses with few occupants (as assumed by SAP), if lights and appliances are turned off when not in use, energy use could be the same as a small dwelling with the same number of people. Conversely if lots of 'per room' equipment is left on regardless of occupancy, and if there are more luxury goods that consume a lot of power, energy use could be much higher than would be proportional.

Should energy for appliances and cooking be

related to occupancy or floor area? Energy used by appliances is assumed in SAP to be roughly equal to the square root of floor area multiplied by occupancy.

Lighting energy is calculated in the same way. This implies that lighting and appliance energy use scales equally with both occupancy and dwelling size. There is no means of accounting for low-energy appliances (though there is for low energy lighting). Cooking energy is taken as proportional to occupancy, plus a large constant. This implies that energy for cooking will be fairly constant, regardless of the number of people.

This also affects the reduction in stamp duty available for 'zero carbon' homes³, although this is less clear-cut due to the banding of stamp duty and the cap on the zero-rating at £500,000. The graph in Figure 3 shows the stamp duty saved through 'zero carbon' status, accounting for the installation of sufficient PV to meet only internal energy use (in reality this will be slightly higher to cover other electricity use). There are no savings for house prices of £2,000/m² or lower, as PV is comparatively too expensive. There are no savings for dwellings less than 100m² at £3,000/m², but there are savings for larger dwellings (up to 250m²). The dwelling size for peak savings drops as prices rise, so the biggest benefit is for small dwellings in very expensive areas.

The current means of assessing 'zero carbon' homes is biased towards larger dwellings. This contradicts the drive towards denser urban developments, penalises the less well-off (who live in smaller houses), and provides no incentive to reduce overall emissions. This is not in line with the stated aim of the Code for Sustainable Homes: to 'reduce our carbon emissions and create homes that are more sustainable'. CJ

Reference

- 1 *The case for space: The size of England's new homes*, Rebecca Roberts-Hughes, RIBA, September 2011
- 2 www.planningportal.gov.uk/buildingregulations/greenerbuildings/sustainablehomes
- 3 Zero stamp duty for zero-carbon dwellings up to £500,000; reduced by £15,000 for those over £500,000.

DR RALPH EVINS is a research engineer in sustainability and building physics at Buro Happold



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Unlocking BIM

Everyone is talking about BIM, but how beneficial is the software to building services engineers?

At countless conferences, we hear that the technology is set to deliver better-quality buildings at a lower cost through greater collaboration and earlier supplier engagement. That's the ultimate goal, but MEP practitioners, now working on the integration of BIM into their workflows, don't always find the process straightforward.

BIM coordinator Thomas Taggart has to build two or three of his own models because the architect model is not complex enough for base load and thermal analysis (see page 39).

The lack of services detail in BIM models is a concern of Paddy Conaghan, of the CIBSE BIM Group (see page 36), who says government risks spending too much time focusing on process and delivery, rather than defining building services elements, which are fundamental to BIM.

In Australia, the MEP-MEPAUS initiative has focused on creating standard product templates for building services, allowing greater integration of a manufacturer's product data into

“MEP practitioners working on the integration of BIM don't always find the process straightforward”



the BIM model (see page 42). Working together to develop templates ensures contractors, consultants and suppliers' requirements are taken into account, and development costs are shared.

Our case study on the delivery of Heathrow Terminal 2B (see page 40) illustrates how BIM workflows improved efficiency and quality, and the addition of a timeline – BIM 4D – allowed the team to check for overlapping work zones and enabled prefabricated elements to be scheduled for delivery and installation around other works.

BIM has changed how the contractor Balfour Beatty design and procure buildings – it now creates BIM models on every bid to understand buildability – and anybody working with the big players needs to grasp the fundamentals of BIM to understand how their designs affect the project model.

The impact of BIM is spreading through the supply chain and the *Journal* will continue to highlight how the building services sector is responding to the challenge and making BIM work for them.

Alex Smith, Editor

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Australia creates standardised BIM templates for building services

Lifting

How do you navigate your way through the mass of information thrown up by BIM?

Tim Dwyer and **Paddy Conaghan** shine a light on the key guidance for engineers, and look at the two biggest obstacles facing MEP consultants trying to get to grips with the software

The excitement of those caught up in building information modelling (BIM) is more than matched by the volume of material published in the trade and professional journals, and on the worldwide web.

There now appears to be so much BIM 'noise' that picking out relevant facts from the mass is becoming increasingly challenging. For many, the web is the de facto resource for information, and a search for 'BIM' returns many millions of pages. Within this cacophony, there is much that industry should be referring to and influencing pro-actively to ensure that the evolution of BIM has the greatest potential to realise its heralded benefits.

For example, current areas of particular relevance to the UK building professions are those tucked away in the 'Labs' section of the UK BIM Task Group website (www.bimtaskgroup.org). It is currently hosting draft versions of the 'Digital Plans of Work', a government document that defines the information management needs that underpin the successful inclusion of BIM for both the supply chain and the public sector. These are areas that will ultimately affect all areas of the UK construction industry and deserve the widest audience (see box).

And it is not just a matter of consultation and development. There is also a need to inform and educate the industry so that the level of knowledge and expertise enables active involvement across the 'supply chain' from project inception, right through to design, manufacturing and fabrication,

supply and installation, commissioning, maintenance, operation and refurbishment to eventual decommissioning and reuse.

There are excellent resources, freely available on the web, both to introduce the unfamiliar and to extend the skills of the seasoned BIM user.

These include case studies and primers from consultants, contractors and software producers that reach far beyond simply advertising its products.

Although BIM may be seen superficially as a 'software development', its real benefit will derive from the change to collaborative working practices needed to drive the creation, exchange and management of information. Initiatives, such as the BIM Regional Hubs (www.bimtaskgroup.org/cic-bim-regional-hubs), have been set up for the government by the Construction Industry Council (CIC) to enable practitioners to discuss the reality of the whole BIM process at locations around the UK.

Additionally, there are many interest groups – associated with products, projects, industry sectors and professional institutions – that are providing a forum for those

CIBSE survey

The CIBSE BIM Task Group is running its second annual BIM Use Survey at bit.ly/BIM2013. You are encouraged to include your experiences in the five-minute survey running this month

the fog

improving their knowledge. There is no shortage of information, but much is lost in the noise and almost never reaches the practising engineer.

Faced with this overwhelming wave of facts and assertions, the CIBSE BIM Steering Group realised that the wider industry would benefit from some aggregation and ordering of information.

The group has initiated a website that, by working with other institutions and groups, aims to evolve into a non-partisan accessible resource. The resulting website – **bimtalk.co.uk** – now provides the first iteration of this work and will further develop with the input of participants. Anyone interested is encouraged to make a visit and pass on suggestions (using the contact link on the site) for its future development.

CIBSE's concerns

The CIBSE BIM Group is looking at two challenges peculiar to the building services industry.

Our first task is to respond to the draft proposals on the government BIM Task Group's 'Labs' website. We have some concerns that the methods, focused on the needs of architectural models, are less well suited to those MEP systems comprising multitudes of data-rich components. For example, the CIBSE Task Group has anxieties that – despite the volumes of data demanded to meet the requirements of Construction Operations Building Information Exchange (COBie) – the 'Plain Language Questions' posed at key early decision stages, tell the client too little about what they are buying, and rather more about process and delivery, than they would usually want to know.

Similarly, the draft Uniclass 2 classification methodology contains a few correctable schoolboy howlers (as in grouping heater batteries with lead acid ones) but its coding system

is more deep-seated concern. Its tables are open to interpretation – so that an entity can be coded in several ways when, presumably, the point of such a system is to ensure that everyone arrives at the same answer. Uniclass 2 does not seem to be at this stage yet. It also appears cumbersome (for example, an attempt to classify an underground drainage survey produced a 46-digit code) but, simultaneously, it lacks the granularity to distinguish between functionally similar, but different, entities.

A second concern is the divide between MEP BIM practices used in design and in contracting. While designers are confident with Level 2 BIM tools, MEP contractors and fabricators are often wedded to Level 1 BIM platforms because they amassed vast libraries of geometrically-exact objects in this format long before Level 2 BIM emerged.

The problem is that Level 1 BIM does not support the myriad data required by formats like COBie UK 2012, and Level 2 BIM does not, as yet, offer much product information that is precise enough for use in fabrication and installation. Thus, we see designers preparing data-rich models using 'generic' system components in Level 2 format, which MEP contractors convert back to Level 1 to add the exact product details they need. The result is that crucial information gets lost in translation.

Something has to give – and the group is trying to help.

One aspect of this work is the development of standard product data templates which, if adopted, will enable manufacturers to describe their products in an electronic format usable by all at every stage of a BIM process, and which will greatly simplify completion of the COBie data drops.

The group is mindful of the Australian BIM initiative on page 46 and the power of a top-down approach to pan-industry harmonisation.

Despite things becoming clearer, there is still much to be done. ▶

6 The divide between MEP BIM practices used in design and contracting is a concern

BIM TaskGroup: key information

Visit www.bimtaskgroup.org to find out more on the following areas

- Coordinated work stages – give details of the new digital plans of work that, based on series of numbered stages, should be applicable to all disciplines involved in building, as well as infrastructure and civil projects
- Plain language questions – present, in non-technical language, the details a client requires at a particular project stage to inform their business decisions
- Data demand matrix – identifies the information that is essential to feed the COBie file to satisfy the needs of the construction chain, including the client



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- **BIM Authoring:** Architectural, Structural and MEP modelling to construction and fabrication level of detail. LOD 1-5.
- **BIM Planning:** Using the BIM to show accurate build sequencing and logistics.
- **BIM Schedules:** Extrapolating the embedded data for procurement and cost estimating.
- **BIM Lifecycle:** Understanding how the BIM can be used throughout the building operation both as a powerful FM and asset management tool.



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How to start a revolution

We need more collaboration between MEPs and architects, as well as better software, if we are truly to embrace BIM, says **Thomas Taggart**

As I see it, our job, as mechanical, electrical and plumbing (MEP) designers – in embracing BIM processes and culture – is twofold. First, we need to begin embedding our geometry with data from which to drive the analysis and design. The goals should be to create internal efficiencies for our teams during the design phase, as well as longer-term information management and distribution strategies. Ultimately, we are seeking to create a data-rich environment based on the construction of a virtual model – a common goal in the construction industry.

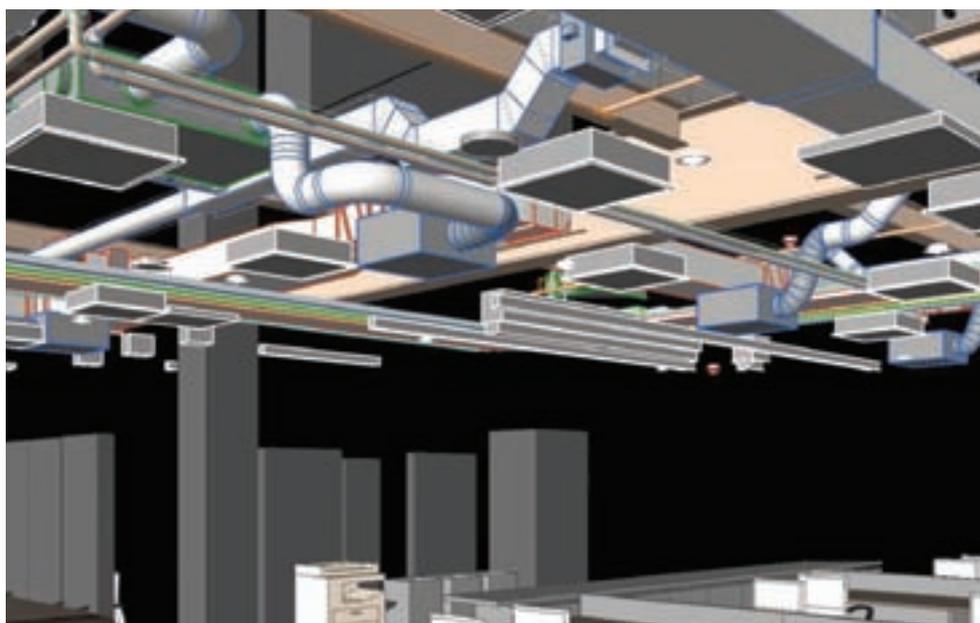
We also need to understand the value that the creation, use and management of this information can have for our clients further downstream. We are long past the days of populating models with information 'because we can'. Harnessing that information to work for us, and to provide a more dynamic product with a longer life cycle, is key.

Second, we need to focus on collaboration – an area that can always be improved upon and an important factor towards time and cost-savings. Joining forces with other disciplines through information-modelling is expected to open many doors. And, as we move towards common file formats and cloud-based data management systems, this is happening. But, at ground level, there are still some basic issues for MEP designers.

Take for instance load/energy modelling. Typically, we replicate the building geometry to perform this analysis in specialist software, which sits outside the main MEP model.

But in our vision, BIM gives the ability for the building geometry to be driven from one place – the architectural model. To simplify somewhat, the live architectural design geometry should directly drive what we export to specialist software for engineering analysis, not building services teams rebuilding the models and entering design parameters outside of the live design model.

Software can support the idea of this



Ceiling coordination is now standard BIM practice, but what else can it offer us?

We need a dedicated tool to review and selectively inherit geometric change in a palatable way

particular workflow. The architectural model room definitions, which drive the MEP, model volumes for analysis. We link the architectural version into ours, map its room geometry to our analysis volumes and, hey presto – the architecture is driving the MEP analysis. A true BIM process in action. Sadly, that's not quite the case.

Perhaps, this might work on a simple building – a training model where everything falls into place – but, the reality on mid-to-large-sized projects, with relatively complex geometrics, is different. There is no real proven workflow that enables the architectural model to drive load/energy models successfully. Therefore, the building of two, or maybe three, versions of the project still happens. Why is this?

There are a variety of reasons. I recently heard the opinion expressed that it was a 'people' issue – architects not building the geometry accurately for MEP use. Of course, different designers have to think in different ways, but there are many workflows to tackle this; the endgame of a single-model environment for all disciplines comes to mind.

I would also agree that we are all struggling with insufficient skill sets

as the models grow in complexity and functionality, but this doesn't quite nail it for me. The software? There are interoperability issues between packages that can cause inefficiencies, yes; some parameters don't carry over when we export, which means we are back to the data being stored across more than one model. Not very BIM.

Change management systems can have weaknesses, especially in this area.

We need a dedicated tool to review and selectively inherit complex geometric change in a palatable way – one which enables us to update our analysis models seamlessly, directly from the architecture.

This is an ideal scenario and, I suspect, the eventual solution lies with stronger collaboration between architects and MEP designers. It needs to be backed up with software development and some clever workflows that cross the traditional boundaries between these disciplines. This is what BIM is all about – a shift in existing practices, represented by change: cultural, technical, social and legal.

THOMAS TAGGART is a BIM coordinator at Arup's London office.



BIM TAKES OFF

Heathrow Terminal 2B has become a beacon for design engineers eager to use BIM in their projects.

Adrian Timmins and **Frank Connolly** explain how they used it to their advantage during the design and construction process

At more than half a kilometre long, including a baggage handling area in the basement with enough capacity to fill 250 Olympic swimming pools, Heathrow Terminal 2B (T2B) is the largest fully airside project to be constructed under Heathrow's masterplan.

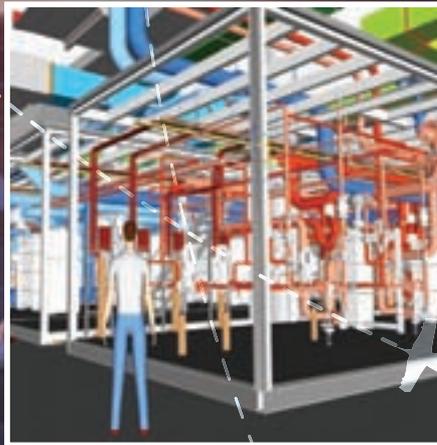
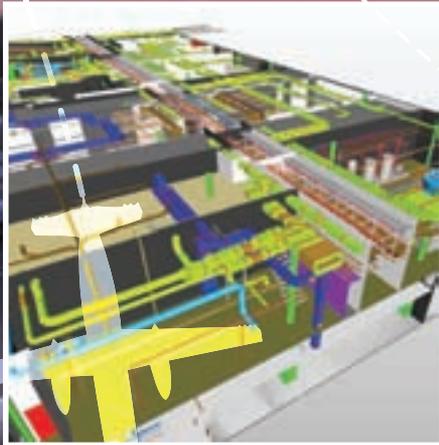
T2B was engineered and built using experience gained from the construction of Terminal 5, with both the client, Heathrow Airport Limited (HAL) – formerly BAA – and the complex-build integrator, Balfour Beatty Group, working closely throughout. This collaborative stakeholder and delivery team agreed that 3D CAD coordination and, ultimately, an enhanced data model, was

required for the design and construction of the terminal.

This meant that the construction team used early building information modelling (BIM) to identify potential mechanical, electrical and plumbing (MEP) elements that could be designed for prefabrication or Designed for Manufacture and Assembly offsite (DfMA).

Phases of construction

The construction of the terminal pier was split into two phases; design of phase one – one third of the pier (excluding the basement) – started in 2005 and became operational in 2009. Grimshaw carried out the architectural



The visualisation for the client (main picture) is based on the building information model

The T2B phase two team

- **Client:** Heathrow Airport Limited (Formerly BAA)
- **Complex-build integrator:** Balfour Beatty Group
- **Architect and lead consultant:** Grimshaw Architects LLP
- **Structural engineer:** Mott MacDonald
- **MEP engineer (scheme design):** WSP
- **MEP engineer:** Balfour Beatty Engineering (Parsons Brinkerhoff)
- **MEP BIM Modelling:** One Point Design
- **ICS consultants:** Balfour Beatty ICS
- **Acoustic engineer:** Parsons Brinkerhoff
- **Fire Engineer:** Exova Warrington

design for phase one using 2D MicroStation, with the structure and mechanical, electrical and plumbing (MEP) being developed in 2D with elements of 3D coordination. During production design and construction, 3D modelling was used for coordination and fabrication by the contractor, fabricators and suppliers.

Phase two, however, proved to be substantially more demanding in terms of coordination due to the construction of the substructure, the design of the complex services and the safeguarding required for the Tracked Transit system, an underground railway linking the pier with the main terminal and future satellite piers. Balfour Beatty decided to build the substructure and

superstructure concurrently, using 'top down, bottom up' construction, to substantially reduce the design-and-build programme.

The combination of build complexity and a tight programme led the design team to review the lessons learned from the construction of phase one and delivery of Terminal 5, and implement a fully coordinated Level 2 BIM model in 2009. This proved to be a steep learning curve for the design team at a time when design protocols and BIM execution plans were in their infancy in the UK.

Design of T2B phase two

At options and scheme design stages – which relate to Royal Institute of British Architects

(RIBA) Stages A to D – a 3D model was developed alongside the 2D drawing process using AutoCAD Architecture 2009. The model formed the basis for coordinating the structural design, as well as providing the framework for issuing any design documentation. It also allowed the team to review design strategies and test the exporting of drawing information. MEP design, at this stage, was a combination of 2D CAD information and localised 3D studies, but it was not integrated into the 3D modelling process. Opportunities for early-stage model coordination therefore required separate workshops to identify constraints and coordination.



► Design and coordination

Grimshaw's architectural model was developed in 3D to a level that could be read at 1:50 scale while embedding intelligence into particular constructs, such as wall and door types. Any drawn information at a more detailed scale would be carried out by a 2D drawn overlay to prevent slowing the model down while in operation. 'Tagging' of the construction elements, within general arrangement and detailed drawing views, provided cross-references to the specification and schedules.

In addition to standard architectural drawings, the data-enriched 3D model provided scheduling of architectural elements and

Implementing a fully-coordinated Level 2 BIM model in 2009 proved to be a steep learning curve for the design team at a time when design protocols and BIM execution plans were in their infancy in the UK

provided the basis for visualisation renders.

The majority of the MEP modelling occurred during the production design stage. Balfour Beatty, alongside the engineering team, employed specialist 3D modelling company One Point Design to develop the 3D services model and embed intelligence into all the services equipment.

As the model matured, it allowed the design team to carry out detailed coordination of all construction packages. Individuals in the design teams were trained in the use of 3D navigation tools to allow checks of design intent, and weekly coordination workshops were held with all disciplines.

Within the construction team, workshops were held to mitigate against site clashes and identify coordination opportunities. Regular updates of the modelling constructs were provided by the design team at key stages. Furthermore, the use of a single coordinated 3D model allowed the team to address any impact that design development may have had on the disciplines involved.



It is important to note that, while the model was used for clash detection and coordination, the review, checking and sign-off process still relied on 2D drawings to track agreed design decisions as this proved to be the best method.

Prefabrication with BIM

The use of the model had many benefits, among them access and maintenance reviews, cost-management and minimised waste during the build.

The BIM model was used to see whether each of the specified areas (see box, page 44) were suitable for offsite prefabrication. Using BIM allowed the design team to see a greater level of detail, helping them minimise the physical size of the plant room while ensuring sufficient space for access and maintenance.

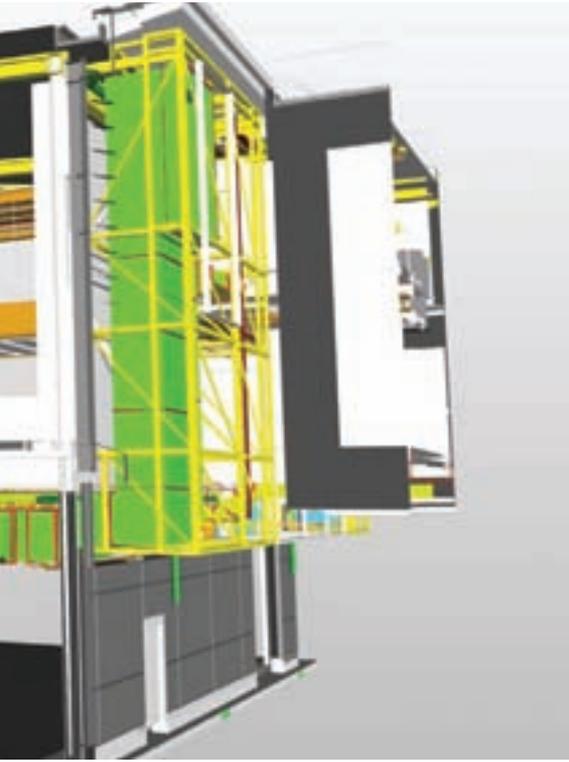
For example, when assessing the transportation of plant, the schedules gave the structural load and weight distribution to assist with the sizings of the self-propelled modular transporter and the lifting requirements for the moving of the plant room across the apron to its final position.

As the prefabricated design developed, the plant and equipment were defined and agreed with stakeholders. This information was embedded into the model and sent to the factory, where it was used for the creation of schedules, which were then issued directly to the suppliers for cost assessment and ordering.

Prefabricated modules were built, tested,

Software used during construction

- **Architectural design and modelling:** AutoCAD Architecture 2009
- **Structural modelling:** Revit Structures 2011
- **Mechanical and electrical modelling:** CADduct 2012
- **Coordination suite:** Navisworks Manage 2012
- **Programming software:** Primavera



quality-checked, pre-commissioned and stored offsite so they could be delivered just when they were needed.

Fabrication and construction

Adding a timeline to the BIM model allowed the design and construction teams the opportunity to 'look into the future'. Using Navisworks linked to Primavera programming software, the team was able to visualise the construction at a point in time. The use of the model and modularisation optimised the effectiveness of the installation while removing safety issues, such as working at height.

Benefiting from 4D

The 4D model was used to simulate a view of the work area and any overlapping working zones in a real time view. It enabled the team to see what a particular work area should look like on any given date. This was then compared with what it actually did look like on that day, demonstrating the accuracy of the model.

As a result, the team was able to manufacture certain elements early, safe in the knowledge that those elements could be incorporated into the building. For example, the team knew that, through 4D modelling, the prefabricated plant areas could be transferred overnight from the hanger (where they had been built) and lifted into position, all in one day.

The use of the visualisations taken from the model linked to Primavera, not only allowed the project team to look forward but also retrospectively, which was particularly important from a site safety perspective.



As an integral part of the Balfour Beatty Group 'zero harm' policy, the 4D model was used to predict potential safety issues, which were scheduled and managed out. It was also used to identify why any actual incidents occurred, so that lessons were learned for the future.

In addition, workshops were held on a weekly basis looking two and six weeks ahead. These were used to identify potential issues that could affect the delivery time, and space reports – showing spatial arrangement of elements on site – were developed in advance of works starting.

Lessons learned

Heathrow Terminal 2B has provided many lessons to the design team about the implementation of BIM on large-scale projects. The establishment of BIM workflows, the unfamiliarity of the tools and the complexity in meeting the client's exacting BIM protocol requirements, presented the design team with considerable challenges along the way.

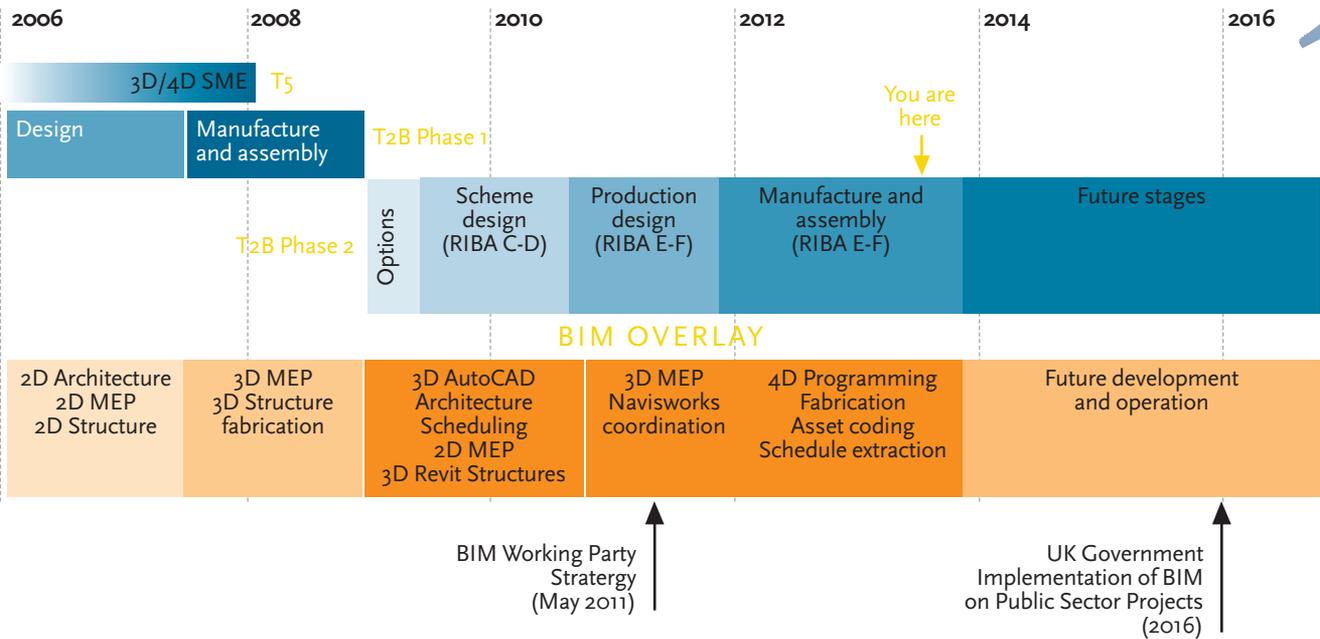
'BIM mindset' and resourcing

It is vital to understand that a building information model is 'built', and is not just a graphical representation of design intent. For this reason it is essential that, from the outset, there is sufficient experience in the design team to understand the consequences of design decisions on coordination and integration. The team must also be trained to understand that information is embedded within construction objects that may be critical to other disciplines and design processes.



The real-time view in the building information model allows the team to see work areas on any particular date

BIM Timeline



Modelling the prefab plant

Prefabricated plant developed from the BIM model included:

- Primary intake plant room
- Suspended plant bulges
- Horizontal distribution
- Apron-level service modules
- Passenger tunnel services routes
- Vertical distribution
- Main intake riser
- Perimeter services risers

At the outset, it is essential to involve team members with knowledge of the BIM process and a clear understanding of the project's goals, to ensure the modelling process is carried out strategically and resource is focused on areas that are of use to the project as a whole.

Scope gaps and suppliers information

The level of detail you choose to model puts limitations on the BIM model's capabilities for coordination. It is undesirable to model all elements of construction, despite the fact that these items could still have an impact on the coordination of the project.

Examples of this might be raised floor pedestals and ceiling framing elements which, because of their repetitive nature, could slow down the modelling drastically.

Similarly, in many cases, manufacturers and suppliers do not provide 3D information to enable any coordination work to take place. Where it is provided, it is often at a later stage in development and it is not appropriate to embed the information and blur the boundaries of ownership. In procurement routes that involve supplier design elements, the detailed design ownership falls with the supplier, not the consultant. The embedding of this information into BIM modelling has yet to be fully developed. Secondary steel associated with cladding, for example, is often not available for coordination until after the primary services distribution has been defined.

To avoid potential confusion, a clear set

of design constraints and principles should be agreed by all parties at the outset and all disciplines should be mindful of the limitations of the model to portray the final construction.

Conclusion

The working practice developed through the design and coordination phases has proved invaluable and BIM implementation has been a great success. The opportunities afforded to the site team for testing prefabrication and onsite activities have not only improved efficiency and quality, but also helped define safe working methods and achieve best practice.

The industry has moved on considerably since the early days of using BIM at Heathrow. BIM execution plans now provide a structured framework for the exchange of data, ensuring the correct level of modelling is used and helping to define each stakeholder's responsibilities.

Terminal 2B is due for practical completion in October and areas of the building have already been handed over to end users. The model continues to evolve to provide information to the site team and, ultimately, will provide full documentation of assets to the client.

● **ADRIAN TIMMINS** MCIBSE CEng RIBA is an architect at Grimshaw Architects LLP and **FRANK CONNOLLY** was the MEP design manager for T2B at Balfour Beatty Group. This piece was reviewed by **ALY DIAB**, design and engineering manager at Balfour Beatty Group.

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WIZARDS

The uptake of BIM in Australia was stalling until far-sighted contractors started sharing 3D models. **Andy Pearson** reports on how standardised templates are transforming the way buildings are being delivered under the BIM-MEPAUS initiative



The pre-fabricated risers recently installed at the Peter Doherty Institute in Melbourne (above and right) are the largest installation of their type in Australia. In just three days, 18 multi-services modules were installed.

There is a BIM revolution taking place in Australia and it is being led by the country's mechanical contractors. Under the Air Conditioning and Mechanical Contractors Association's BIM-MEPAUS initiative, many of the country's leading contractors, subcontractors, suppliers and designers are contributing to the development of an integrated project delivery workflow and a national MEP template that incorporates defined content.

The initiative was launched some three years ago because contractors were failing to benefit from the potential of BIM. 'At that time, services consultants were increasingly using BIM to design and document projects. However, the BIM models were not being released to the construction teams because of concerns over intellectual property and potential contractual liabilities,' says Warwick Stannus, group engineering manager for specialist building services contracting firm A G Coombs.

As a consequence, the BIM-MEP initiative was introduced to encourage design teams to forward BIM models to the construction team.

Once in possession of the model, the contractor is able to develop the BIM model into a construction model in a virtual-build process, in advance of construction starting on site. 'We are now starting from the position that we will be provided with the designer's BIM model, not a set of 3D pdf drawings,' explains Stannus. He says gains have been 'significant' and that stronger working relationships are being created between designers and constructors 'that are delivering benefits all round'.

Australian M&E contractors are increasingly using BIM as their preferred means of work, and the construction model has now become the

central project platform. The model supports a range of activities including procurement, pre-fabrication, site positioning and commissioning processes. Our position has changed in the last 12 months from BIM being an extra to it now forming our base offer,' says Stannus.

With the issue of consultants failing to share BIM models resolved, the BIM-MEP steering committee turned its attention to the supply chain. 'It was clear that a lack of industry-based modelling standards, workflows and fit-for-purpose manufacturers' content was a significant barrier to the adoption of BIM,' explains Stannus. As a result, the committee set about incorporating workflow practices and disciplines found in other sectors – such as automotive manufacture and logistics – into the supply chain practices to fast-track the adoption of BIM.

Adoption of a national MEP template

A key feature of the BIM-MEP initiative is its focus on supply chain integration as an enabler for construction efficiency gains. Procurement, installation and commissioning can be significantly more complicated for building services than for other construction trades, so the AMCA set out to develop a series of standards for plant and equipment that can support the BIM model at each phase of project delivery, from design to as-built and commissioned for handover to the client. 'We want to take the one Revit model from design, through construction, to deliver a commissioned as-built model to the client,' says Stannus.

Three main principles underpin the supply chain integration initiative: the adoption of a national MEP template tailored to Australia; the support of the needs of the construction team; and the adoption of a standard product template.

While the initiative is vendor-independent, the majority of designers use Revit MEP, so

OF OZ

the initiative focused on the development of an Autodesk Revit MEP template add-in that incorporates Australian Standards, industry practices and the National Construction Code. Having a national template to cover all services improves the efficiency of content workflow.

A key concept currently being refined is the development of foundation content models. These form the content within the template and are also the source of manufacturer content. With all manufacturers using the same source model, it then becomes simple for contractors to change one pump manufacturer for another when equipment selection is finalised.

The model must support the needs of the construction team, but it does not need to be all things to all stakeholders. One example is the use of software to convert the construction design model into fabrication models that can be used to manufacture ductwork.

'It is important that designers have real-world ducting and piping libraries, which use content developed from fabrication libraries to give assurance that a ductwork or pipework design can actually be manufactured,' says Stannus.

Translation software allows the construction design model to be efficiently converted into a fabrication model suitable for driving the coil lines and plasma cutters in the fabrication shop. Getting the ductwork fabrication workflow functioning effectively requires tight control of standards.

Stannus says it has been 'quite a challenge'. However, since Autodesk's purchase of MAP software (the firm that produced the industry standard CADduct ductwork fabrication software), the efficiency of the design-to-fabrication workflow has improved dramatically. 'We can now convert more than 95% of the Revit model into a ductwork fabrication model,' he says.

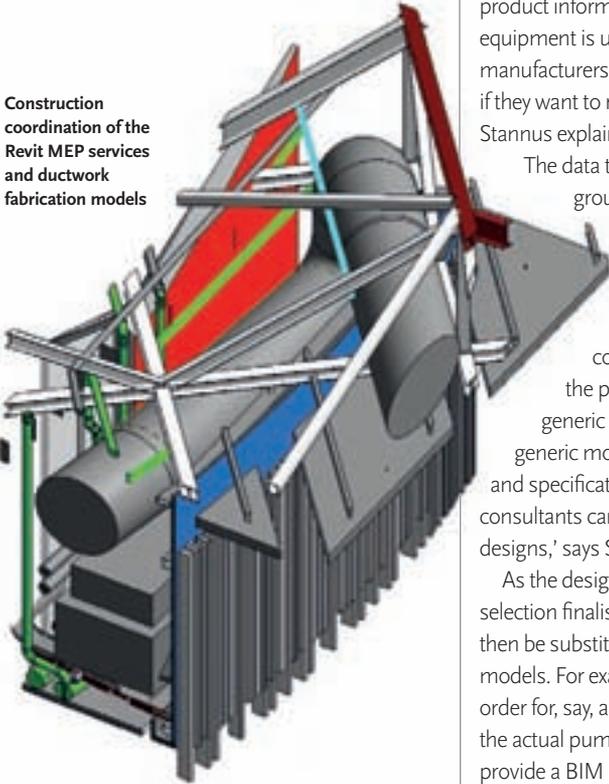
The final guiding principle is the development and adoption of a single nomenclature and product data template for plant, equipment and fittings for use by the entire construction sector.

ACMA has set out to improve BIM productivity through the development and adoption of a detailed schema for disciplines, as well as naming conventions and detailed specifications for each product type, such as axial fans or chillers to

“ We reviewed COBie and believed it would be very difficult to implement; our drive has been to keep things as simple and efficient as possible’
Warwick Stannus



Construction coordination of the Revit MEP services and ductwork fabrication models



It was clear that a lack of industry-based modelling standards, workflows and fit-for-purpose manufacturers' content was a significant barrier to the adoption of BIM Warwick Stannus

improve consistency of modelling practices. In order to achieve this, the BIM-MEP initiative has established what Stannus terms 'Best of Breed' national product specification guidelines and a series of naming conventions and nomenclature standards. This ensures consistent product information, whichever manufacturers' equipment is used on a project. 'Increasingly manufacturers understand that this is essential if they want to remain relevant in the future,' Stannus explains.

The data templates are finalised by industry groups comprising consultants, contractors and suppliers to ensure the data sets meet their requirements. This also helps share the development cost. Software vendors then turn the produced data templates into generic design models. 'Because the generic models have all the functionality and specification fields that designers need, consultants can use these generic models in their designs,' says Stannus.

As the design is progressed and equipment selection finalised, the generic models can then be substituted for manufacturers' certified models. For example, if a contractor places an order for, say, a pump, in addition to supplying the actual pump, the manufacturer will also provide a BIM model of the pump with Revit functionality and its actual geometry, along with product specific data sets for construction and commissioning – all in accordance with the pump template. This enables the contractor to accurately create the pump in the BIM model.

With the manufacturer's data incorporated into the BIM model, it is then a simple operation to run a filter to pull out data needed by the commissioning engineer, such as water flow rates. Similarly, once the project has been commissioned, data can be added to the as-built model, prior to the model's handover.

The template standard was launched over a year ago. Recently there has been a drive by AMCA to fast-track the development of content. This is relatively easy because manufacturers generally recognise that it is better for everyone if BIM works well using defined standards. With a standard format for the specification, the focus now is on finalising the schedules, which can be achieved relatively quickly. 'It is a democratic process, which enables us to write a BIM standard in four to six weeks,' Stannus explains.

The product data sets are not intended to be fully COBie compliant. COBie is a spreadsheet of data, which can be extracted from the BIM model to enable the FM team to manage the building effectively on handover. The UK government expects building information to be delivered in COBie format on all of its buildings completed after 2016. There is currently no such COBie requirement in Australia, which is a good thing from Stannus' perspective: 'We reviewed COBie and believed it would be very difficult to implement; our drive has been to keep things as simple and efficient as possible,' he says.

Nevertheless, even without formal COBie compliance, Stannus says he is confident that the data sets developed under the BIM-MEP initiative will support a building's FM team. 'From a design and construction perspective we've been pragmatic; we cover a lot of bases but not things such as maintenance plans, performance curves and embodied energy because, in our view, there are better places for this type of information to reside than in the model,' Stannus asserts.

Following its launch of three years ago, BIM-MEP has grown quickly to gain the support of a number of government authorities and has been endorsed by many of Australia's main contractors, designers, specialist trade contractors and suppliers. Viva la revolucion!

For further information visit the BIM-MEPAUS website at www.bimmepaus.com.au



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CAD Simulation Tool for Direct Expansion Systems

With its ability to simulate real-time conditions for HVAC design variables, LG's new CAD simulation tool can reduce design times for direct expansion systems by up to 60%

Where is LATSCAD best suited for you?

LG Electronics Air Conditioning and Energy Solutions Division has introduced its first CAD simulation tool for direct expansion systems. The application, called LatsCAD is integrated into AutoCAD Professional and acts as an 'add on' tool for 2D design of Direct Expansion Systems. This application has been specifically developed to cater for consulting engineering companies in the field of HVAC that want to increase the effectiveness and accuracy of direct expansion systems in their projects.

When design engineers conceive an air conditioning system for a building, they must consider numerous factors – LatsCAD can help reduce design time, by accounting for these constraints. Although, it is not a 3D

application it can produce load calculation by using unitary load per surface. This tool is able to:

- Calculate surface areas and automatically multiplies the rendering for the necessary load of the room.
- Perform simulations in real time conditions for variable refrigerant flow systems that use both air and water sink exchange environments, multisplit systems for various residential applications and monosplit systems for commercial applications.

All system simulations are realised considering many of the direct expansion systems constraints such as: temperature, necessary loads, piping lengths, combination ratios, efficiency, defrosting, recovery conditions etc.

When deadlines have to be met, LatsCAD is a must!

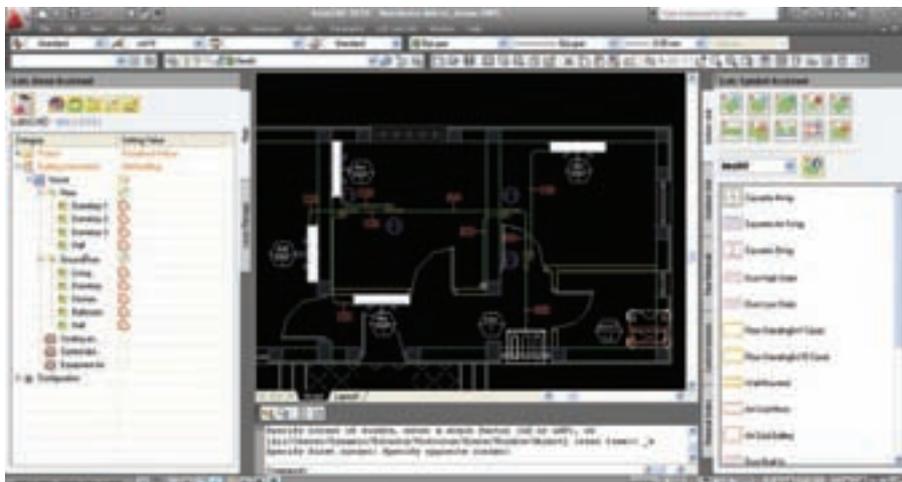
LatsCAD is a time saving tool for engineering companies that design HVAC building systems. The application can reduce design time by up to 60% and can be used both at every stage of the design process. Checking and changing systems is now faster and

more accurate than it has ever been before. One command (Manual Registration of Room) allows you to define a room, calculate the area of the room, calculate the necessary load (cooling and heating) and suggest the number of indoor units required in under 20 seconds.

This application offers the possibility to indicate the main artery of piping and through smart connection all of the indoors will be connected to it. From here it is only one step away from verifying, providing the system meets all the conditions of a DX application. At one click, system simulation will start checking the configuration for load ratios, temperature conditions, combination ratios, and piping lengths. Upon completion of the simulation each piece of equipment will be named and each pipe diameter will appear automatically. Once the simulation is complete, you can be assured the correct equipment has been selected for the job.

The reduced amount of time needed in design means several variations can be sent to the customer. LatsCAD can save the previous version of the project and can replace the indoor units with a click of the mouse. This means several options can be considered in a short time frame. The versatility of this tool ensures a clear view of projects to consultant (by .dwg) as well as for installers (by isometrics).

Once the design is complete the end customer can be provided with: detailed AutoCAD drawings with legends; a general overview of the system's configuration; a detailed report with information about the building and, most importantly, comprehensive details about proposed system in real life conditions.



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KING OF COOL

Camden council can afford to include two public swimming pools and a library in a prestigious new office block in King's Cross in part because of predicted energy savings of £500,000. An innovative chiller was a key specification in the low-energy design

The redevelopment of land around King's Cross station is an object lesson in urban regeneration. With a long way still to go, already the mix of high-quality offices, elegant squares and restored Victorian warehouses has turned a seedy industrial zone into an uplifting environment.

Part of the appeal is the diversity and quality of tenants being attracted to the site, from Google and Central Saint Martins College of Arts and Design, to the Art Fund.

One 2014 arrival will be the London Borough of Camden's 22,500 m² Five Pancras Square, designed by Bennetts Associates, with building services design and sustainability strategy undertaken by Grontmij, on the King's Cross Central site. As well as 11 floors of offices for council workers, it will feature two swimming pools, a leisure centre, customer service area, café and public library.

There are two reasons why Camden can afford such a prestigious building: it is rationalising its property portfolio and selling valuable existing sites in central London; and it estimates the new building will cut its energy bill by £500,000 per year.

The new HQ will have a host of passive features including: exposed thermal mass; optimisation of daylight factors across the occupied floor plate; solar shading, angled to help minimise direct solar gain; and the ability to benefit from night-purging to cool the building naturally.

These measures, in conjunction with an energy-efficient ventilation system and an innovative modular central cooling system, adaptive control methodologies and connection to the King's Cross Central low carbon district heating network, is predicted to result in carbon emissions 50 per cent lower ➤

The pump selection and staging has also been addressed to provide effective operation to reduce energy consumption and reduce the end-user's running costs

than the 2010 Building Regulation target.

High efficiency targets were set by the design team, and to achieve them, the focus was put on innovation. The main items identified were: chillers and chilled water auxiliary equipment; air-handling units and exhaust fans; lighting control and luminaire selection; and power distribution, including metering and sub-section pre-wired and pre-tested off-site.

The *CIBSE Journal* will publish a full case study on Five Pancras Square on completion, but this article focuses on the chiller, which M&E contractor Kier IME says is key to the building achieving – and exceeding – design performance targets. The Part-L compliance dynamic thermal model set a seasonal energy efficiency ratio (SEER) target of 4.9 on a total building cooling load of 2.2MW, divided over two air-cooled chiller units.

All the central plant was targeted for improvement against the energy model, with consideration given to the spatial constraints and co-ordination of a city-centre building.

A chiller system from Hitachi features in the scheme. The 14 RCME modules selected each have a maximum cooling capacity of 165kW and the high-efficiency screw chiller was shown to achieve a SEER of 5.31.

The screw compressor operates on refrigerant R134A, which is associated with high part load efficiency and reliability, and offers a three-year warranty. The RCME range achieves compressor efficiencies similar to more expensive and complex units.

Twin plate heat exchangers on each module are designed in series for greater efficiency, which in turn ensures the refrigerant velocity increases, plus constant distribution of the refrigerant flow across the exchange surface.

The chillers are built from three basic modules with ratings of 40HP, 50HP and 60HP. By combining them, higher capacity units can be achieved up to 1,280kW, with one

module set as master and the rest as slaves. All operate together as a single system.

The project team looked at mixing the chiller modules and variability of the capacities to suit the minimum/nominal/maximum load, and finally settled on 14 x 60HP, which delivered the optimum efficiency against the spatial constraints.

If space was not a factor, then a greater number of units with a smaller output would deliver higher efficiencies, as they could be more closely controlled to match the load.

Each chiller for the King's Cross Kier project will be supplied with a power meter assembled at the factory. This will display total power and power per phase, frequency, power factor total, voltage both phase-to-phase and phase-to-neutral, three phases and neutral current, with an hourly counter and time-integrated outputs.

Efforts have been made to stage the chiller units down to minimal load as low as 32kW. Pump selection and staging has also been addressed to reduce energy consumption and cut the end-user's running costs. The main pump sets run from 100% (2.2 MW) to a minimum (220kW) and the secondary pump covers the range from 15% (330kW) to 1.5% (33kW).

Kier says its specification of innovative systems, including the chiller, means the envisaged post-construction BREEAM score is actually expected to be higher than the design-stage score of 93.05%. The team is working towards a revised target of 96%, which would make it the most sustainable building in the UK, as assessed by the BREEAM rating process.

The building is expected to open for business in 2014, and will be closely monitored in terms of energy and water use. The effective operation of the chiller will be key to Camden achieving its expected energy savings, and crucial in ensuring taxpayers don't contribute towards the project's costs. **CJ**



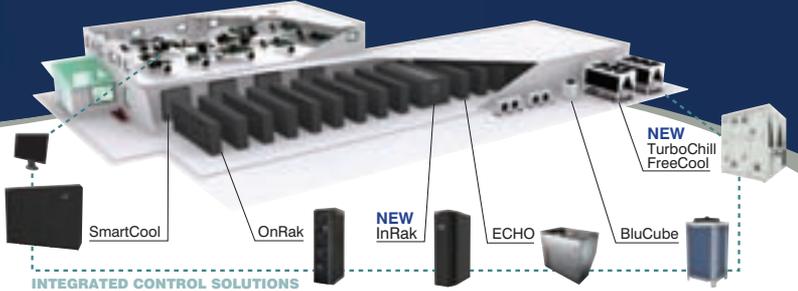




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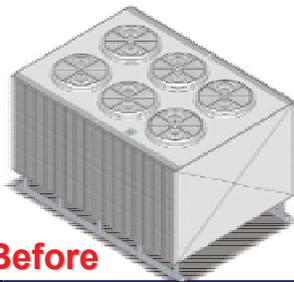


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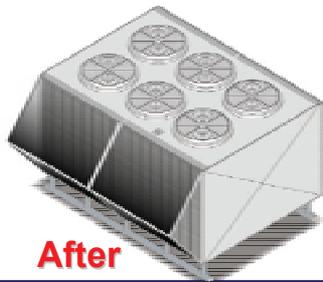
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MAKING WAVES

Water-cooled, oil-free magnetic bearing compressors are now ranked among the US Department of Energy's Federal Energy Management Program's top 20 technologies for deployment, with trials at three Navy bases showing they can produce up to 60% energy savings. Mildred Hastbacka, John Dieckmann and Antonio Bouza explore their capabilities

6 The major drivers for selection of building products and technologies in this market have been life-cycle costs and return on investment

In 2003, there had been a technically successful development of a 25-tonne (88 kW) capacity, two-stage centrifugal compressor for R-134a that could be used in either water-cooled chiller applications or air-cooled chiller or unitary air-conditioning applications.

The two centrifugal impellers were direct-driven by a permanent magnet rotor dc motor on a common shaft. The compressor operated at variable speeds, between 35,000 and 50,000 rpm and used refrigerant-lubricated ball bearings to support the shaft. With refrigerant lubrication of the bearings, no oil lubrication was required, eliminating circulating oil through the rest of the refrigeration loop. At this high speed, the impeller diameter is quite small, about 75 mm. Despite the potential advantages, this technology did not advance to commercial production¹.

Since then, another configuration of small, high-speed centrifugal compressor has emerged and become an established commercial product. As with the previous development, the compressor has been designed for R-134a, with two stages to provide sufficient pressure ratio and temperature lift to allow it to be used in air-cooled applications. The motor and impellers are on a common shaft, with a variable rotating speed of about

30,000 rpm, with impeller diameters between 75 and 100 mm.

A significant difference is that the bearings are magnetic bearings, which levitate the shaft on a magnetic field, with no contact with a stationary bearing half. This eliminates mechanical friction loss and allows lubricant-free operation. While these compressors have extended, the range of competitive performance of centrifugal compressors to lower capacities than traditional centrifugal chillers – down to 60 tons (211 kW) – the technology has proven to be scalable, with high-speed centrifugal chiller products on the market with capacities up to 700 tons (2,460 kW).

This compressor configuration contributes to increased energy efficiency in several ways. From the perspective of scaling laws, the combination of small impeller diameter and high rotating speed is optimum for a centrifugal compressor in this relatively small capacity range. The variable operating speed provides excellent part-load efficiency, with the speed being varied to match the condensing temperature.

The two-stage design allows a refrigerant economiser cycle to be incorporated; the condensed refrigerant is expanded in two stages from the condensing pressure to an



This is a modified version of an article first published in the ASHRAE Journal (February 2013) © ASHRAE www.ashrae.org



A US Navy ship approaches the San Diego base, where two of the compressor installations were made

intermediate pressure (the pressure between the two compressor stages) after the first stage of expansion, then to the evaporating pressure after the second stage of expansion. The vapour flashed after the first expansion stage, at intermediate pressure, is directed to the second compressor stage (instead of passing through the second expansion stage, to the evaporator). Energy is saved because compressing the flashed vapour from the intermediate pressure between expansion stages requires only approximately half as much energy as would be required to compress this vapour all the way from the evaporating pressure to the condensing pressure.

Typical energy savings from the refrigerant economiser cycle range from 5% to 7%. The magnetic bearings allow unlubricated operation with low friction loss. Eliminating lubricating oil from the system results in incrementally better refrigerant-side heat transfer performance, particularly in the evaporator.

Energy savings

The US Department of Energy's Federal Energy Management Program has included water-cooled, oil-free magnetic bearing compressor technology among its top 20

technologies for deployment.^{2,3} Annual cooling energy savings, ranging from about 40% to more than 60%, have been achieved with this technology, as documented by the Navy Technology Validation (Techval) Program.^{4,5} Three project sites were involved in the Navy evaluation: San Diego, Newport, and Jacksonville.⁵ Projects included a compressor retrofit, as well as a new chiller and an added compressor.

Table 1 presents a high-level summary of each project, as well as energy savings results and payback based on the total project cost. In the San Diego project, three existing chillers, with and without the new compressors, were used as the basis of the energy savings comparison. Baselines for the Jacksonville and Newport projects were the existing compressors.⁶

A significant contributor to the energy savings is the technology's excellent efficiency at partial loads, which is typical of chiller operation.^{2,3,4} The longer the compressor is run at part load and the higher the electric rate (for example > \$0.07/kWh), the greater the advantage offered by magnetic bearing chiller compressors.⁴

The incremental costs for these three projects were reported as \$24,000 (£15,550), \$8,000 (£5,150) and \$13,000 (£8,350)

“The bearings are magnetic, which levitate the shaft on a magnetic field, with no contact with a stationary bearing half, eliminating mechanical friction loss and allowing lubricant-free operation

The new chiller with an integrated 90-tonne variable-speed compressor used to replace one of the existing 100-tonne reciprocating chillers at NUWC, Newport, RI



COURTESY OF SEC GROUP, INC

Eliminating lubricating oil from the system results in incrementally better refrigerant-side heat transfer performance, particularly in the evaporator

respectively. Using this incremental project cost for payback calculations yields payback periods of 1.1 years for San Diego; 0.3 years for Newport; and 0.8 years for Jacksonville.⁵

Market potential

Small centrifugal compressors are now commercially available from multiple sources and are expected to replace reciprocating and screw compressors for chilled-water systems in the 25 to 80-tonne (88 to 281 kW) range.⁷ Comparatively high first costs can be, and have been, substantially offset by improved energy efficiency.

Mechanical contractors serving the school construction market report that magnetic bearing chillers are among the new technologies of interest to this market.⁸ With overall school construction demand down by 50% from pre-recession levels, the major drivers for selection of building products and technologies in this market have been life-cycle costs and return on investment, rather than LEED or sustainability.

In New England, with electric rates hovering around \$0.15/ kWh, data storage centres with water-cooled chillers are realising reduced power consumption, as well as lower maintenance costs and high reliability from use of oil-free, magnetic bearing compressors.⁹ Both data centre users and data centre service

providers are concerned about shutdown risks. Many data centre users have migrated from leases based on cost/ft² to leases based on 'service level agreements' (SLAs), which compensate data centre users for time periods in which they cannot access critical data.

Cooling system reliability affects shutdown risk. Given that 80% of chiller problems in data centres have been attributed to failures in compressor-oil return, oil-free compressors are an attractive option for data centre service providers.⁹ Also, data centre applications benefit from the low inrush current required to start a magnetic bearing compressor, which permits downsizing of standby generator equipment. **CJ**

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Project/type	Tons	Utility rate (\$/kWh)	Annual energy savings	Per cent energy savings	Project cost	Payback (years)
San Diego/ third compressor added	240	\$0.121	\$21,206 (£13,651)	40%	\$178,787 (design through installation)	8.4
Newport/ new chiller	80	\$0.115	\$26,192 (£16,860)	65%	\$100,783 (design through installation)	3.8
Jacksonville/ compressor retrofit	120	\$0.054	\$15,358 (£9,886)	41%	\$107,592 (installation, including compressor)	7.0

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Application of small-scale combined heat and power

This module looks at energy efficiency in small-scale CHP systems

Combined heat and power (CHP) can provide an efficient system by making both generated electricity and recovered engine heat for immediate local use. Through generating, and effectively consuming, heat and power simultaneously, CHP can reduce primary energy use by up to 30% compared to the more conventional methods, such as condensing gas boilers and grid supplied electricity.

This CPD will concentrate on aspects of small-scale CHP, commonly referred to as 'packaged CHP', as the units are typically delivered to site as a complete item, ready for installation. CHP systems are commonly classified based on electrical output (kWe), as shown in Table 1.

As shown in the example mini-CHP in Figure 1, the engine known as the 'prime mover' drives a generator to produce electricity and recovers heat from the engine coolant, exhaust gas or – in the case of a larger steam turbine system – through spent steam. CHP effectively works as a localised power station close to the point of electricity and heat demands, avoiding transmission and distribution losses and utilising the waste heat locally, leading to higher fuel efficiency and potentially lower carbon emissions. Most 'small scale' CHP installations in buildings are packaged units, based on natural gas-fuelled reciprocating engines, with an electrical output normally less than 500 kWe. Small-scale gas turbines are also available that have lower

maintenance requirements, but also lower electrical efficiencies.

The primary energy saving for CHP may be compared¹ to traditional systems by considering the typical output from a CHP that is consuming 100 units of natural gas. This will generate **35 units of electricity** and **45 units of useful heat**.

Conventional grid-based electrical generation at 40% efficiency to produce 35 units electricity
(40% = energy used at end user/energy consumed at power station)
= 35/0.4 units of fuel = 88 units

Conventional heating to produce 45 units of heat at 80% efficiency
(80% total fuel efficiency of commercial heating system)
= 45/0.80 units of fuel = 56 units

The total fuel required, using a conventional supply to match the CHP output
= 88 + 56 = 144 units

Common classification	Electrical output
Micro CHP	<5 kWe*
Mini or small-scale CHP	5 kWe – 500 kWe
Medium CHP	500 kWe – 1 MWe
Large-scale CHP	>1 MWe

*Micro has recently often been categorised as less than 2 kWe, as that ties in with the current maximum limit of the UK government's 'Feed in Tariff' (FIT) funding for fossil-fuelled CHP.

Table 1: Typical classification of CHP systems

So the potential saving in primary energy is about 30%.

CHP can use many forms of fuel such as oil, biomass, bio liquid and bio methane, but the most frequently used fuel is natural gas.

The generator and electrical power production

Asynchronous or synchronous generators are typically used to produce three-phase

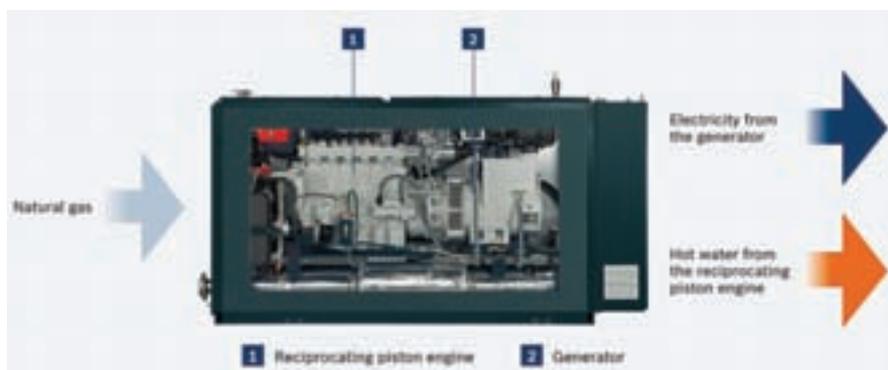


Figure 1: Packaged small-scale CHP (Source: Bosch)



Figure 2: Potential peak operating efficiencies for mini-CHP (Source: Bosch)

► electricity at 50 Hz 400 V for connection into the low voltage site distribution system. The generated power would normally be used locally. It is possible to export power into the grid with agreement from the local district network operator (DNO), but for natural gas fuelled mini-CHP module, this is generally uneconomical – particularly as the price paid by the networks could be just half of that paid for buying in electricity. When establishing the potential benefits of applying CHP, the effect on the mains electrical supplier must be considered, as both peak electrical demand and overall site consumption will reduce, affecting the negotiated tariff costs.

The potential for CHP

At the end of 2010, there were just under 1,200 non-industrial CHP installations in the UK², and the introduction of UK government's 'Feed in Tariff' (FiT) payments (guarantees to pay a fixed tariff for each kWh of electricity generated, and an additional payment for each kWh of electricity exported to the grid) has accelerated the adoption of micro-CHP systems, with more than 400³ having been installed since 2010. The trial undertaken by the Carbon Trust (reported in 2011⁴) of 87 micro-CHP installations in typical UK households and small commercial applications, found that the larger domestic systems – using more than 15 MWhth heating per year – and small commercial premises were most likely to benefit from savings in carbon, with average CO₂ savings of up to 16%. On average, small domestic installations benefit (in carbon terms) by a few per cent compared to using a condensing boiler and grid electricity. The first three years of the UK government's FiT has provided an incentive for micro-CHP (<=2 kWe), helping to boost the adoption – and expertise in installation – of small gas-fuelled units. This is likely to improve the performance of future installations.

Using factory produced small-scale CHP schemes may potentially achieve peak operating efficiencies of up to 90%. The seasonal efficiencies will be dependent on the matching

of the year-round local thermal load to the heat produced by the CHP. Applications that are particularly suitable are those with consistent heating and/or hot water loads alongside electrical demand, such as hospitals, leisure centres with swimming pools, and factories with processing requiring heat/hot water/low pressure steam or district heating systems.

Economic and environmental considerations

The CHP is powered using a lower cost fuel, such as natural gas, to produce energy with a higher value in the form of electricity. The difference between the cost of these two fuels (known as the 'spark-gap') has a most significant effect on the economic viability of a project. As the spark-gap increases, the payback period for the capital (and operational) investment will reduce. Manufacturers quote a product life of around 10-15 years of operation (with appropriate maintenance), and although fuel prices will change over that period, the separate fuel prices typically increase together to maintain a practical spark-gap.

To provide increased benefit, a CHP scheme should operate as many hours per year as possible. As a general 'rule of thumb', the

recommended minimum running hours for financial success is an equivalent of 12 hours per day, with well-selected, designed and operated systems potentially providing payback within five years. In the UK, the heat demand is inevitably seasonal. However, by using heat-driven absorption chillers, there are opportunities to extend the season so that heating base load is increased during the summer months, enabling a more effective use of the CHP plant. Symbiotic energy-linking with nearby users that have complementary heat/power profiles can provide highly effective solutions – for example, a tomato farm and supermarket, or a university administration block and student residences.

Apart from a potential reduction in carbon emissions, there are a number of financial incentives in the UK to encourage the application of CHP systems.

Natural gas-fuelled systems with an electrical output no greater than 2 kWe are currently eligible for funding under the FiT scheme.⁵ Systems (up to 5 MWe) fuelled with biogas from anaerobic digesters are also eligible for FiTs, as well as the **Renewable Heat Incentive (RHI)** for up to 200 kWth.⁶

The **Enhanced Capital Allowance (ECA)** scheme allows businesses to claim 100% first year capital allowances on investments in qualifying energy saving technologies and products that can include CHP.

The **Quality Assurance for Combined Heat and Power (CHPQA)**⁷ provides a standardised method to compare the effectiveness of CHP systems, through a quality index (QI) and power efficiency. This provides the principal evidence required for determining eligibility of CHP schemes for ECAs – see CHPQA document *Guidance Note 42* – and **Climate Change Levy (CCL)** exemption.

Qualifying CHP projects can be exempt from

Some installation factors

Noise – The CHP can generate significant engine noise and vibration that may transmit through the pipework and the exhaust/flue systems. Packaged units will often be supplied with attenuated enclosures, although additional silencers and vibration isolation may well be required.

Access – Installation will require appropriate access (often including cranes), but the future maintenance needs of engines requires significant clearance.

Flue/exhaust system – These need to be high-pressure systems (potentially operating with 5 kPa pressure), with gas velocities of 25-35 m·s⁻¹ at high temperatures.

Hydraulics – Care must be taken with the design/installation/commissioning of the water side of the systems CHP, otherwise it may cycle more frequently, leading to higher maintenance costs and longer payback periods.

Ventilation – Casing losses from CHP equipment will require ventilation (particularly in summer periods). If the CHP combines a heat extraction system, extra ventilation will be required to maintain a positive pressure inside the plant room.

Grid connection – Contact the district network operator (DNO) as soon as the project starts, as they will be able to identify what is required to meet regulations.

paying CCL on the gas used to fuel the scheme, while also benefiting from not having to pay CCL on the electricity generated. For larger consumers (with total electricity consumption under 6,000 MWh per year), CHP can reduce the liabilities under the **Carbon Reduction Commitment (CRC)**.⁸

'Good quality CHP' can also attract business rates exceptions.⁹

Additionally, the CHP can enhance the environmental rating of a building. For example, a properly installed, commissioned and monitored system can attract **BREEAM** credits for areas including emissions, energy monitoring, low and zero carbon (LZC) technologies and innovation.

Sizing CHP schemes

This requires historical or projected data about heat and electricity use. From this data, an annual profile may be established for heat usage and concurrent power demand that will assist in determining the base load for the building. As indicated in Figure 3, the profiles of heat will be highly dependent on the building type, and this will strongly influence the installed capacity of CHP (keeping in mind the 'rule of thumb' average 12 hours-a-day, 4,500 hours-per-annum breakpoint for economic viability).

However, proper consideration requires half-hourly or hourly data of concurrent heat and power usage, as using time frequency data (see Figure 3) may conceal periods of mismatch between the power and heat loads. Similarly, temporal data will enable spreadsheet models to be created that can include the vagaries of fuel tariffs. A suitably sized CHP can then be matched to the profile, which typically may be under 20% of the peak heat load.

It is possible to have electrically-led operation, where the CHP is operated to primarily meet an electric load, but this will inevitably lead to the wasteful rejection of heat. Although there could be occasions where this might be economical

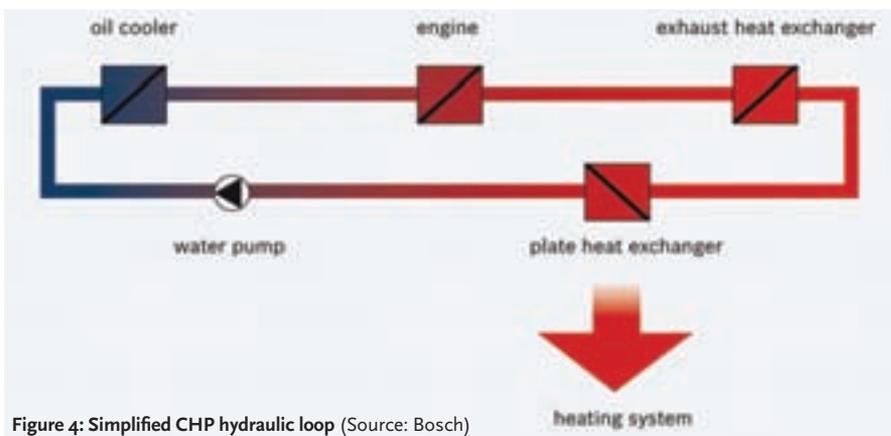


Figure 4: Simplified CHP hydraulic loop (Source: Bosch)

(for example, in off-grid locations), the total efficiency of the scheme will drop dramatically.

Hydraulic integration

Figure 4 shows the typical water circulation around a CHP unit. A pump circulates return water first through the oil cooler, followed by the engine block and on to the heat exchanger around the exhaust system, before finally transferring the collected heat via a plate heat exchanger to the heating circuit. With this configuration, the return temperature to the CHP must not fall below 70°C, as this can damage the engine. Some CHP units have an internal 'back end protection' system fitted to maintain the return temperature or, if it is not incorporated, an external (but closely coupled) back end protection system is used.

The CHP units will operate in conjunction with other heat sources, such as condensing boilers. To help meet peaks in demand, a thermal store is often incorporated into the system and, for mini-CHP, this is typically sized¹⁰ to store the heat from one hour run time of the CHP. The thermal store and CHP should be connected into the system so that the heat from the CHP is used in preference to any other non-renewable heat source, acting as the 'lead boiler'. This will extend the period during which the CHP may generate electricity, as well as

reducing the call on the more carbon-intensive heat sources, even at times when the load is below the point where the CHP plant can operate effectively. This adds further complexity to the economic modelling of the CHP system, as it allows heat to be supplied from that generated by the CHP even at times, such as at night, when the electrical tariff would make it uneconomic to operate the engine. Using a predictive control strategy, the charging of the thermal store can be optimised to maximise the operational hours of the CHP.

A CHP installation can offer a sound financial investment, but this is dependent on a rigorous site evaluation and pre-selection, appropriate sizing, holistic design, installation, and a fully monitored and maintained operation.

© Tim Dwyer, 2013.

Further reading:

There are two particular documents that provide extensive detail on the appropriate application of CHP. *CTV044 – Introducing CHP*, published by the Carbon Trust, is available on the web, and the recently revised *CIBSE AM12 Combined Heat and Power for Buildings* provides much excellent material and is available through the CIBSE Knowledge Portal – freely downloadable for all CIBSE members.

References

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- 2 *CTV044 – Introducing CHP*, Carbon Trust, 2010, http://www.carbontrust.com/media/19529/ctv044_introducing_combined_heat_and_power.pdf accessed 5 May 2013.
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- 4 *CTC788 – Micro-CHP Accelerator – Final Report*, Carbon Trust, 2011, http://www.carbontrust.com/media/77260/ctc788_micro-chp_accelerator.pdf – accessed 5 May 2013.
- 5 <https://www.gov.uk/feed-in-tariffs> – accessed 5 May 2013.
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- 7 *Use of CHPQA to Obtain Enhanced Capital Allowances*, https://www.chpqa.com/guidance_notes/GUIDANCE_NOTE_42.pdf – accessed 5 May 2013.
- 8 DECC – CRC Energy Efficiency Scheme, <https://www.gov.uk/crc-energy-efficiency-scheme> – accessed 5 May 2013.
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- 10 Bosch internal document.

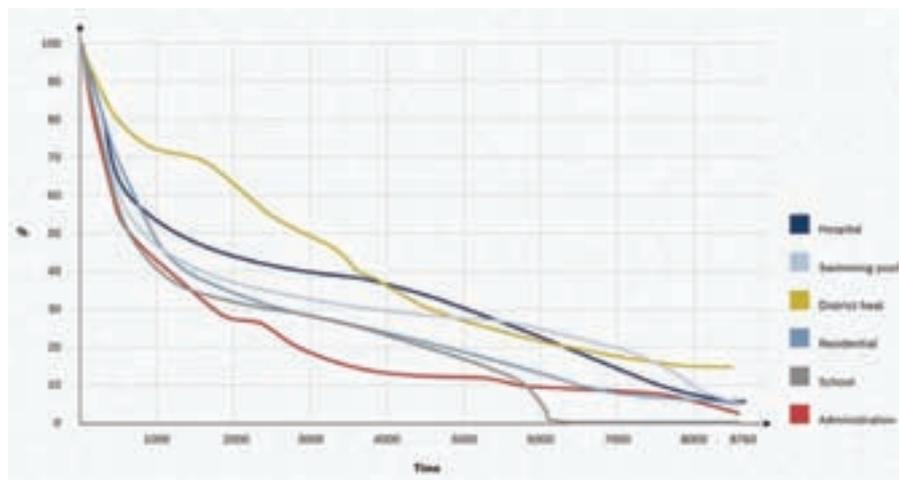


Figure 3: Typical heat load profile examples for different building types (Source: Bosch)

Module 53

June 2013



1. What maximum size of CHP would normally be considered as 'small scale'?

- a. 2 kWe
- b. 5 kWe
- c. 500 kWe
- d. 1 MWe
- e. >1 MWe

2. What does the article propose is the potential saving in primary energy from employing CHP?

- a. 30%
- b. 35%
- c. 40%
- d. 45%
- e. 50%

3. What is the approximate 'rule of thumb' annual minimum operating period for CHP to provide an economic solution in a 'standard' UK application?

- a. At least 1,000-1,500 hours per annum
- b. At least 2,000-2,500 hours per annum
- c. At least 3,000-3,500 hours per annum
- d. At least 4,000-4,500 hours per annum
- e. At least 5,000-5,500 hours per annum

4. If fuelled by biogas from anaerobic digesters, what is the maximum thermal output of CHP that would currently attract funding under the UK RHI?

- a. 0 kWth (it is not eligible)
- b. 2 kWth
- c. 20 kWth
- d. 200 kWth
- e. 2 MWth

5. Which of these is a principal reason for using thermal storage with CHP?

- a. To provide 'back-end protection'
- b. To ensure that associated condensing boilers operate effectively
- c. To allow the CHP to run effectively for the maximum period
- d. To make the economic modelling more straightforward
- e. To simplify legionella protection

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CircLED – the sleek and stylish solution

Riegens Lighting has launched CircLED, a sleek and stylish energy efficient bollard for amenity applications. Contained within a robust vandal-resistant outer (IK10 vandal protection), CircLED is IP54 rated and also resistant to vibration and impact. Designed for easy maintenance, the bollard's smooth design allows for self cleaning and the



LED light source offers a life of more than 50,000 hours offering indirect light distribution without any light pollution. CircLED also provides instant start-up, even at low temperatures. CircLED is ideal for use in a variety of applications, including car parks, retail parks, street lighting, entrance roads and pedestrian areas.

● Visit www.riegens.co.uk or email riegens-lighting@riegens-lighting.com



Kingspan Klargester's new shallow dig septic tanks

Kingspan Klargester, a specialist in the design and manufacture of off-mains drainage solutions, has

launched the Sigma shallow dig septic tank – a cylindrical-shaped tank with a lower-profile for quicker, cheaper, off-mains installations. The new design of the Sigma tank means that it requires a shallower dig and less excavation, as well as far less pea-shingle or concrete backfill to secure it in place. Sigma septic tanks are also ideally suited to rocky strata conditions, where deep digs are not always possible.

● Call 01296 633033, email sales@klargester.com, or visit www.klargester.com

PaySmart debt-free energy billing

Historically, many landlords and housing associations that manage housing schemes with communal heating have been required to maintain a debt fund to cover any shortfall in energy payments. Evinox can eliminate the requirement for a debt fund by providing a system where residents pay for energy in advance, which keeps the tariff rate down as less administration and fewer management services are required. A PaySmart debt-free metering solution enables residents to be in control of their own energy bills.

● Call 01372 722277 or email info@evinox.co.uk



Aquatech Pressmain and Autron sponsor Ginetta Junior Scholarship Car

The Ginetta Junior Championship forms part of the support package for The British Touring Car Championships, which take place throughout the UK, televised on Sundays on ITV4. This year's driver of the sponsorship car is 14-year-old Jamie Chadwick, a young lady with outstanding talent who is set to make a big impact over the season. Aquatech Pressmain and Autron are delighted to sponsor this high profile, exciting sport and Jamie's positive ambition.

● Visit www.agm-plc.co.uk



Marshall-Tufflex's Powertrack first to gain Intertek ASTA-type test certification

Cable management specialist Marshall-Tufflex has reinforced its market-leading position with its Series 507 Powertrack and fittings, becoming the first system to achieve ASTA-type test certification for short circuit testing to BS EN 61534-22:2009, clauses 15.4, 18.4.3.2, and 18.4.3.3. The testing regime was conducted by specialist Intertek. 'The Marshall-Tufflex 507 system complied with the requirements of the standard and, as a result, the ASTA-type test certificate (No 18559) was issued. This short-circuit withstand test is now a compulsory part of the latest harmonised standard for Powertrack systems,' said Jeremy Dodge, head of marketing and technical services.

● Email marketing@marshall-tufflex.com or marketing@kimbercoms.co.uk



SSG awarded accreditation to ISO 14001 (environmental systems)

Static Systems Group (SSG) has been awarded ISO 14001 accreditation, which provides evidence to its customers of the company's commitment to operate in an environmentally responsible way. The headline task is that of improving SSG's carbon footprint by reducing the environmental impacts of its operations across the entire range of products and services. Sustainability has become SSG's byword and this is achieved by integrating environmental management into the company's everyday activities and processes.

● Visit www.staticsystems.co.uk or call 01902 895 551

ATAG looks for growth in Scotland

ATAG Heating, the UK subsidiary of ATAG Verwarming of Holland, one of Europe's leading manufacturers of high efficiency, low emission boilers, has appointed McCallum Water Heating of Glasgow as its sales agent for Scotland. Founded in 1878, McCallum is one of Scotland's oldest-established heating appliance, manufacturer, distributor and repair specialists and has an enviable reputation for the quality of both the products and services it offers – from commercial and domestic calorifiers, cylinders and plate heat exchangers, to thermal storage and rainwater harvesting systems.

● Call 01243 815770



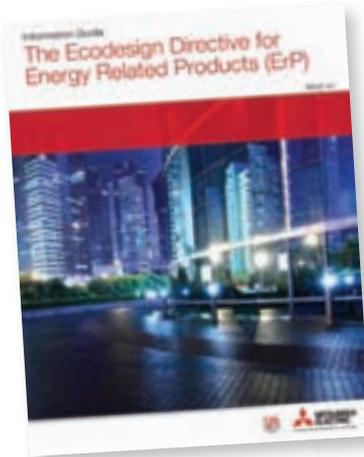


A fresh solution from SE Controls for Birmingham City Council offices

Birmingham City Council's award-winning office development at Woodcock Street is using an advanced natural ventilation solution from SE Controls to create a comfortable environment for staff and visitors, while enhancing the building's sustainability credentials by reducing energy consumption. The £38m, five-storey building provides a flexible working environment for around 3,000 employees and forms part of the local authority's plans to rationalise its office portfolio and

generate more than £200m of savings by reducing its occupancy of leased buildings. A key focus of the building's design was the use of a wide range of sustainable technologies to minimise energy consumption and reduce its carbon footprint. In addition to rainwater harvesting, a 'brown roof' wildlife habitat and photovoltaic panels, SE Controls' natural ventilation solution also played an essential role in helping achieve the energy reduction targets. SE Controls supplied, installed and commissioned the extensive natural ventilation system, which involved 562 TGCO chain- and tandem-type actuators, together with 101 OS2 type 22 controllers to ensure the precise operation of automatically opening windows and vents within the workspace and four atria.

● Visit www.secontrols.com or call 01543 443060



Mitsubishi Electric adds more ErP-compliant equipment to its range

Details of the additions to Mitsubishi Electric's popular M Series and Mr Slim ranges of air conditioning systems have been released – all of which fully comply with the requirements of the Energy Related Products (ErP) Lot 10 Directive, which came into force at the beginning of 2013. The new models join the manufacturer's existing range of fully compliant units, each featuring labels detailing seasonal efficiency and performance. The EU-wide ErP rules focus on performance in three distinct climate zones – cold, moderate and warm.

● Visit www.airconditioning.mitsubishielectric.co.uk or email livingenvironmentalsystems@meuk.mee.com

VortX offers superior trapped gully bodies

The next generation of drainage solutions – VortX – from iron technology leader Saint-Gobain PAM UK, part of leading materials group Saint-Gobain, includes a range of innovatively designed trapped gully bodies, which are lighter in weight and easier to install than traditional trapped gully bodies. A trapped gully is used to prevent foul air entering a building. The 'P' and 'S' traps, which accommodate horizontal and vertical water flow respectively, require less installation space – only 180mm borehole – delivering savings on installation and a more convenient and compact floor drainage solution.

● Visit www.pam-vortx.co.uk or www.saint-gobain-pam.co.uk



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

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

● Call 01293 871751 or visit www.castlinesystems.com



LG's 'LEEP' of faith

LG Electronics air conditioning and energy solutions division has developed a new energy calculation tool in the form of LEEP (LG Energy Estimator Program). LG's LEEP helps contractors, consultants and specifiers to readily and quickly understand the savings and performance capabilities of LG's range of advanced VRF products. The LEEP tool (based on Microsoft Excel) quickly calculates an energy estimation model for LG's Multi V III, Multi V Mini air source and Multi V Water II water source series of products.

● Visit uk.lgeaircon.com



Reduced operating costs from Fläkt Woods chilled beams

Fläkt Woods has further expanded its highly efficient and flexible range of iQ Star active chilled beams with the new iQ Star Nova, designed specifically for exposed soffit installations. Building on the success of Fläkt Woods' extensive portfolio of chilled beams, the new iQ Star Nova provides excellent savings on running costs, as well as exceptional performance with an 80% turndown – perfect for commercial applications such as offices and schools, or where room occupancy levels fluctuate.

● Visit www.flaktwoods.co.uk



Shard climbs to new heights

Just a couple of months after The Shard's official opening, the 1020 ft/310 m vertical city received a huge accolade when it was acclaimed project of the year at the recent Building awards. The development is perhaps the most ambitious to date in London and has been the subject of much debate between advocates and detractors. It was designed by the architect Renzo Piano, who compared his slender, spire-like design to 'a shard of glass', a nickname that stuck. Behind the scenes, keeping such an iconic building operational, are a small army of Grundfos pump solutions. Grundfos was selected because of the combination of its experience in supplying to skyscraper projects in London – in particular Canary Wharf – coupled with its track record in successfully delivering complete and complex pump solutions. Other aspects that helped to secure this landmark project were Grundfos' reputation, and the reliability and breadth of its product portfolio.

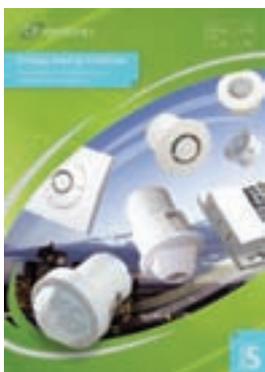
● Email grundfosuk@grundfos.com, call 01525 850000 or visit www.grundfos.co.uk



Kingspan Klargester pump station range

Kingspan Klargester, a specialist in the design and manufacture of complete off-mains solutions, has invested in its long-established pump product portfolio. At the same time, it has refreshed the name of the full range to the easy-to-remember 'Pumpstor'. The Klargester pump range includes: the new improved Pumpstor Compact Pump Systems for outbuildings and extensions, cellars, pool houses and external WCs; Pumpstor Domestic and Domestic + systems, offering economical solutions for homes and properties with up to 13 people; and Pumpstor Commercial High Capacity Pump Systems for businesses such as pubs, shops or hotels.

● Call 01296 633033, email info@klargester.com, or visit www.klargester.com/products/pump-stations.htm



CP launches technical guide

The most comprehensive technical guide to date has been launched by CP Electronics, focusing on the company's extensive and diverse range of products. Offering easy solutions for reducing energy consumption, the new catalogue includes integration diagrams and tips for obtaining considerable financial savings. The CP product portfolio includes stand-alone presence detectors, lighting connection systems, lighting control systems, emergency lighting, light level controls, heating, ventilation and air conditioning controls and programmable handsets. Each section provides detailed explanations on topics, including absence and presence detection.

● Email enquiry@cpelectronics.co.uk, call 0333 9000671 or visit www.cpelectronics.co.uk

Baxi commercial division supplies heating plant to Oakham School

Baxi Commercial Division has supplied energy-efficient equipment, including a combined heat and power unit, for a complete refurbishment of the heating system serving Oakham School's swimming pool and sports hall. This equipment comprises Potterton Commercial condensing boilers, and an Andrews MAXXflo condensing water heater, supplementing a Baxi-SenerTec UK Dachs mini-CHP unit which, together, have reduced the school's carbon footprint and made a significant contribution to energy savings.

● Call 0845 070 1055, email jeff.house@baxicommercialdivision.com or visit www.baxicommercial.co.uk



Fastlane supplies Hertfordshire school

Eight bespoke air-handling units (AHU) have been designed, manufactured and supplied to Holywell Primary School in Hertfordshire by Fastlane Ventilation Equipment. West Midlands-based Fastlane, the supplier of air handling equipment, heating and heat recovery systems, built the bespoke high efficiency, low noise units, used to condition and circulate air as part of the school's heating, ventilating, and air conditioning (HVAC) system, to suit the layout of the school and its particular access requirements. The main contractor handling installation of the eight units was Burgin, of Colchester in Essex.

● Call 01384 720460, email sales@fastlaneventilation.co.uk or visit www.fastlaneventilation.com

Honeywell wins three-year contract to maintain luxury hotel

Honeywell Building Solutions has secured a three-year contract to service and maintain business critical systems including fire, closed-circuit television (CCTV), intruder and disabled refuge alarms at the Raithwaite Hall Country Retreat, near Whitby. 'Maintaining our critical systems to a high standard and ensuring compliance with all regulatory requirements is vital to the comfort and safety of our guests and staff,' said Martin Jenkinson, Raithwaite Hall engineering manager. Honeywell's building controls expertise, combined with its network of engineers and its commitment to continuous improvement, delivers the high levels of service and reassurance we require, leaving the Raithwaite Hall management team free to focus on delivering a high quality experience for our visitors.

● Visit www.honeywellnow.com



Remeha boilers score high with Bath Rugby

At Bath Rugby's elite training centre, Farleigh House, the heating has undergone a 21st-century transformation, thanks to Remeha boilers. Two Quinta Pro 65 condensing boilers, heating two 500-litre Remtank cylinders, provide hot water for post-training showers in the state-of-the-art gym. In the Long Barn medical and rehab centre, two Quinta Pro 90 boilers feed underfloor heating and radiators, as well as providing primary heating to a 2,500 litre solar cylinder for the additional showering facilities. 'We set a very demanding brief,' said project architect Simon Pugh-Jones, 'and yet these boilers exceeded our expectations – so much so, that we show visitors round the plant rooms too!'

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



Pegler launches new valve

As a continuation of product development by renowned plumbing systems manufacturer Pegler Yorkshire, the company has announced the launch of a new valve. The Tectite TMV series combines the latest in metal push-fit technology with the ultimate protection against hot water scalding and thermal shock. The Tectite TMV utilises the latest innovations in metal push-fit technology and will provide connectivity to copper, stainless steel and PE-X and PB. It also benefits from additional push-fit advantages, such as installed cost savings, as joints are made in a fraction of the time.

● Email brochures@peglyorkshire.co.uk, visit www.peglyorkshire.co.uk or call 0844 243 4400



Polypipe launches Silavent MVHR unit

As part of its ongoing commitment to developing innovative energy-saving ventilation solutions, Polypipe has launched the brand new Silavent Green Line HRX2, a highly efficient Mechanical Ventilation Heat Recovery (MVHR) appliance with the highest available heat exchange performance on the SAP Appendix Q register. Featuring a heat exchange efficiency of up to 95% and a full summer bypass option, the HRX2 offers the homeowner a year-round ventilation solution. Designed for use in a wide range of properties, the HRX2 is suitable for installation in a cupboard, utility room or loft.

● Visit www.polypipe.com/ventilation or call 08443 715523



Lg Multi V Space: the outdoor unit that can go indoors

New from LG is the Multi V Space II, which is a discreet outdoor unit, with 57 patents and offers 16 kW cooling and 18 kW heating via ceiling and floor units. This product is perfect for creating a comfortable environment in luxury living spaces, such as urban loft developments and apartments. Key features of Multi V Space II include front suction and discharge, reduced fan noise and a four-step modular design that offers either right- or left-hand discharge.

● Visit uk.lgeaircon.com



Loughborough University's MSCs ideal for low-carbon economy

A surge in low carbon work predicted in the March edition of the *CIBSE journal* notes that 'those who have the right skills and qualifications will be in a strong position'. Loughborough's MSc courses in this area were designed with this in mind, aiming to meet the national and international demand for graduates with skills in these areas. Devised in collaboration with industry and accredited by CIBSE and the Energy Institute, these courses offer exceptional employment prospects, delivered by a team ranked first for building engineering. We also offer a range of research degrees and training, including our MRes in Energy Demand Reduction.

● Visit www.lboro.ac.uk/civil

New acute services hospital in Glasgow sees Ensign systems specified

Ensign drainage systems from well-known iron technology specialist Saint-Gobain PAM UK, part of leading materials company Saint-Gobain, have been specified for the sanitary soil and internal rainwater system in the new South Glasgow Hospital, set to be one of the most advanced adult acute services hospitals in the UK. Designed and constructed by Brookfield Multiplex, the hospital will be the biggest critical care complex in Scotland. It will comprise a new acute care hospital with 1,109 beds in single-room accommodation.

● Visit www.saint-gobain-pam.co.uk/soil-press



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Solar success in the capital, thanks to MHS Boilers

MHS Boilers has recently supplied more than 60 m² of AURON DF evacuated tube solar collectors and 14 twin coil AQUAPRIMO cylinders to the new JW3 Jewish Community Centre London and adjoining residential accommodation. The main centre building houses a nursery, screening room, restaurant, bar and community spaces, with the 10-storey residential block comprising 14 two-bedroom luxury apartments. The installation of the new solar collectors is set to reduce both buildings' utility costs significantly.

● Visit www.mhsboilers.com



BSS Industrial increases HTA stock to stop metal thefts

BSS Industrial, a leading distributor of heating and pipeline solutions, is increasing its stock of Durapipe UK's HTA pipework system as it looks to cater for a demand in plastic pipework solutions. The distributor has seen a surge in enquiries for plastic pipework systems for hot and cold water applications, as specifiers, contractors and consultants look for alternatives to copper to avoid the threat of metal thefts. In addition to increasing stock levels, BSS Industrial is also significantly improving the breadth of the HTA range, ensuring that customers can receive any HTA orders on a next-day delivery basis.

● Call 01543 279909/0116 262 3232 or visit www.durapipe.co.uk For BSS, visit www.bssindustrial.co.uk



Ariston's NUOS calls last orders on high energy bills

The Glencairn pub and restaurant in Dumbarton, Scotland, has had an Ariston NUOS FS 200 heat pump water heater installed to cater for its hot water demands, following a consultation between its owners and local plumbing and heating company

Alternagas. The decision to fit the NUOS arose after Alternagas director, John Lavery, set up an energy monitor on the venue's old immersion heater in November 2012, following concerns from the pub's owners about water-heating costs.

● Visit www.ariston.co.uk, call 0333 240 6666 or visit info.uk@aristonthermo.com

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Dorset HealthCare

University NHS Foundation Trust



Dorset HealthCare University NHS Foundation Trust is a successful provider of integrated community health and mental health, specialist learning disability services, community brain injury, community dental services - including community hospitals and prison healthcare.

The Trust has a turnover in excess of £220m, more than doubling in size in 2011, having a disperse and extensive property portfolio across the county of Dorset along with providing care at some sites further afield.

Associate Director: Estates

£89,513 p.a. inc. of car allowance

Job ref: 152-5799.13

The Trust is seeking an experienced, innovative Estates professional to lead and develop its estates and facilities management functions. Whilst initially managing the Trust's estates, fire safety and transport management staff, the role will also integrate and subsequently manage the Trust's Facilities Management services.

The post will report to the Finance Director and conclude the integration of two estates teams to provide a customer focused maintenance function and develop and deliver an estates strategy to both best support our clinical delivery of services and maximize the inherent potential of our property holdings.

Whilst the post will be based in the Bournemouth and Poole area, the post will involve car travel across Dorset.

Closing date – 28 June 2013

Please apply online at www.jobs.nhs.uk



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LANCASTER UNIVERSITY



Facilities

Energy Manager

£38,522 - £44,607 Reference: A610R

A new and challenging post has arisen within the Facilities Infrastructure team for an ambitious and professional Energy Manager with proven experience. You will develop and implement a comprehensive programme of carbon, energy and water usage reduction strategies ensuring University Carbon Management Plan targets are met and delivered. Lancaster University is committed to its Carbon Management Plan and has installed a 2.3MW Wind Turbine, 2MW CHP and 1MW Bio-Mass Boiler.

You will work with Senior and Operational Managers, Staff, Project Managers and Faculties and will examine, challenge and reconfigure plant operations using existing and emerging technologies and best practice to minimise energy and water consumption. You will also provide specialist advice for support and design teams and develop staff and student awareness regarding carbon management, working with key stakeholders and highlight successes in this area.

Applicants will be professionally qualified with a relevant degree or equivalent in building engineering services or a related engineering based subject and have significant hands on experience in a similar or related role with substantial experience in the management of utilities. Applicants will have excellent presentation and interpersonal skills and a proven analytical and problem solving ability.

Informal enquiries may be made to Mike Sheppard, Deputy Director of Facilities on 01524 593032.

Closing date: Sunday, 30 June.

Interview date: To be confirmed.

To apply, access further information or register for email job alerts please visit our website.

www.lancaster.ac.uk/jobs



Snr Building Physics Engineer | London | to £45K+ | ref: 3486

Our client is a leading International multi-disciplined engineering consultancy. Candidates will be expected to lead the production of Building Physics analysis and provide advice to clients and design teams on suitable sustainable options. A working knowledge of BREEAM and BIM would be beneficial.

Int Mechanical Design Engineer | London | to £35K+ | ref: 3628

A busy, growing M&E consultant is looking for a degree qualified mechanical engineer. You will have sufficient post graduate experience allowing you to work unsupervised and deal with clients. Current projects include hotels and high end residential.

Junior M&E Design Engineers | Bristol | to £25K | ref: 3619

A blue-chip consultant requires engineers with 1-2 years post graduate experience. Candidates will ideally have a working knowledge of IES and / or Amtech. Projects include commercial and education.

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

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

Senior Mechanical Design Engineer | Kent | to £45K+ | ref: 3616

Our client requires a Mechanical Engineer ideally with 8-10 years' consultancy experience. Candidates should be fully conversant with IES modeling, be able to produce full design from concept through to completion and have experience on site, overseeing works and commissioning. LCC and LCEA accreditations would be beneficial.

Mechanical Design Engineer | Hertfordshire | to £40K | ref: 3627

Ideal candidates will be degree qualified and have circa 10 years industry experience. You will have the opportunity to take on your own clients and lead your own projects from the initial concept through to commissioning. Current projects include schools, as well as major new build commercial offices.

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Principal Electrical Design Engineer

London, £50k - £55k + car + benefits

A fantastic opportunity has arisen within an award winning, multi-disciplinary, international consultancy with a staff count of 400. They require a degree qualified Principal level Electrical Design Engineer to join the team in London. With years of experience specialising in residential, commercial, education, and healthcare projects based both in the UK & Internationally, they offer excellent exposure to the most rewarding projects currently being undertaken in the UK and Overseas. BAR1201/JA

Intermediate - Senior Mechanical Design Engineer
North London, to £30ph

Immediate need for 3 mechanical engineers with a busy expanding consultancy in North London. Their team conduct a range of project types, including residential, commercial, and mixed use developments with M&E project values up to £20 million. The company have developed an enviable name and out strip some major competitors within the industry with continual and substantial project wins, this has enabled them to increase the staff headcount by over 70% whilst retaining the majority of their existing talent. BAR 1216/JA

Intermediate Electrical Design Engineer

London (Central), £30k - 35k + benefits

Leading Building Services & Environmental consultancy with overseas reach are looking to recruit a talented, career minded, mid-level design engineer to assist on a variety of UK projects and overseas design work. Ideally you will have a background working with consultancies, and previous involvement in a varied project including the commercial, residential & retail sectors. Successful candidates should possess a relevant degree and be working towards becoming chartered. BAR1213/TA

Associate Director

West Sussex, £65K + car + benefits

A specialist building services contractor established for over 50 years are seeking an Associate Director for a central role within the heating installation and contract management teams. You will be a key leader responsible for business development, delivery of contract heating installations, servicing and maintenance, management of project schedules, budgets and financial performance. Social Housing contract experience including ITT, PQQ, and bid writing is essential. This is an excellent opportunity to take a pivotal role in a reputable and growing contractor developing to a board director in 12 - 18months. BAR2127/CB

Senior Public Health Design Engineer

Dubai, UAE, 30k - 35k AED (PCM) + accommodation + car

We are currently recruiting for an internationally renowned consultancy, who have a presence in over 30 countries across the globe and who have forged a fantastic reputation for themselves in the Middle East. Their team in Dubai continue to win a variety of large scale projects and require an experienced Public Health Design Engineer to join their established expat team. Applicants will be from a building services design consultancy background, having had extensive experience in PH design on a range of project types/sizes. BAR1015/PA

Building Services Manager (Mechanical bias)

Romsey, Hampshire, £50 - £65k (DOE) + benefits

Our client is an international security engineering firm established in 1975, employing 50 staff. They are world leaders in their field and have successfully delivered military and civilian projects in 40 countries worldwide. The successful person will lead, and most importantly, develop a department of mechanical and electrical engineers deployed on technically challenging and unusual projects and ideally you will possess similar project experience from within the nuclear, defence, pharmaceutical, process, or laboratory containment sectors. You should be ambitious, self-motivated and have the ability to demonstrate marketing and management experience. BAR910/PA

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Skelly & Couch LLP is a young, exciting and innovative firm of building and environment services engineering consultants based in Central London. Our primary market focus is to provide fully coordinated sustainable designs for bespoke and complex projects across a variety of sectors.

To find out more about us, our diverse projects and our ethos, please visit our website www.skellyandcouch.com

In order to support our continuing growth and success we are currently looking for engineers who are keen to lead the design and delivery of projects and develop a holistic approach to engineering.

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If you wish to work within a challenging and rewarding environment, please email a CV and covering letter to scruitment@skellyandcouch.com

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Conrad Consulting
Technical Recruitment Specialists

For a confidential chat, Call us **8am to 8pm**

MEP Design Director | East London/Essex
£70,000 Plus Benefits and Bonus

A major Contractor is currently seeking a MEP Design Director to assist in continuing to develop their operation. Ideal candidates will be at Principal/Associate level, or Director of a building service engineering consultancy / contractor, and be able to lead multiple MEP project teams. The MEP Design Director will report directly to one of the Equity Partners, and will have the opportunity of becoming an Equity Partner after 12 months. Candidates will take on the management and development of a number of key client relationships, whilst being responsible for the entire design department, working within the residential and leisure markets.

Associate Sustainability Engineer | Central London
£60,000 Plus Benefits and Bonus

A leading building services consultancy in London are currently on the lookout for an Associate level Sustainability Engineer to lead their expanding Sustainability team. Candidates should have at least 8-10 years' experience within a building services consultancy, or contractor, and have experience leading projects and teams of engineers. Previous experience within a client facing role is essential, as is a real passion for sustainable building design. This is a fantastic opportunity to join an expanding consultancy, with the possibility of being promoted to a very senior level within the company.

Senior Electrical Design Engineer | Central London
£45,000 - £50,000 Plus Benefits Package

We are currently recruiting for one of the major players in the international building services consultancy market, who are on the hunt for a senior level Electrical Design Engineer. You will be working and developing within a small team of specialised engineers who work within the Education, Health and Residential sectors. The role requires candidates who will be responsible for managing all aspects of projects, attend meetings and also, after time and training from the current, experienced team, be involved with business development. This is a great opportunity to grow as an engineer, with the possibility of Associate level in the not-too-distant future.

Contact: george@conradconsulting.co.uk | 0203 159 5387
Find more jobs online at www.conradconsulting.co.uk

Events & training

NATIONAL EVENTS AND CONFERENCES

ThinkFM 2013

10 June, London
Facilities management event. This year's focus is The Leadership Challenge.
www.thinkfm.com

The Great DEC Debate!

24 June, London
A debate about the greater use of Display Energy Certificates.
www.cibseepgdebate.eventbrite.com

CIBSE GROUPS AND SOCIETIES

For more information visit www.cibse.org/events

Site visit to the BBC studios at Roath Dock

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

SoPHE AGM

4 June, London
SoPHE's annual general meeting, plus The Shard – designing and installing public health systems in western Europe's tallest building.
www.cibse.org/sophe

Designing for better indoor environmental quality buildings

11 June, London
The Building Simulation Group explores current and future approaches to improving indoor environmental quality.
s.sawaf@pgr.reading.ac.uk

There's more to drainage than meets the eye

13 June, London
Reviewing successful drainage design and the need to raise the standards to ensure 'best in class' solutions.
www.cibse.org/events

Golf outing

13 June, Belfast
The Northern Ireland region invites you to the Shandon Park Golf Club.
d.willis@blgroup.co.uk

Acoustics

18 June, Brentwood
An evening event organised by the Home Counties North East region.
www.cibse.org/events

Rising to the challenge of project management

20 June, Bristol
An evening event organised by the South West region.
millham.orchard@fiscali.co.uk

Technical tour of Sambrooks Brewery, Battersea

20 June, London
An exclusive tour with the head brewer, a qualified chemical engineer, who will be answering your technical questions. Organised by the Home Counties North West region.
www.cibse.org/events

CIBSE ANZ Region AGM

21 June, New South Wales, Australia
The annual general meeting of the Australia and New Zealand region.
secretary@cibse.org.au

Society of Façade Engineering City Walk and Lecture

26 June, London
A lecture and city walk focused on the new Rothschild Bank.
www.cibse.org/sfe

BIM and Soft Landings

2 July, London
An evening event from the Home Counties North East region.
andrew.saville@armville.com

CPD TRAINING

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

ISBEM Training

3 June, London

LEED 201 core concepts and strategies and GA exam preparation

3 June, London

LEED O&M

4 June, London

Electrical services explained (three days)

4 June, Birmingham

Introduction to biomass heating systems

5 June, London

Fans for a greener future

5 June, London

Biomass systems operation and maintenance

6 June, London

Building drainage explained

6 June, Newcastle

Variable flow water system design

7 June, London

Introduction to energy efficiency

11 June, London

Green Deal training

11 June, Birmingham

Fire sprinkler systems: designed to BS EN 12845

12 June, London

HSE guidance on legionella control

12 June, Manchester

Energy surveys

13 June, Newcastle

Lighting legislation (including daylight)

13 June, London

Energy strategy reports

13 June, Manchester

Understanding and application of psychrometric charts

18 June, London

Green Deal training

18 June, Leeds

Air Con 3: air-conditioning plant

18 June, London

Applying for the RHI – what you need to know

18 June, London

Best practice in energy management: ISO50001

19 June, London

Metering requirements – RHI

19 June, London

Overview of current fire legislation and guidance

19 June, London

Inspection and testing of electrical installations and portable equipment

20 June, London

Energy-efficient façade design

21 June, London

Electricity at work regulations explained

25 June, London

Mechanical services explained (three days)

25 June, London

EPC training

25 June, London

Low and zero-carbon energy technologies: undertaking feasibility studies and understanding design considerations

26 June, Birmingham

Smart metering

26 June, London

Fire safety in purpose-built blocks of flats

27 June, London

Building drainage explained

2 July, London

Earthing and bonding systems

2 July, London

Introduction to facilities management

3 July, London

Fire-resisting and smoke-control doorsets

3 July, London

Practical controls for HVAC systems

4 July, London

Building regulations section 6 (energy)

4 July, Inverness



The conference will be held at the iconic Crystal Building in London

Crystal Clear BIM Conference

17-18 June, London

Taking the 'wash' out of building information modelling (BIM), the Crystal Clear BIM conference aims to bring focus and clarity to the topic in a practical way.

In Amtech's first two-day BIM conference, the group aims to present a 'real world view' on BIM with an emphasis on reality.

The BIM phenomenon is set to change the construction industry forever and this conference seeks to show how BIM should work in the real world, particularly for services within buildings.

From 2016, BIM will be mandatory on all public sector contracts in the UK, and will

apply to the complete lifecycle of a building. The conference hopes to take the confusion out of BIM and what it means for the industry and businesses. It will include presentations from important keynote speakers, real case studies and 'BIM in action in the auditorium' to illustrate the true reality and benefits of the software – for everyone.

The Crystal Clear BIM Conference takes place on 17-18 June at The Crystal Building, London. CIBSE members can claim a £50 discount by using code CIBSE1718 when registering. To book your place, visit www.amtech.co.uk/conference

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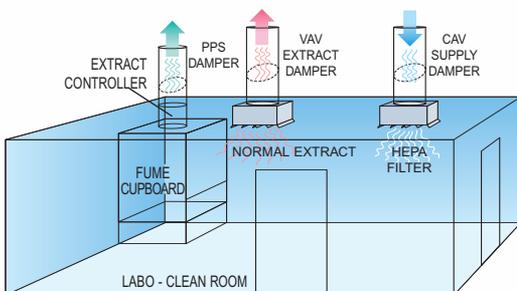


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