

CIBSE

JOURNAL



The official magazine of the Chartered Institution of Building Services Engineers

February 2014

Russia's WINTER PALACES

Sochi Olympic projects kickstart green building revolution

JOINED-UP THINKING

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HEADS UP

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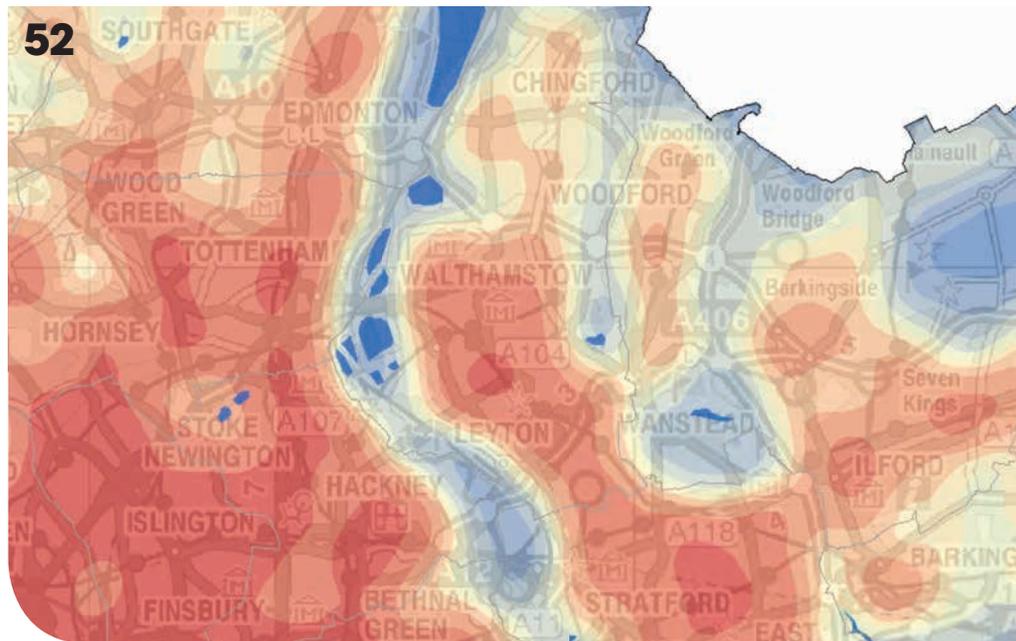
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On the start line

Some may scoff at the notion of a sustainable Olympics in Russia. The state produces 1,829m tonnes of CO₂ – the world’s fourth highest total – and, until recently, its idea of effective energy use was holding neighbouring countries to ransom by withholding gas from their energy networks.

But having won the bid to host the 2014 Winter Olympics Russia now has to take sustainable building seriously. Our feature on the Olympic projects in Sochi (page 32) shows that some advances have been made. Guy Eames, as the head of the Russian Green Building Council, is helping to advise the Russian organisers on energy certification and construction best practice. As a result BREEAM is being used on 10 Olympic projects.

Now, according to Eames, construction best practice is being adopted on projects further afield in Russia, and a Green Building Council has even been established in Kazakhstan.

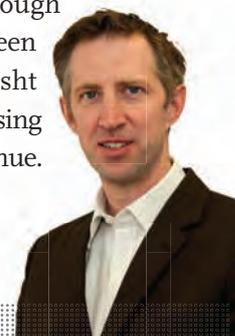
We talk about picking the low hanging fruit in the UK by carrying out easy wins such as loft insulation and proper plant commissioning, but it’s nothing compared to the amount of over-ripe windfall lying on the Russian continent. Countless tonnes of carbon could be saved by carrying out the most straightforward of energy saving measures.

The West shouldn’t be too judgemental. If it had oil and gas as plentiful as Russia, there would be less incentive for economies to reduce carbon. There is no pressure from consumers suffering high energy bills either. The grandparents of the *Journal’s* senior reporter, Liza Young, live in a four-bed apartment in Tula, 120 miles south of Moscow, and only pay around £13 on their monthly energy bills. (They still complain about the bills, mind – all things are relative).

Images on the BBC’s *Russia on four wheels*, of fly-tipping on an industrial scale in Sochi, indicate what a long way there is still to go. To embrace a Winter Olympic analogy, the Russians have not yet completed a lap of the speed skating track – they’ve barely got to the start – but at least they’ve shown some commitment and, with training and encouragement, could significantly drive down emissions.

With the football World Cup only four years away, there will be more opportunity to drive best practice through international standards. There has already been one example of resource efficiency – the Fisht Olympic Stadium, which hosts opening and closing ceremonies, is being reused as a World Cup venue.

Alex Smith, editor
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RUSSIANS ADOPT BREEAM CERTIFICATION AT SOCHI OLYMPICS

Buro Happold and Aecom are carrying out BREEAM assessments at two major Winter Olympic Games venues in Sochi. The organisers asked Buro Happold to assess the Bolshoi Ice Palace (above), while Aecom's Russian office is assessing the Adler Arena skating centre. Ten major projects are being assessed under BREEAM, and four have already been awarded

a Very Good rating, including the Sochi Olympic Park railway station and the Russian International Olympic University, which was assessed by PRP Architects. The Olympics has helped kickstart a sustainable building revolution in Russia, despite the low cost of energy – a four-bed apartment can cost as little as £13 on month energy bills. Read more on page 32.

Europe imposes tough new rules on HFC refrigerants

● Regulations set to come into effect in 2015, with a wider ban on GWP gases in 2020

Environmentalists have greeted new refrigerant gas regulations announced by the European Commission (EC) as 'the beginning of the end for HFCs in Europe'.

Following months of negotiations over the revisions to the F-Gas Regulation, new rules capping the use of HFC refrigerants in heating and cooling equipment will come into effect in 2015, in an attempt to cut the industry's use of global warming gases by 79% by 2030.

The EC has also agreed to a traceability system to better track equipment containing F-gases that is imported into the EU, as well as a service and maintenance ban to ensure that current equipment moves towards environmentally friendly alternatives.

An agreement was also reached to extend the bans on HFC equipment by introducing a Global Warming Potential (GWP) limit for large refrigeration systems and small split air conditioners.

'The phase-down will steer innovation and help industry to move towards alternative solutions in a safe and efficient way,' said Andrea Voigt, director general of the European Partnership for Energy and the Environment (EPEE), which represents manufacturers

of air conditioning, refrigeration and heating equipment.

He added that EPEE was pleased the decision would 'provide regulatory certainty to ensure long-term business planning – all of which will ultimately benefit the EU economy'. EPEE said it did not believe the new bans were needed to reach climate goals, but accepted they had helped 'reach a common political agreement'.

A ban on using refrigerants over 2,500 GWP in service and maintenance will be imposed from 2020,

and will apply to all equipment with a charge over 40t CO₂ equivalent. Member states will also have to have 'producer responsibility schemes' for encouraging recovery of F-Gases.

'These new rules are a vital addition to the EU's arsenal of measures to tackle climate change,' said Green MEP Bas Eickhout. 'After falling back in other areas of climate policy, this new

legislation will enable the EU to justifiably claim to be leading on this crucial issue.'

Environmental groups were more cautious. Clare Perry, from the Environmental Investigation Agency, said they would have preferred 'more bans with fewer loopholes as these are the most effective method of preventing greenhouse gas emissions'.

However, she added that it was 'the beginning of the end for HFCs in Europe – at least now the industries involved will be able to see which way the wind is blowing and invest in cleaner, greener alternatives'.

'The phase-down will steer innovation and help industry move towards alternatives'

Industry figures honoured

The New Year's Honours list included an OBE for John Daggart, the founder of SEA and co-founder of ECD, for services to Sustainable Energy Technologies and Energy Efficiency.

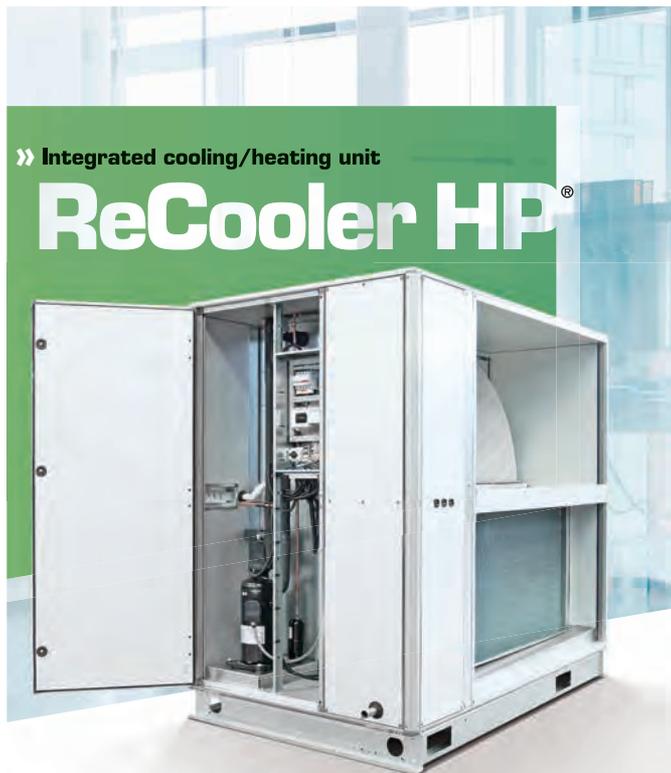
Graham Jukes, chief executive, Chartered Institute of Environmental Health was also made an OBE for services to environmental health in the UK and abroad.

Dr Deborah Pullen, director of the Modern Built Environment Knowledge Transfer Network and group research director at the BRE was made an MBE for services to innovation and knowledge transfer.

Mrs Eve Farraud, a member of the management team at the Construction Industry Council, was awarded the BEM for services to the construction industry.



Dr Deborah Pullen MBE



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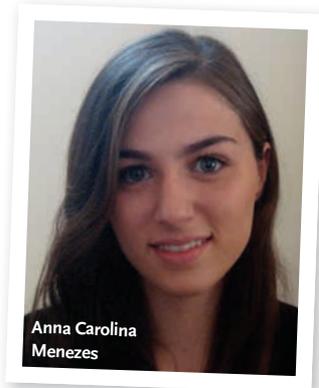


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Movers and makers



Adam Handyside



Anna Carolina Menezes

● This month's industry moves

Mott MacDonald has appointed David Colyer as a mechanical and electrical associate in its programme and commercial management (PCM) team. He joins from Capita, where he spent 11 years in charge of the company's mechanical, electrical and quantity surveying team in London.

Colyer has nearly 20 years' experience in both contracting and professional practices, providing pre- and post-contract services, including value engineering, feasibility studies, cost planning, lifecycle costing and enhanced capital allowances.

'Colyer will enhance service delivery and add expertise in the area of property'

The company said his knowledge of mechanical and electrical services would 'enhance our service delivery and add expertise to our commercial management business, especially in the areas of property and transportation'.

Anna Carolina Menezes has joined Tesco as group energy manager based in Welwyn Garden City. She joins from Aecom where she was a sustainability consultant working on LEED and BREEAM projects, as well as post-occupancy evaluations and energy audits.

She was previously a research engineer at Aecom and undertook an Engineering Doctorate (EngD) at



Trevor Taylor

Loughborough University, focusing on post-occupancy evaluation. She is the current chair of the CIBSE Young Energy Performance Group.

Commercial boiler and water heater manufacturer Lochinvar has expanded its sales team with the appointment of new area sales managers in the South East and North West.

Surrey-based Adam Handyside joins from Vent-Axia where he was area specification engineer; and Trevor Taylor has spent the past 12 years working as a technical sales consultant for Heating and Cooling Solutions.

Both have extensive experience of working with consulting engineers and contractors.

Taylor, who is based in Manchester, first joined the industry in 1976 and has also worked for pump manufacturers Grundfos and Crane. Handyside began his working life as a site-based operative and has broad experience of the building services market, having also worked for Space Air Conditioning and the air handling manufacturer Envirotec.

Cameron fires up shale gas

● Government backs fracking as shale-gas water use proves lower than expected

The UK is 'going all out for shale', according to the Prime Minister, who branded opponents of shale gas 'irrational'.

Local authorities could earn up to £1.7m a year and as much as £10m over the lifetime of a shale gas site, following the government's decision to allow them to keep the business taxes paid by fracking companies that drill in their areas.

David Cameron has also suggested that funds are paid directly to householders living close to extraction sites.

'A key part of our long-term economic plan to secure Britain's future is to back businesses with better infrastructure. That's why we're going all out for shale. It will mean more jobs and opportunities for people, and economic security for our country,' he said.

French energy giant Total has also announced a major investment in two exploratory fracking sites in Lincolnshire and new fracking sites have opened up in the Midlands, Cumbria and Wales.

However, the environmental group Friends of the Earth said the decision to hand over tax revenues to local authorities was a 'bribe' and marked 'a new low in the government's attempts to curry fracking favour with local people'.

Other groups have expressed concern about the



WPA POOL / GETTY IMAGES

impact on water supplies, but a study by the Chartered Institution of Water and Environmental Management (CIWEM) showed that, compared with other fossil fuels, the overall water use intensity of shale gas is low. It said claims that the industry represents a threat to the security of public water supplies were 'alarmist'.

The study found that, at the exploratory phase, water demand is not likely to be significant compared with other users. Estimates show that to meet 10% of the UK gas demand from shale gas over 20 years would require between 1.2 and 1.6m m³ water per year.

'Although this may sound a large amount, when compared with the volume of water that is licensed to be taken from the environment each year in England and Wales, it equates to less than one tenth of 1% of total abstraction,' said CIWEM.

New focus for SummitSkills

SummitSkills, the Sector Skills Council for building services engineering, is refocusing its work on National Occupational Standards, apprenticeships and qualifications.

The organisation has secured funding from its five stakeholder trade associations – the Building & Engineering Services Association, Association of Plumbing & Heating Contractors, Electrical Contractors' Association, SELECT (the Electrical Contractors Association of Scotland) and the Scottish & Northern Ireland Plumbing Employers' Federation.

General manager Nigel Hollett said because of 'recent positive policy announcements on construction and low carbon incentives', it was even more important 'to make sure that the qualifications, apprenticeships and standards for the sector reflect what businesses on the ground need them to be'.

SMEs back sustainability

One in four small businesses plans to make sustainable business practices a priority in 2014, according to a survey by Lloyds Commercial Banking.

The survey showed that a third of small businesses expect to increase investment in sustainable business practices over the next five years. It draws on responses from more than 1,000 small- to medium-sized enterprises (SMEs).

The report found that more than half (54%) believe business sustainability helps reduce costs and almost a third (30%) believe it increases profitability.

Although 87% said they were already implementing sustainable practices, most still focus on narrow activities such as energy saving and recycling.

Stephen Pegge, external relations director at Lloyds Banking Group, said the next stage was to focus on broader practices, such as sourcing.

'Sustainability also means interacting with charities, social enterprises and the community in which they operate; working responsibly within their supply chains; and engaging with the next generation,' he said.

LED retrofits made easier

New LED lighting could cut energy costs by 50% if used to replace the estimated 12 bn fluorescent lighting tubes in offices, shops and factories worldwide, according to the manufacturer Philips.

The company's InstantFit LED tube has been designed to be compatible with standard fluorescent lighting fixtures, making it easier for building owners to carry out complete retrofits. Philips said that a supermarket could now switch to LED lighting in less than four days, compared with the current norm of four weeks.

'We studied the process for replacing fluorescent tubes with LED technology step by step to



Replacing fluorescent lighting with new LED tube lamps could save up to €42 bn

TRINBOX / SHUTTERSTOCK

tackle those issues that dissuade facility managers and installers from making the switch,' said Rene van Schooten, chief executive of Philips Lighting. 'We found speed

and simplicity were key.'

He said that while existing LED tube lights typically require light fittings to be re-wired, the new LEDs can be installed 'in a matter of seconds'.

Only 1,612 take up Green Deal

The number of Green Deal packages has reached just 1,600, sparking fresh calls for a government rethink.

Recent figures show that 1,612 households had Green Deal plans in progress at the end of December 2013 and only 626 were 'live', with all measures installed. In 2012, ministers had hinted that they wanted 10,000 Green Deal projects completed in the scheme's first year.

Although the number of Green Deal assessments has continued to rise - increasing from 117,454 to 129,388 in December - the increase was 21% lower than in November.

Paul King, chief executive of the UK Green Building Council, said the latest figures should come as a 'wake-up call' that the Green Deal is not delivering in its current form.

He said the government must be prepared to make its flagship policy more appealing through stronger incentives and more attractive finance options.

Female president set to head Royal Academy for first time

● Dowling to be formally elected in September

The Royal Academy of Engineering (RAE) has nominated Professor Dame Ann Dowling, head of the department of engineering at the University of Cambridge, as its presidential candidate.

Dowling will now go through the formal election process by Academy Fellows and, as the only nominated candidate, is expected to take up the post in September.

She will be the Academy's first female president, serving for five years.

A world authority on combustion and acoustics, Dowling became a Cambridge research fellow in 1977 and has remained at the university ever since. In 1993, she became the department of engineering's first



female professor and, in 2002, was made a CBE for services to mechanical engineering. This was followed in 2007 by a DBE for services to science.

Dowling said the nomination came 'at a crucial time, when it is generally acknowledged that many more engineers will be required to

help the country benefit from the knowledge economy of the future'.

'The world faces some enormous challenges, including clean energy, resilient infrastructure, water and food supply, and engineers have a crucial role in addressing these issues,' she added.

Dowling is a non-executive director of BP, a panel chair for the Research Excellence Framework, and was named one of the 100 most influential women in the country in BBC Radio 4's *Woman's Hour* Power List 2013.

● Sarah Davis, chair of WiBSE, will make a presentation to parliament to mark International Women's Day in March. Meg Munn MP will launch a series of essays by major industry players entitled *Women in Construction - time to think*.



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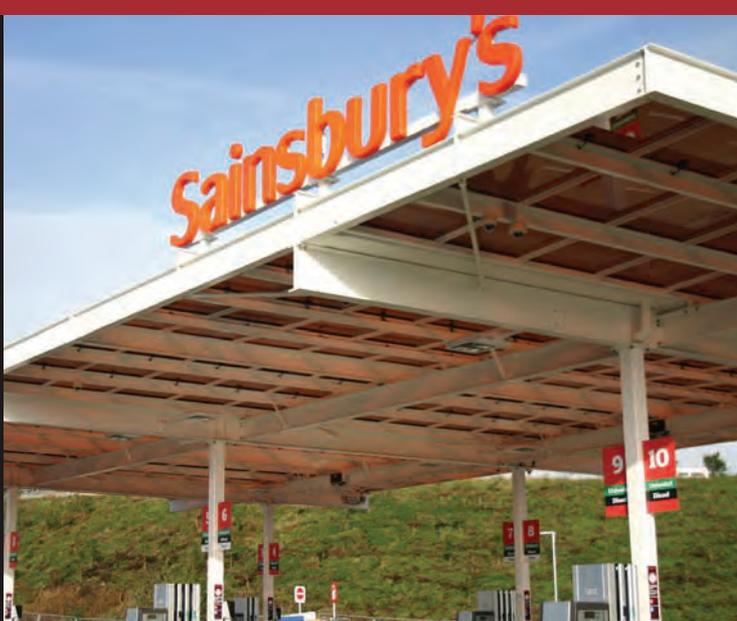
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PETROL STATION POWERED BY SOLAR CANOPY

A Sainsbury's petrol station in Leicester is powered by what the supermarket claims is the world's first transparent photovoltaic solar canopy. The solar-panel roof generates more than a quarter of the service station's energy requirements, while reducing its need for artificial lighting.

The translucent solar-glass technology, developed by Cambridge-based Polysolar, can absorb light from both sides and works with low levels of ambient light, making it possible to use on flat or vertical surfaces.



ACR Show tackles F-Gas regulations

Industry experts will brief visitors on the changes to F-Gas Regulations and their practical consequences in a series of free seminars at the ACR Show 2014, which takes place in Hall 9 of the NEC Birmingham, from 11 to 13 February.

The revisions to the F-Gas Regulations, formally proposed by the European Union in late December 2013, will result in a phase-down of commonly used HFC refrigerants with a high global warming potential (GWP).

The affected refrigerants are used in air-conditioning and refrigeration systems in offices, retail stores, food and drink production, restaurants, leisure centres, hospitals, data centres and educational establishments across the country.

Jan Thorpe, exhibition director, said: 'The new regulations will affect some of the most important refrigerants in use today. They will have implications for all who manufacture, install, purchase or use cooling systems for use in buildings or businesses.'

'People can get up to speed with the changes – and what they mean – by attending our free, expert-led seminars at the ACR Show in February.'

Visit www.acrshow.co.uk

IoR president calls for less cooling

● Heat pumps key to major CO₂ reductions by 2035

The refrigeration industry is more essential than ever, but needs to further reduce its greenhouse gas emissions, according to the new president of the Institute of Refrigeration

In his inaugural speech, Graeme Maidment told an audience at London South Bank University (LSBU), that refrigeration, air-conditioning and heat-pump (RACHP) equipment produced double the emissions of air transport, and consumed 16% of UK electricity production.

While it is making progress on direct contributions to CO₂

emissions by tackling refrigerant gas leakage, it needs to do more to improve the energy efficiency of installations to reduce its indirect contribution, he said.

RACHP equipment accounts for 10% of the UK's greenhouse gas emissions, added Maidment, who was critical of government policy, which he said was too focused on renewables and not enough on demand reduction.

'We should be investing more in energy efficiency rather than expensive PV,' said Maidment, a professor of air conditioning and refrigeration at LSBU.

'We need to reduce the need for cooling, increase efficiency and use lower-carbon electricity. We must also improve coefficients

of performance by optimising the lift between condensing and evaporating temperatures, and improving the integration of heating and cooling systems.'

Using heat pumps to replace boilers could cut CO₂ emissions to one-fifth of the current level by 2035, Maidment told his audience, which included CIBSE ASHRAE Group members. Wider adoption of 'proactive maintenance' would also cut running costs and improve system reliability.

He said the industry did not get the recognition it deserved for its contribution to the country's economic and environmental wellbeing, adding: 'We are not metal bashers – we provide a vital service to society.'

EU sets tough 40% carbon target

A tough target to reduce Europe's greenhouse gas emissions by 40% by 2030 was unveiled by the European Commission (EC) last month.

The package includes a binding, EU-wide renewable-energy target of 27%, as well as measures to strengthen the EU's emissions-trading scheme.

The landmark deal was reached after long negotiations, as groups within the EC and member states



fought over whether to water down the proposals.

The decision was made ahead of a United Nations meeting in

Paris in 2015, which will set out a worldwide framework for reducing global warming.

All other major developed and developing economies are expected to set out their national emissions targets by 2015.

The UK's energy and climate change secretary, Ed Davey, said the target was too low, but he was overruled by other member states, including Germany, France and Italy, which backed it.

UK's lightbulb moment

Almost nine in 10 UK households are buying energy-saving lightbulbs, a Europe-wide survey has revealed.

The UK is one of the top five European countries for buying CFL (compact fluorescent lamp) lightbulbs in a bid to cut energy use and save money, according to the Energy Saving Trust survey.

It comes in fourth for adopting CFL lightbulbs, beating the average adoption rate of 78%, but is still behind Italy, Spain and Portugal. For LED lights, the UK ranks sixth, scoring only slightly higher than the average 32%.

MARK WILLIAM RICHARDSON / SHUTTERSTOCK

In brief

LONDON'S POWER BRIDGE

Network Rail has switched on the world's largest solar array on a bridge. A total of 4,400 photovoltaic panels provide around half of the energy for London Blackfriars station.

Solarcentury installed the panels over the past two years, while the station remained in operation.

First Capital Connect, the train operator that runs London Blackfriars, said the panels would cut the station's carbon emissions by about 511 tonnes a year. The 1.1MWp array will generate 900,000kWh annually.

GOOGLE BUYS THERMOSTAT MAKER

Technology giant Google has made its second-biggest acquisition after paying £1.93bn (\$3.2bn) for smart-thermostat manufacturer Nest Labs, of Palo Alto, California.

The thermostat is designed to predict when and how you like to heat your home. It will turn heating on and off intelligently, while attempting to save you energy by only firing up the boiler when you really need it.

NATIONAL BIM SURVEY OPEN

The 2014 NBS national Building Information Modelling (BIM) survey is open for members who wish to have their say on building modelling.

All respondents will be entered into a prize draw for a 32GB iPad with retina display. To access the survey, visit <http://surveys.ribaenterprises.com/wh/s.asp?k=138269119430>

Cambridge ditches plans for district heating network

Return on investment falls short, feasibility study finds

Cambridge has abandoned plans to install a district heating network in the city after a feasibility study found it would not make its backers enough money.

Initially the £25m scheme would have provided heat and power for university and council buildings, and eventually would have connected to housing and commercial premises.

The city council spent £25,000 on a feasibility study for the project, which was a partnership between the council and the University of Cambridge. Councillor Tim Ward, executive councillor for planning, said the district heating scheme could have been built, but the return on investment would have been insufficient and could even have lost the partners money.

Research by Aecom to identify potential demand for the CHP heat

No CHP for King's College, Cambridge



RADEK STURCOLENSKI / SHUTTERSTOCK

and energy found some reservations among estate managers.

One college bursar said: 'It is pretty unlikely that we would look to join in, having spent large sums, of late, on replacing most boilers and installing renewables.'

Roderick Watson, director of Best Western The Gonville Hotel, said it would also have limited use for heat, and added: 'We installed air-source heat pumps last year, but would be interested in hot-water heating for showers, washers and so on.'

The university highlighted the difficulty of signing a long-term contract without knowing future patterns of occupancy.

Paul Hasley, University of Cambridge energy manager, said: 'A 20-year contract would be difficult to agree on, due to changing uses of buildings. There must be a greater or equal reliability, and some kind of monetary savings.'

It was forecast that the project could have cut the heat-related carbon emissions of participants by around 57%.

Over 600 BMS systems open to attack

Hundreds of building management systems (BMS) are in danger of being hacked because they have not been secured properly.

The security of primary care trusts, schools and a large telecoms firm were found to be vulnerable to cyber criminals by BMS and IT engineer Abtec. In a letter to *CIBSE Journal* (page 18), it revealed it had identified unsecured IP-based networks on the Niagara

Framework, a universal software infrastructure on which companies can build web-enabled BMS applications.

The unsecured BMS are similar to the network in Google's Australian office, which was hacked last year. Hackers will have access to the controls of the building's HVAC and security devices. Abtec's head of marketing, Chris Topham, warned: 'It's serious. I can see buildings being hijacked and even held to ransom.'

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Were you in the class of 2013?

● Take advantage of graduate membership of CIBSE this year

Are you a graduate of 2013? Did you complete a bachelor's degree in an engineering, science or technology subject or an MEng? Then you may consider applying for CIBSE Graduate membership. Graduate members enjoy valuable benefits, including a huge range of knowledge resources, access not just to products and publications, but to contacts and networks of established professionals via the Institution's Regions, its Societies and Special Interest Groups.

If you are a graduate working in the industry and plan to seek corporate membership of CIBSE and professional registration with the Engineering Council, joining, or upgrading to Graduate



membership is the next logical step in your professional development.

Rafay Hasan is senior engineer at Grontmij, and is a CIBSE Graduate member. 'I firmly

believe Graduate membership is a great start for any newcomer in the industry,' he says.

'It provides opportunities to socialise and network with other building services professionals.'

To see how CIBSE membership has benefited Hasan in other ways, check out www.cibse.org/casestudies

The CIBSE website holds plenty of useful information to guide you through the membership options, including real-life examples of engineering practice reports, interview presentations, technical reports, and case studies from successful

applicants. Visit www.cibse.org/graduate

And, if you're visiting Ecobuild this year, pop along to stand N310/11 to meet our membership advisers.

Ken Dale Travel Bursary winners' reports

The Ken Dale Travel Bursary winners' travel research reports on *Sustainable Mixed Use Developments*; *Renewable Energy in East Africa*; and *CO₂ Refrigeration* span activity across four continents and are now available online.

Read the reports and further information on the bursary for 2014 at www.cibse.org/bursaries

HCNW REGION ACCELERATES INCLUSIVITY PRACTICES IN 2014

CIBSE Home Counties North West (HCNW) is building on its 2013 inclusivity event and continuing to implement the outputs of the workshop it held in June 2013. The event, attended by CIBSE President George Adams, heard of individual experiences and ideas from speakers, including Cynthia Forson from the University of Hertfordshire, plus representatives from Stonewall and women in CIBSE – including an IET mentee.

Delegates sought ways to accelerate inclusivity in the sector, with ideas dealing with diversity, accessibility, peer-to-peer support, and more.

HCNW will be holding an event entitled *Careers, Personal Development, Resilience and Inclusivity* in 2014. For more information, on HCNW or any region, visit www.cibse.org/regions



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CIBSE winner to speak at Ecobuild

● Book your place at the CIBSE membership clinic and seminar at this year's event

CIBSE is continuing its support of Ecobuild – the world's leading event for sustainable design, construction, energy, and the built environment. The exhibition is home to 1,000 exhibitors, two conference arenas with more than 600 industry experts, ministers and global academics, and more than 100 conference and seminar sessions.

The CIBSE membership team will once again be holding a membership clinic at Ecobuild, ExCel, London, from 4-6 March. Visit CIBSE stand number N310/11 and take the opportunity to get individual, face-to-face advice on any membership-related queries you may have. The clinic is open to both members and non-members who want advice on joining, upgrading membership, level of membership, completing application forms, and any other general enquiries. Individuals can book a 20-minute slot with an adviser from 10am to 4pm each day of the exhibition. Visit www.cibse.org/membershipclinic to secure your place.

Seminar session for the diary: Converting Low Energy Aspirations into Low Energy



Buildings, Tues 4 March 16.15pm-17.45pm.
One of the 2014 CIBSE Building Performance Award-winning teams will be presenting its case study at this seminar, which takes place in

the Building Performance and BIM zone.
CIBSE is a lead supporter of EcoBuild 2014. Register for your free ticket at www.ecobuild.co.uk

Technician apprenticeships in spotlight at breakfast briefing

A breakfast briefing about becoming part of the Technician Apprenticeship Consortium (TAC) apprenticeship scheme is to be held in London on Thursday 13 February, 2014.

TAC is a group of more than 30 large and small engineering consultancy practices that has come together to develop and deliver Advanced Technician Apprenticeships to assist in meeting the demand for highly skilled technicians.

It was conceived in 2010 with just six employers and eight apprentices. Since then it has become a highly credible and proactive professional group with 19 employer members at national level and many more at local level. It is proud to have created around 200 apprentice vacancies in 2013 alone, making a total of more

than 400 apprentices in training.

The distinctive nature of the apprenticeship is that it was developed with the support of CIBSE, and is mapped to the Engineering Council UKSPEC requirements for EngTech registration and LCIBSE. The apprenticeship, therefore, provides a valued work-based

route to a career as a professional engineer.

If you are interested in finding out more about the Advanced Technician Apprenticeship in Building Services Engineering and the TAC, and would like to attend the breakfast briefing in London, please email Sheila Hoile at shoile@acenet.co.uk.



Goodwin wins Bronze Medal

George Adams, CIBSE President, hands Mike Goodwin his Bronze Medal. The award celebrated Goodwin's 20 years' voluntary service to the CIBSE Home Counties North West Region (HCNW) as secretary and as chairman. Goodwin was assisted by Allison Meaney, whose contribution to HCNW has also been widely recognised.

CIBSE would like to extend thanks to the entire volunteer network; your efforts are greatly appreciated.



New members, fellows and associates

FELLOWS

- Campbell, Stephen**
Reading
 - Carter, Michael James**
Hook, Hampshire
 - Chan, Ying Ho Danny**
Ma On Shan, Hong Kong
 - Coates, Steven Ryan**
Hampton, Middlesex
 - Craney, Colin John**
Birmingham
 - Davies, Jason Graham**
Cobham, Surrey
 - James, Patrick Alexander Bree**
Southampton
 - Lam, Florence Wing Kum**
London
 - Lau, Kai Pak Desmond**
Ontario, Canada
 - Lau, Chun Chung Joseph**
North Point, Hong Kong
 - Monteiro, Delano Claro**
London
 - Mowlds, Derek Francis**
Tallaght, Republic of Ireland
 - Woollett, John**
Skovde, Sweden
- ### MEMBER
- Ajaero, Frances Adanna**
London
 - Amrania, Kartik**
London
 - Anthonypillai, Anitha**
Harrow, Middlesex
 - Armstrong, Stephen**
London
 - Asgari, Afshin**
Worcester Park, Surrey
 - Baldwin, Nigel Scott**
Morden, Surrey
 - Bandi, Siddhartha**
Bath
 - Bentley, Tristan John**
Sale, Cheshire
 - Bonnett, Steven John**
Basildon, Essex
 - Bourne, Adrian**
Chippenham, Wiltshire
 - Brown, Russell Alan**
Manama, Bahrain
 - Buckley, Alan Daniel**
Sydney, Australia
 - Burjony, Lee**
Hampton, Middlesex
 - Burree, Nicholas George**
Cheltenham, Gloucestershire
 - Caldwell, David Andrew**
London
 - Cameron, David Christopher**
Carlisle, Lanarkshire
 - Cannam, James**
London
 - Carroll, John Charles**
Wallasey, Merseyside
 - Cashman, Isabel**
Epsom, Surrey
 - Chan, Chun Man**
New Territories, Hong Kong
 - Chan, Kwan Tai**
New Territories, Hong Kong
 - Chan, Chi Fong Kevin**
Jordan, Kowloon, Hong Kong

- Cheng, Kwok Hon Eric**
Kowloon, Hong Kong
- Cheung, So Ting**
Kowloon, Hong Kong
- Cheung, Wai Keung**
Pok Fu Lam, Hong Kong
- Ching, Ming Tat**
West Point, Hong Kong
- Cho, Chun Hung**
Chai Wan, Hong Kong
- Choy, Wai Kong Rico**
New Territories, Hong Kong
- Chyla, Wojciech Jozef**
Bochnia, Poland
- Costelloe, Daniel**
London
- Coyle, Dominic Joseph**
London
- Crampton, Richard Phillip**
Leeds, West Yorkshire
- Craven, Andrew David**
York
- Dalby, Matthew James**
Abu Dhabi
- Danquah, Nana Yaw**
London
- Das, Tejes Chandra**
Carlton, Australia
- Dealey, Robert Stephen**
London
- Doyle, Eugene Angelo**
Harrow, Middlesex
- Dubovsky, Ladislav**
Maidenhead, Berkshire
- Dunne, Stephen Francis**
Southampton
- Durbary, Muhammad Ali Hishaam**
Mauritius
- Ekure, Akporhonor Ericson**
Dartford, Kent
- Elsworth, Robert James**
Chelmsford, Essex
- Eyre, Natasha Jayne**
Surbiton, Surrey
- Fan, Chi Kin**
New Territories, Hong Kong
- Filitcroff, John Robert**
Wanchai, Hong Kong
- Freeman, Mark James**
London
- Gouveia, Pedro Miguel Vaz**
London
- Gustafsson, Roland Joel**
Cambridge
- Hall, Matthew**
Plymouth
- Harman, Christopher William**
Stoke d'Abernon, Surrey
- Hassan, Sherif**
Greenford, Middlesex
- Hawthorne, Nicholas Colin**
Newtownabbey, Antrim
- Hebden, Daniel Charles**
Bracknell, Berkshire
- Hingston, Mark**
Bexleyheath, Kent
- Holleff, Jonathan Lee**
Merthyr Tydfil, Mid Glamorgan
- Horn, Steven**
Newcastle Upon Tyne

- Hosford, Gerard Martin**
Gateshead, Tyne and Wear
- Howard, Matthew**
Reading
- Hughes, Iain Lucas**
Oxford
- Ingram, Martin Paul**
Sittingbourne, Kent
- Jackson, Anthony Richard**
Chipping Campden, Gloucestershire
- Jesus, Paulo Alexandre Fernandes**
Sunbury-on-Thames, Middlesex
- Jimenez-Bescos, Carlos**
Chelmsford
- Johnson, Stephanie**
Woking, Surrey
- Jones, Andrew**
London
- Jones, Ben Alexander**
Sydney, Australia
- Juzak-Oraczewska, Katarzyna Elzbieta**
Glasgow
- Kachappilly, Jitto Sam**
Singapore
- Kelly, Richard**
Dublin, Republic of Ireland
- Kordel, Tom**
London
- Krawczyk, Aleksander Walenty**
London
- Kwok, Kin Man Stephen**
New Territories, Hong Kong
- Lam, Wing Cheung**
Happy Valley, Hong Kong
- Lamb, Robert Andrew**
Beiper, Derbyshire
- Lee, Bruno**
Eindhoven
- Lee, Jia Wen**
London
- Leung, Man Wai Patrick**
North Point
- Loutif, Matthew James**
Sufton, Surrey
- Ma, Yiu Man**
Kwun Tong, Kowloon
- Macrae, Iain Douglas**
Oxford, Oxon
- Mannu, Manolo**
Romford
- Marshall, Alexander Fraser**
London
- Massey, Andrew David**
Sheffield
- McAneaney, Maurice**
Castlewellan, County Down
- McGhee, Paul Michael**
Altrincham, Cheshire
- McQuire, Luke**
London
- Mencherini, Ely**
Florence
- Mohammed, Zaki Ahmed**
New Salata 40, Doha
- Mohammed, Mautasimuddin Altamash**
London
- Mohammed, Firdausuddin**
Slough, Berkshire

- Mohatta, Benjamin**
Clitheroe, Lancashire
- Morkel, Ian**
London
- Morris, Natalie Kim**
London
- Mikani, Aguy**
Borehamwood, Hertfordshire
- Muldoon, Paul John**
Birmingham
- Neale, Anna Patricia**
Newmarket, Suffolk
- Needham, Martin**
Bath
- Newton, Craig Alexander**
Glasgow
- Ng, Hon Wai**
Hong Kong
- O'Brien, Vincent**
Toomebridge, County Antrim
- O'Connor, Steven**
Glasgow, East Renfrewshire
- O'Dwyer, Christopher**
Horley, Surrey
- O'Flynn, Dean Martin**
London
- O'Kelly, Eamon Michael**
Southampton
- Olaoye, Tunde**
Stafford
- Owczarczyk, Piotr**
Manchester
- Oxizidis, Simeon**
Brighton
- Papanikolaou, Yiannis**
Bury St Edmunds, Suffolk
- Parson, Mark Richard**
London
- Patel, Umesh**
Hounslow
- Petterson, Mark Edward**
Wembley, Middlesex
- Prior, Edward**
Leeds
- Qabaha, Tareq**
Croydon
- Raymond, Daniel**
London
- Regan, David James**
Dublin, Republic of Ireland
- Remington, Nicholas**
London
- Ridley, David**
Newcastle Upon Tyne
- Roberts, Mark**
London
- Ross, Innes**
Bath
- Ryan, Michael**
Preston, Lancashire
- Scanlon, Eunan Patrick**
Edinburgh
- Seaton-Smith, Simon John**
Solihull, West Midlands
- Seechim, Richard**
Manchester
- Siu, Ka Wai Gary**
New Territories, Hong Kong
- So, Tsz Wa**
Kowloon, Hong Kong
- Soltanahmadi, Babak**
London

- Southern, Robert**
Walton-on-Thames, Surrey
 - Stachow, Daniel Szymon**
London
 - Stassen, Caroline**
London
 - Statham, Gavin Peter**
Cheadle, Cheshire
 - Stewart, Graham**
Cardiff
 - Sun, Chun Fung**
New Territories, Hong Kong
 - Tatham, Andrew**
London
 - Tobin, David Andrew**
Worthing, West Sussex
 - Tong, Lap Wai**
Kowloon, Hong Kong
 - Tooze, Vaughn Russell Allan**
Solihull, West Midlands
 - Travis, Michael**
Wigan, Lancashire
 - Trebowicz, Alex**
Manchester
 - Van Rooyen, Cairan**
Plymouth
 - Walley, Steven Paul**
Stoke-on-Trent, Staffordshire
 - Wang, Bo**
London
 - Ward, Jeffrey Martin**
Andover, Hampshire
 - Wickramaratna, Moditha Arangi**
Sunbury-on-Thames, Middlesex
 - Witt, Marta Janina**
Manchester
 - Wong, Charles**
Bath
 - Wong, William Hong Wei**
North Point, Hong Kong
 - Woo, Hin Leung**
Kowloon, Hong Kong
 - Woods, Richard**
London
 - Wu, Hon Sum**
Tung Chung, Hong Kong
 - Yau, Shuk Ping**
Kowloon, Hong Kong
- ### LICENTIATE
- Clapp, Luke**
Bristol
 - Croft, Joshua Ingham**
Nottingham
 - Jackson, Joseph**
Clevedon, North Somerset
 - Jones, Lewis Marshall**
Rotherham, South Yorkshire
 - Jones, David**
Ilford, Essex
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Is your BMS back door secure?

.....
 This month, our readers discuss cyber security, rewiring the Palace of Westminster, and the secret of efficient church heating

Time to get serious with security

I read with interest the articles about cyber security in the last two issues of *CIBSE Journal*. As a building management system (BMS) company that employs several Cisco-certified engineers, we see cyber security as a growing problem. Technology is driving our industry into the world of IP – Internet Protocol. Yet, how many building services engineers have the relevant skills to operate effectively in this world?

The hacking of Google’s Australian

office’s BMS system last year illustrates the issue perfectly. To recap, a BMS contractor left an unsecured ‘back door’ to the Niagara BMS connected to the web. It gave hackers access to the controls of the building’s HVAC and security devices. This raises two questions: why wasn’t there any improved security on that web connection, and were security issues considered when specifying the remote access connection to the BMS?

Think this is just a simple oversight? Think again. A search of the Shodan

It took me two minutes to find a local council publishing access to its BMS on the web

HQ website displays more than 600 similar BMS backdoors in the UK alone, including primary care trusts, schools and a telecoms company. It took me two minutes to find a local council that was publishing access to its BMS on the web – I’ve informed that council.

We recently helped an established energy-management business avoid a multimillion-pound legal action. It had subcontracted the lighting controls element of a retrofit project. The subcontractor installed poor-quality, unmanaged networking equipment on the client’s corporate IP infrastructure. This equipment caused the client major disruption and the energy management company was getting the blame. Our Cisco-certified network engineers identified the root cause of the problem – the subcontractor’s equipment, which mitigated the energy-management company.

Without employing that networking expertise, we risk our clients’ brands and our businesses. Now is the time to take IP security seriously, before we become the headline.

Chris Topham, Abtec Building Technologies

To heat or not to heat

I have been a consultant to the Exeter Diocesan Committee on heating systems for more than 10 years. There is obviously no system that fits all

The perfect combination..... P-Sensor and the CMR Velogrid



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P-Sensor

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circumstances, and systems need to be designed to suit the building, with work being carried out at the same time.

Underfloor heating can be a good solution, giving low temperature gradients. But unless the floor is being replaced for other reasons, the total capital cost can be high.

Reusing existing floor ducts by installing finned tube and under-pew heaters can be a good way to find space for the heat emitters, but care must be taken to prevent the pew timber from being damaged by the heat.

I have looked at biomass boilers on several sites and, with the RHI payments, they look viable but, with the capital cost being many times higher than a conventional boiler system, parishes have found it difficult to commit to.

Churchyards are often very quiet places and the noise level of some heat pumps can be intrusive – and to get the best from them, low water temperatures are required. For the amount of hot water normally used in a church, an electric water heater would be sufficient.

A number of churches have been fitted with air-based plenum heating systems in the past, but it can be difficult to find a suitable space for the plant.

The last thing you need to do to a church is heat it up quickly as this can damage the delicate fabric by causing rapid changes in space humidity and temperatures. These changes will cause moisture to evaporate on the wall surfaces leaving a residue of salts. The best way to run the heating in this type of building is continuously with a set back of temperature when the building is not being used.

Keith Dodd CEng FCIBSE

Palace preening

I read with interest the article on the Palace of Westminster (*CIBSE Journal*, January 2014) and I'm afraid there may well be a bit of an error. It implies that little has been done since the 1980s.

I was heavily involved in what was known as the PDVN project for more than 10 years during the 1990s, where approximately 80% of the Palace's office space was fitted with up to six Cat 5e data outlets for both telecom and data-use – along with the complete rewiring of small power and lighting circuits – while providing the automatic fire alarm and voice alarm systems and repairing the historic fabric.

For the new systems to work, two central data hubs and four extremely large file-server farms were created, with all the associated resilient infrastructure.

The spend on that project ran into many millions during that decade and every item of work was carefully recorded for the O&M manuals. The refreshment departments also had major refurbishments, as well as the passenger and goods lifts.

A building like this will always drain resources, and making them more efficient will challenge the best engineers. But remember, the vast majority of accommodation in the 1830s-60s was residential and large areas were still used for sleeping.

James Walker, IEng FIET MILP

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

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

I'VE SEEN THE FUTURE – AND IT'S BIM



The performance gap is a huge embarrassment for the building services industry, but Ruskin's David Fitzpatrick thinks he has seen a better future

Fifty years ago, science-fiction guru Isaac Asimov predicted how the world would work in 2014. Not surprisingly, the author best known for *I, Robot* got a lot of the details wrong – but he was right on the button with many of the key issues.

He talked about energy use and predicted we would be largely nuclear-powered with support from massive solar farms; he thought we might all be living underground to mitigate the impact of climate change; and he predicted the dominance of computers and wireless gadgets.

So what about the next 50 years?

We will certainly not be able to keep producing buildings that fail to meet client

expectations and use more energy than they should. Even if the shale gas revolution means energy costs come down at some point in the future, the rocketing global population will force us to be more resource-efficient.

Far too many buildings disappoint – even new, apparently cutting-edge ones.

This is not a technical thing – we are not still waiting for something to be invented. We have the right people (although we could do with more of them). And we have some excellent technologies. It is the delivery process that lets us down.

We need a new 'culture' that allows us to better focus our engineering expertise in the right areas and to ensure future buildings are operated sensibly and sustainably.

And that new culture is building information modelling (BIM) – although I would prefer to call it building information management, because the secret is ensuring the right people have the right information at the right time.

The potential benefits include buildings that are properly designed before construction commences because the entire project team is working together and communicating fully before any engineering 'work' happens.

Everyone is buzzing about BIM – hardly a day goes by when I don't receive an invitation

to a meeting on the subject – but few actually address how it will work in practice.

Manufacturers are still working in the dark because they

haven't been told what is required of them. Without the standard templates that underpin BIM models, we are rudderless.

The future is upon us and, unless we shape BIM fully and quickly, I fear another 50 years of unstructured project planning and supply-chain chaos.

Ruskin Air Management is a market leader in air distribution and fire and smoke control. It combines the Actionair, Air Diffusion and Naco brands. The companies work together to provide complete HVAC solutions for the built environment.



@ Feedback

The CIBSE presidential blog prompted two discussions on LinkedIn concerning the role of FMs and urban planting

Malcolm Wallace

I'm presuming that, to be chartered, a person will need a university degree, more so in this age of globalisation. And I do wonder whether FM is one of those professions that naturally lends itself to non-university educated people with a broader and deeper range of experience.

I think the requirements of any professional registration absolutely has to enhance and not hinder the chances of that person performing.

Jim Kingston

I often despair of FMs not being aware of new technologies; not wanting to understand the requirements of new tenants; working hard to find fault with contractors working in their building, rather than working with them so that what they are constructing will, in the future, make the FM easier... And when it comes to energy efficiency and sustainability, if chartered, they



may then understand what the words actually mean and what they should be doing to promote this.

RICS already has Chartered Facilities Management Surveyors, which belong to the FM Professional Group, which I believe has about 12,000 members.

In my experience, few FM managers belong to RICS. The majority are probably non-graduate, although that is changing with FM graduates entering the profession, along with those from other disciplines.

My personal view is that you need a good mixture of non-graduates and graduates in the engineering field and, in FM, there needs to be a gentle tilt towards increasing the latter, who tend to think more broadly and strategically.

FMs should become chartered sooner rather than later

Martyn Horton

This can only be done if they have the same technical qualifications as chartered engineers, otherwise it de-values and makes a mockery of chartered status. We also need to realise that people become FMs from a broad range of backgrounds, including soft services such as cleaning or catering.

Rob Farman

There are many professions that are chartered: surveying; architecture; accountancy; marketing; personnel and development; physiotherapy; and sciences, like biology and chemistry.

My view is that FM should become chartered sooner rather than later, and I think it will help BIFM up its game to gain its charter.

Where I do agree – and have often advocated with BIFM LinkedIn discussions – is that FM managers need to improve their technical knowledge, particularly, of energy and sustainability. However, they do not need – and cannot afford – to spend the time studying to the same depth as a design engineer.

Join the debate at CIBSE's LinkedIn group. www.linkedin.com The presidential blog is at www.cibsepresidentblog.co.uk

CIBSE asks: what role does urban planting play in tackling climate change?

John Coleman

Has anyone noticed that where there are thermally inefficient buildings with adjacent vegetation, there is a tendency to create micro climates that encourage insect, plant and bird-life? Thus robins, dunnocks and wrens survive during harsh weather in towns, as opposed to rural areas where stocks diminish significantly. I'm not proposing to justify poor thermal performance – rather that improvement will have an impact.

Julie Futcher

Here in London, we have a tendency to build on every square inch, with the development of brownfield seen as sustainable sites... I think this stance is wrong and that we need to reevaluate this approach... along with the one that says its bad to develop the sterile green belt... I'm not saying build on the green belt, I'm saying we have to get this into some kind of perspective... This includes the positive influence that open spaces in central urban

environments have on building energy management.

William Roberts

I am not a tree hugger, [but] maybe if we all planted at least one tree a year, our children would have better air quality?

Malcolm Wallace

For a pro-tree city, come and have a look at Toronto. The view from the 24th floor of a downtown office tower was of a pure urban forest – a canopy of trees.

This is supported by local by-laws that some may consider draconian – it's illegal to cut down a tree (definition: anything with a 'trunk' more than 4") even on your own property. The downside is plenty of leaf raking in autumn and, of course, the extensive power outages after last week's ice storm (falling branches bringing down overhead lines).

The upside is an urban environment that is definitely nicer than that of many cities in the world.

OWER



TAXPAYER VALUE IN A PICKLE

The Information Commissioner has ruled that the DCLG should not withhold details of EPCs. Hywel Davies considers the value of making this information more widely available

On 16 January, the BBC¹ reported that the Information Commissioner upheld an appeal by Martin Rosenbaum of the BBC. He had referred to the commissioner the Department for Communities and Local Government's (DCLG) refusal to release the data it holds on public and commercial buildings, in the non-domestic register of Energy Performance Certificates (EPCs) and Display Energy Certificates (DECs). Rosenbaum had previously used the Environmental Information Regulations to obtain the DEC data on large public buildings, but that took several months and involved a change in the Energy Performance of Buildings Regulations (EPBRs).

In March 2013, he requested EPC and DEC data for the public and commercial buildings listed on the non-domestic register. DCLG refused to release the data, saying the information was already 'easily accessible' by entering a postcode or a 20-character unique reference number for each building on the register website, and it was a 'straightforward' process to obtain the data, building by building.

The BBC estimated it would take at least 26 months to obtain the data in this way, and the Commissioner ruled it could not therefore be considered 'easily accessible', calling the proposed approach an 'onerous process'. He told DCLG that it cannot justify refusing to release the data on this basis. It is unclear whether DCLG will now comply, or find another reason to refuse.

The most frustrating thing is that DECs must be displayed 'in a prominent position' in a public part of the building to which they relate. It is a simple task for Landmark Information Group, which operates the register, to extract the data, but it seems that either it, or DCLG, does not wish to do so.

The whole episode shows the misunderstandings and missed



The BBC is calling for better access to energy performance data

CORON BEL / SHUTTERSTOCK

opportunities around public disclosure of energy performance. Every reader understands the concept of fuel economy for cars. The benchmark is distance per unit volume of fuel. This distinguishes the economic models from the gas guzzlers, and allows owners to benchmark performance over time. The idea of trying to keep this data secret is laughable.

EPCs provide a similar measure to the standardised fuel economy test. And DECs are the equivalent of recording the fuel consumed and miles driven every time the tank is topped up. A DEC tells an owner how effectively they are managing their building. Indeed, the headline on a DEC in England and Wales asks: How efficiently is this building being used?

The DEC also helps the operator to improve the performance of their buildings. And, since public buildings' energy bills are ultimately paid by taxpayers, the idea is for the public to know how their money is being spent.

Communities Secretary Eric Pickles champions taxpayer value. As recently as 4 January he said: 'Rubbish collections are the most visible service that people get for their council tax bill.

People deserve a comprehensive weekly service in return for their taxes.'

Yet Mr Pickles does not want to reveal a simple dataset that makes visible the efficiency of public authorities' use of the same taxpayers' money in public buildings. Is it because DECs and EPCs are required by an EU Directive? The result is that, while we can benchmark our car's economy, and the value of waste collections, we cannot readily access the data that reveals how efficiently public buildings use energy.

So our public buildings can waste energy – and public money – with impunity. A number of US cities, including Chicago and New York, have introduced disclosure programmes for all large buildings, even private ones.

Free market management thinker Peter Drucker said: 'You can't manage what you don't measure.' If our public buildings measured and disclosed energy use properly, in one public dataset, they could begin to save energy and reduce spending. Measuring and disclosing would show the private sector what is possible. The best operators in the private sector, such as Building Performance Award-winning British Land and its peers are doing it now. But many others could do much more. Saving energy cuts costs. It also reduces total energy demand, meaning we need to generate less, and invest less in new generating capacity.

All it needs is some leadership and disclosure by DCLG to make DEC data totally public and give taxpaying individuals and businesses the information to help them save energy. It is just good business management. That is why CIBSE supports the BBC's efforts to obtain the data.

All it needs is some leadership and disclosure by DCLG to make DEC data totally public

References

¹ <http://www.bbc.co.uk/news/uk-politics-25736563>

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

P
RICE

DON'T BIN THE YELLOW TRACE JUST YET



Great ideas are borne out of sketching on disposable tracing paper, says **Geoffrey Palmer**, who fears over-reliance on BIM will see engineers experimenting less with their designs



BIG PANTS PRODUCTION / SHUTTERSTOCK

 Pick up a copy of any construction-related magazine and you are likely to find reference somewhere to building information modelling or BIM. It may be images of completed projects, the latest government initiative, adverts for software or legal comments on potential difficulties over shared models.

The industry – partly driven by government assertions that this approach will drive efficiency and reduce construction costs – is now wondering not *if* it will adopt BIM, but *when*.

For complex projects, there can be no doubt that modelled 3D coordination between all elements of the works is at worst beneficial, but much more likely to be critical for successful delivery. Most design organisations have been using 3D design for nearly two decades. This is not always for an entire project, but often focused on complex areas, where real value is added by the modelling process.

Designing complex projects, such as Crossrail, without a tool that

creates a virtual reality of the project is not sensible. Yet to apply such a sophisticated tool as BIM to a wiring replacement or solar installation for a primary school would be inappropriate. From 2016, central government departments will adopt, as a minimum, collaborative level 2 BIM. No one yet knows whether it will be required for these sorts of simple projects.

While in Hong Kong in 1995, I was involved in various design packages related to the construction of the new airport at Chek Lap Kok. Alignment, settlement and coordination of the runways and their surrounding facilities were critical. A single 3D model was built to represent the inputs from numerous design parties fully and these included asset tags, key attributes, line and level for all major elements. This was critical for the success of the project and was an early forerunner to BIM.

For me, however, there is a ‘but’ – and a fairly big one at that. Beyond the fact that very few people seem to really understand the difference


I've never met an architect who's locked onto the final solution on their first sketch

between BIM and 3D design, I have real concern that BIM could stifle good design, because it doesn't allow you to experiment with ideas.

I believe good design needs dead ends, and great design requires yellow trace. It's a cheap and disposable medium and allows maximum expression at minimum cost.

Passion for good design is what drives me. Yes this design needs to be both coordinated in its detail, and initially borne out of experimentation and the exploration of different options – which may lead to dead ends. If we don't push the boundaries in finding out what doesn't work, how can we possibly know we have the best solution? My fear is that if we move to BIM without our eyes wide open, we may end up more focused on serving the model, rather than great, sustainable, forward-looking designs.

With BIM, if you go down a design cul-de-sac, you may not be able to turn back because the cost of change is excessive, or the necessarily complex three-point turn may lose you both time and design momentum.

Could BIM before Stage D stifle good design? Certainly I've never met an architect who's locked onto the final solution on their first sketch.

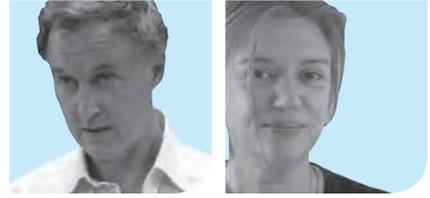
Good consultants use all manner of manual and computer-aided techniques to better understand project challenges, and to balance the pros and cons of their potential solutions. Long may these design tools remain in our armoury, alongside BIM solutions for detailed project development and coordination.

As I reflect on the benefits of yellow trace, I wonder if it's the satisfaction of achieving three points from a 15-yard cross-office bin shot that excites me, or the knowledge that my next sketch is likely to be better than the screwed up ball of paper now sitting in the recycling bin?

 **GEOFFREY PALMER** is a director at Grontmij

G UARANTEE

THE SELFISH GIANTS



Modelling must look at the impact of buildings on the performance of nearby structures – otherwise energy strategies will be compromised and lawyers hired, says **Julie Futcher** and **Gerald Mills**

Grandiose new city towers don't make great neighbours. The skyhigh interlopers muscle their way in to prime sites and proceed to steal energy, shade and sightlines from nearby buildings, while dumping unwanted waste on the surrounding streets in the form of blistering heat, blinding glare and turbulent winds.

Too many buildings are being designed without due consideration of their impact on the wider built environment. Minds have been concentrated on the issue by the impact of 20 Fenchurch Street – aka the Walkie Scorchie – on its neighbours when light reflected by its concave glass façade scorched buildings and objects.

It exposed some of the gaps in the methodologies that assess building energy performance¹. Among these is the failure to account for the interdependent energy relationships between buildings and to evaluate the energy performance of the built environment as a whole, rather than on individual buildings.

Assessment is currently based on the reduction of regulated energy demand through a fabric-first approach, alongside the supply of energy from renewable sources. This means that the potential for the building form to reduce energy demand at the outset is overlooked, and energy efficiency

measures are applied generically, regardless of the external environment.

We evaluate the energy performance of buildings as though they were divorced from the surrounding urban landscape. The effect of neighbouring buildings on the energy load is ignored and vice versa.

The 'Walkie Scorchie' is one of two recent examples on the London skyline. Its energy management strategy is expected to exceed current target reductions by about 24%² owing to its optimisation ratio of fabric and technologies. Unfortunately, its ability to reflect and focus solar energy onto nearby Eastcheap has become a defining attribute that will necessitate a costly modification to the façade.

This exceptional event highlights a more general point; 20 Fenchurch Street affects the thermal performances of all the surrounding buildings to a greater or lesser degree – through reflection, shading and modification of airflow patterns – yet there is no standard means of assessing these impacts.

The second example – Heron Tower – is a 230m glass-clad tube³. About 2.5% of its energy needs are supplied by building-integrated photovoltaics, consisting of 3,000m² of PV cells embedded in the glazing on the south façade, which will generate 92,000kWh of electricity a year⁴.

At noon at the time of the equinox, 100 Bishopsgate will cast a 145m shadow up the south-facing facade of PVs on Heron Tower

However, this design presumes that the façade will continue to have a nearly unobstructed access to the solar beam and this depends entirely on what is built on the plot 30m to the south (100 Bishopsgate). The site has planning permission for a 172m office tower, and if construction goes ahead, the energy management strategy of Heron Tower will be compromised – for example, at noon at the time of the equinox, 100 Bishopsgate will cast a 145m shadow up the south-facing façade of PVs on Heron Tower.

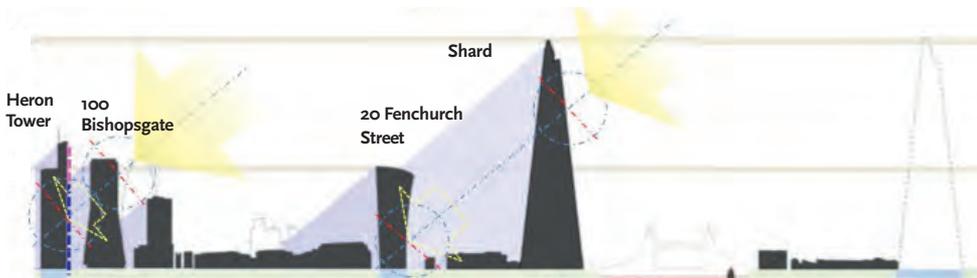
Both examples highlight the urban energy management issue because of their size viz-à-viz the adjacent buildings. Each protrudes well above the height of the surrounding urban landscape and is treated as an isolated entity (from an energy perspective). As a result, the energy effects are inequitable. While the buildings along Eastcheap will not have a significant effect on the performance of 20 Fenchurch Street, the reverse is not the case. Similarly, Heron Tower achieves much of its green credentials by capturing the solar beam over a large area while casting a long shadow. The irony is that if 100 Bishopsgate is built as planned, Heron Tower will find itself in the same situation as its lowly neighbours – deprived of solar resource.

It is time to take an integrated approach to the energy exchanges of buildings in urban areas and to integrate this into traditional building impact assessments, which include concerns about protected views, sky light, glare and dangerous winds.

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DR JULIE FUTCHER AND DR GERALD MILLS are undertaking a study with De Montfort University to look at the effects of interdependent relationships on building performance. Contact julie@climate22.com



Section showing positioning of 100 Bishopsgate next to Heron Tower, and the fictional repositioning of The Shard. It clearly demonstrates the interdependent energy relationships between buildings – 100 Bishopsgate will put Heron Tower's PVs in the shade

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CIBSE BUILDING PERFORMANCE AWARDS 2014

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

The 2014 CIBSE Building Performance Awards will see the launch of a new category showcasing the best in international building design.

The following projects have all made the shortlist of CIBSE's International Project of the Year, and one of them will be crowned best of the best at the Grosvenor House Hotel on Tuesday, 11 February.

The award represents CIBSE's growing international membership – up 14% in the last year – and the category attracted the second highest number of entries at this year's awards.

Entrants were asked to demonstrate outstanding measured building performance, energy efficiency and reduced carbon emissions, as well as achievement of high levels of user satisfaction and comfort.

More than 60 organisations submitted an entry, showing the amount of work being

done to improve energy efficiency and to close the performance gap on an international scale.

Of the six shortlisted projects, four are in Asia, revealing how much low-energy design is being embedded into the fabric of the new megalopolis of the Far East.

The six shortlisted entries represent a variety of building types across many sectors, including the regeneration of a 1930s post office in Milan and a chiller plant replacement scheme in Hong Kong (see right).

In total, 61 companies, projects and products have been shortlisted in the 13 categories for this year's prestigious awards.

To view the full shortlist, find out who this year's judges were, and book your table, go to www.cibseawards.org

To monitor the awards follow @CIBSE Awards, and #BPA2014 for live results on the night. **CJ**



Parkview Green, Chaoyang District, Beijing



The Shortlist

Aporti Palace, Milan, Italy – Studio Planning

A major regeneration project in Milan that turned a 1930s building, originally designed as a central post office, into a modern seven-storey office complex. The project aimed to preserve the original architectural character of the building, while complying with modern building specifications.

Chater House, Central, Hong Kong – Hong Kong Land

The project aimed to reduce the energy consumption, carbon emissions and operation cost of Chater House by replacing the air-cooled chiller plant with a water-cooled one. A photovoltaic system was also installed on the new chiller plant enclosure, which served as a pilot scheme for the rest of Hong Kong Land's managed buildings before wider application to the rest of its estate in Hong Kong.

Commonwealth Bank Place, Darling Quarter, Sydney, Australia – Arup/Lend Lease

Commonwealth Bank Place (CBP) is the largest office development in the Sydney Central Business District. Its campus-style precinct comprises two eight-storey Grade A office buildings with 3,000 m² of ground-floor retail space and a 1,000m² children's theatre. The



Chater House, Central, Hong Kong

International Commerce Centre, Kowloon, Hong Kong





Gardens by the Bay, Marina Bay, Singapore

6 The category attracted the second highest number of entries at this year's awards



Aporti Palace, Milan



Shortlist continued

► buildings were awarded world leadership status by the Green Building Council of Australia (GBCA) and achieved 6 Star from Green Star – Office As Built (Version 3), which is the equivalent of LEED Platinum or BREEAM Outstanding.

Gardens by the Bay, Marina Bay, Singapore – Atelier Ten

Three waterfront gardens that define Singapore as the world's premier tropical garden city – Gardens by the Bay was named World Building of the Year at the World Architecture Festival 2012. The conservatory complex is divided into two biomes, creating two of the world's largest conditioned conservatories. The façade

design is based on specifically selective glazing to control radiant transmission and surface temperatures, while retractable external shades modulate internal daylight levels.

International Commerce Centre, Kowloon, Hong Kong – Kai Shing Management Services

The sixth tallest building in the world, the International Commerce Centre (ICC) was completed in 2011. Its Building Management System (BMS) manages and controls the ventilation and energy use in the building, while the Power Monitoring System (PMS) enables real-time monitoring of the power supply and energy efficiency.

Parkview Green, Chaoyang District, Beijing, China – Ove Arup & Partners Hong Kong

Parkview Green, Beijing is a LEED-CS Platinum certified mixed-use development with Grade A office space, a six-star hotel and retail facilities.

Key passive and active green features include an earth pre-cooling system, chilled ceiling radiant cooling, under-floor air-conditioning, and grey and storm water recycling systems.

The different building elements, including the roofs and walls, are designed to provide movement among the contact points and adjoining sections, to allow seismic shocks to be absorbed and transferred from one structural component to another.



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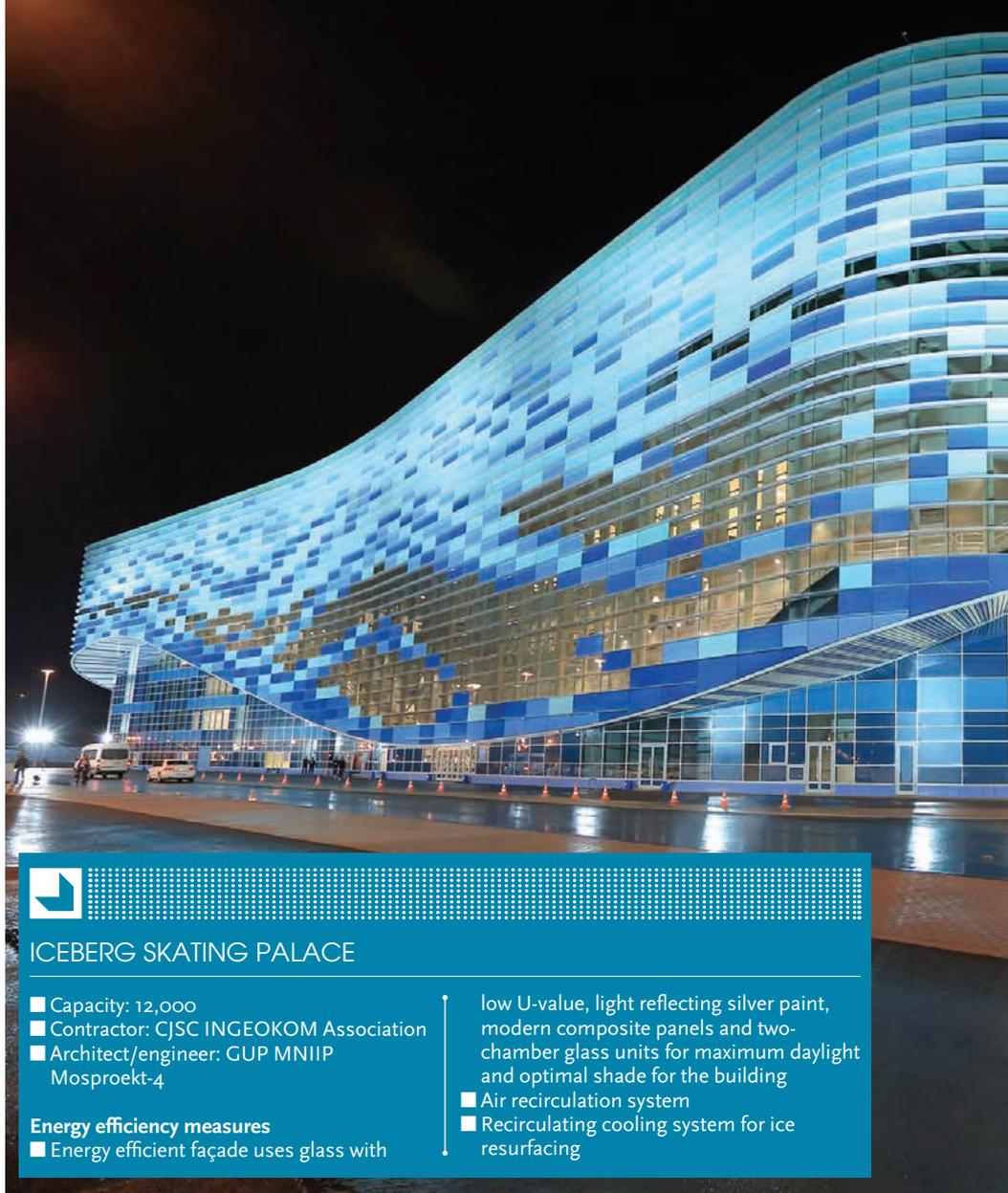
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People felt that there was no real need because Russia has always been an energy superpower, and that it wasn't in its interest to save energy

The Sochi Winter Olympics has triggered a seismic shift towards low-energy building in Russia. **Liza Young** details the environmental features of the key venues, and speaks to the English head of the Russian Green Building Council about the challenges of driving low carbon design in a country with access to cheap fuel



ICEBERG SKATING PALACE

- Capacity: 12,000
- Contractor: CJSC INGEOKOM Association
- Architect/engineer: GUP MNIIP Mosproekt-4

Energy efficiency measures

- Energy efficient façade uses glass with

- low U-value, light reflecting silver paint, modern composite panels and two-chamber glass units for maximum daylight and optimal shade for the building
- Air recirculation system
- Recirculating cooling system for ice resurfacing

TECHNICAL MERIT

The concept of green building is relatively new to Russia. In a country blessed with an abundance of natural resources and cheap energy, developers had little incentive to specify low carbon buildings. Instead, the common mantra has been to build it quick, and build it cheap.

Winning the bid for the 2014 Winter Olympic Games has marked a turning point for the Russian construction industry. The International Olympic Committee makes

sustainability a condition of hosting the Games, and Sochi's successful bid meant the Russian government had to put low carbon building high on its agenda for the first time in its history.

Putin's government took its task seriously and promised environmental certification for all 200 of the construction projects being built to serve the Games.

The Russian Olympic organisers turned to the recently established Russian office of the Green Building Council (RuGBC) for advice

on delivering a sustainable Olympics. Under the leadership of Englishman Guy Eames, the RuGBC introduced the organisers to environmental consultants with Olympic experience, including Buro Happold, PRP Architects and Aecom, and encouraged the Russian project teams to work towards BREEAM certification on 10 key projects.

Eames said there was a steep learning curve. 'There was a lack of awareness of what green building was and the opportunities it offered. We had a lot of people laughing in our face saying they did not believe that green building in Russia would ever take root.'

The Sochi Olympic venues form two clusters: the coastal development, in Sochi's Adler district, and the mountain group near Krasnaya Polyana village.

The Olympic Park in the coastal cluster combines sporting venues, parkland and infrastructure, including a new CHP district heating plant, water treatment plants and 7.5km of dedicated cycleways. The new railway and highway connects the coastal and





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ADLER ARENA SKATING CENTRE

- Capacity: 8,000
- Contractor/architect/engineer: JSC Omega
- BREEAM assessor: Aecom Russia

Energy efficiency measures

- To keep cool in summer and save heat in winter, the air conditioning systems use partial recirculation of exhaust air. Air exchange in the spectator area promotes assimilation of ventilation air heat and moisture to visitors and employees, without affecting the ice cover surface
- The supply circuit and removal of air from the hall separates the ice track and stands zones. Temperature in the stands is 3-4°C higher than in the ice track zone. The

result is a significantly reduced intake of unwanted excess heat and moisture in the area towards the stands

- Sun visors and slats shield the arena from direct sunlight, and windowpanes have a specially tinted sunscreen
- Remote monitoring for the control and building management systems
- Natural lighting via transparent roof elements
- Highly insulated structure (59% above Russian building regulations)
- Rainwater harvesting for watering grounds and flushing toilets
- Water treatment by reverse osmosis for ice surfaces

mountain areas, and provides a connection to the new terminal at Sochi International Airport, enabling quality public transport access straight off an intercity train or plane.

The Olympics were responsible for a variety of new technologies being developed in the Russian construction industry, including energy modelling and the use of integrated renewable technologies, rainwater harvesting and glass roofs.

Eames said the change of attitude was refreshing. 'The idea of trying to make innovative buildings, which were assessed, was a real breakthrough in a country that had no history of assessing buildings to green building standards.'

He believes the Games will leave a legacy of greener construction, in part due to the Russians realising that if they can be more energy-efficient, Russia can sell more energy at higher prices to fuel export markets in the West.

The Olympic projects on the following pages represent the vanguard of this new Russian building revolution. **CJ**



Bolshoi Ice Palace

- Seating capacity: 12,000
- Contractor/architect/engineer: SC Olympstroy
- BREEAM Assessor: Buro Happold

Energy efficiency measures

- Energy-saving, dome-shaped stained-glass windows made of multi-functional glass with glare shielding and heat insulation
- Heat recovery in HVAC systems
- Photovoltaic power supplies and converters with automatic mode switching to ensure outdoor lighting energy savings

- Recovered heat from the refrigeration condenser for ice production is used for the additional heating of external intake air
- Heat from refrigerating compressor stations used for heating hot water
- To provide a heat supply for snow-melting technology, ventilation systems, heated floors, and the hot water supply, 50 per cent of the thermal load is covered by reused heat from cooling machines
- The heat in the hot water supply system is produced entirely by reusing heat at the venue



COASTAL OLYMPIC PARK

- 1 Bolshoi Ice Palace
- 2 Adler Arena Skating Center
- 3 The Iceberg Skating Palace
- 4 Fisht Olympic Stadium
- 5 Shayba Arena
- 6 Ice Cube Curling Centre



ICE CUBE CURLING CENTRE

- Capacity: 3,000
- Investor and developer: ISK Slavoblast
- NPO Mostovik
- Architectural designer: Stroioproekt
- Stroioproekt

Energy efficiency measures

- Uses composite panels to reduce heat losses
- Connection to the centralised technical water supply system of the Olympic Park
- Water taps with motion-detecting infrared sensors (saving up to 21 m³ of water per day)
- 90% of construction waste, including glass, concrete, bricks was recycled and re-used
- Total volume of excavated soil was 15,000 m³, 25% of this was used for re-cultivation

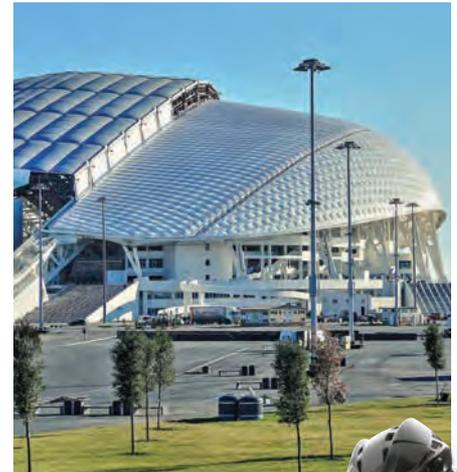


Fisht Olympic Stadium

- Capacity: 40,000
- Contractor: SC Olympstroy
- Architect: Populous/Mosproject-4
- Engineers: Buro Happold

Energy efficiency measures

- High-efficiency internal and external lighting, including zoning and sensors. Energy-efficient LED and compact/tube fluorescent lighting internally
- Passive elements include high level of natural lighting (more than 75%)
- Rainwater and melt water harvesting (300cbm tank collecting water from a 28,500 m² roof)
- Automatic control systems and lighting controls
- Modern thermal insulation and vapour insulation materials, minimising heat loss



RAILWAY NETWORK

- Investor: JSC Russian Railways
- The Olympic Park railway station (BREEAM rating: Very Good) includes 1,022 Pramac Luce photovoltaic cells, with a capacity of 125W each. Transformed energy goes to the distribution board and transferred to the railway station network
- Adler railway station has 320 solar panels to provide hot water on-site



SUSTAINABLE COMFORT AT APORTI PALACE IN MILAN THANKS TO CLIMAVENETA INTEGRA UNITS

Rising energy costs, incentives on the reduction of consumption and new regulations on energy performance of buildings require to develop a new perspective on the heating and air conditioning. Talking about energy, efficiency and pragmatism are the only winning path. For Climaveneta it is already a consolidated point of view, expressed in advanced engineering solutions. Among these, the multi-purpose INTEGRA units deserve a note thanks to a constructive logic specifically designed for contemporary demands of heating and cooling throughout the year, typical of modern buildings such as hotels, business complex and shopping centres.

One of the most prestigious showcase of this technology is Aporti Palace in Milan, shortlisted at CIBSE Building Performance Awards 2014. The project, coordinated by architects Antonio Citterio and Patricia Viel & Partners, provided a high quality standard in the structure and above all for what concerns the plant design.

In order to increase the energy efficiency



of the building and reset CO₂ and pollutants emissions in the heart of the city, Planning Engineering studio has adopted four multi-purpose heat pump Integra units, ERACS-Q by Climaveneta.

To demonstrate the advantages of Integra solution, Climaveneta carried out an energy analysis on the building allowing to dispose of the basic data for correct simulation of thermal loads. The annual thermal demand of the building was estimated at about 3,835,160 kWh/year, while cooling at about 1,925,850 kWh/year. The power absorption of the proposed unit, calculated taking into account the real capacity of the multi-purpose unit to produce for free a portion of energy required is about 1,082,520 kWh. Accepting the rough calculation of the annual efficiency average as the ratio of total energy output and energy consumption, we get a TER of 5:32, a value absolutely unreachable by any other conventional air source chiller. In case in the same building should be instead provided the solution with standard chiller and boiler, to meet the request of air conditioning in summer and winter given above, primary energy consumption would amount at 3,913,430 h kW/year (high-performance boiler, medium $\eta = 0.98$) + 1,413,990 h kW/year (high-efficiency chillers, medium EER = 3.00). It is so easy to calculate that Climaveneta Integra units only consume 2,384,400 kWh per year, **saving in primary energy consumption by more than 55%.**

In addition to the drastic reduction of running costs, the choice of multi-purpose units instead of chiller plus boiler solution



Historic seat of Royal Post, Aporti Palace has now become a new office building.

brings other significant benefits such as reduction of technical space to be allocated, having to place one unit instead of two, plant simplifying because exchangers provide water connections and does not require any special reverse side of 'cold' and 'hot' hydraulic circuits or any auxiliary disposal. Furthermore as multi-purpose unit is self-adaptable to the needs of the plant, it is not expected summer / winter switching and unit will ensure the simultaneous and independent hot and cold water circuits intended for. Finally there are **no direct CO₂ emissions:** the units are electrically powered, so there are no exhaust fumes into the atmosphere at installation.

INTEGRA multipurpose units by Climaveneta overcoming the traditional chiller and boiler system, ensures perfect comfort all year round, without CO₂ emissions in the atmosphere, and reduces running costs by more than 55%. The plant works successfully in Aporti Palace and in many other buildings all over the world and should be a winning solution also for future sustainable and innovative projects in the UK.



RUSSIA'S GREEN REVOLUTION

Russia's move to low-energy design is being spearheaded by Englishman Guy Eames. **Liza Young** finds out how the experience of Sochi is being used to spread environmental best practice across the Russian continent



Many developers eyed the certification suspiciously, regarding it as an unnecessary burden – *Guy Eames*



EAMES' PATH TO THE SOCHI OLYMPICS

Guy Eames has worked in business development in Central and Eastern Europe since leaving college in 1991. In 2005, he returned to the UK to take a Master's in Sustainable Development and Climate Change at DeMontfort University. He then spent a year setting up the Peterborough Eco Innovation Centre, before returning to Russia to establish the Green Building Council in 2009. Last November he was re-elected for another two years.

The pretty market town of Stamford is an incongruous setting for a meeting with the Russian Green Building Council (RuGBC). But its CEO and co-founder Guy Eames is English, and he's taking a break in his hometown before flying back to Moscow to help Russia deliver a sustainable Winter Olympics in the Baltic town of Sochi.

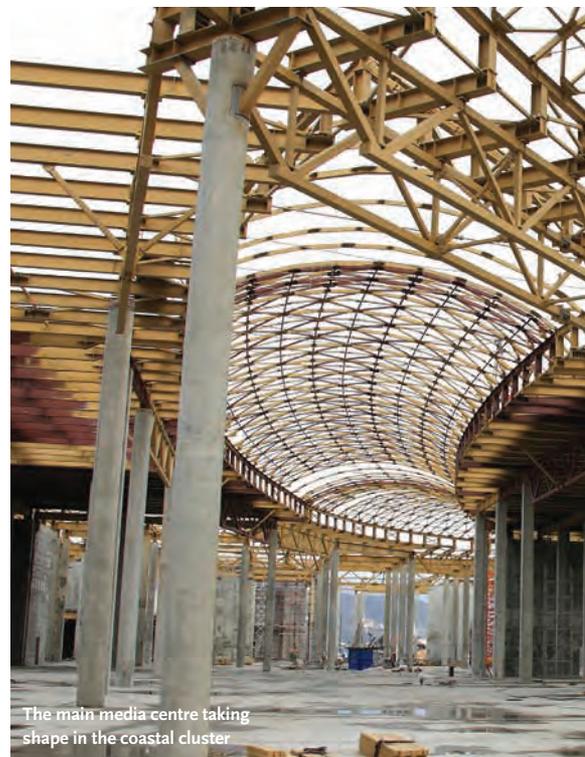
Eames has been advising Putin's government on the delivery of sustainable venues for the Games since 2009, when he co-founded the Russian arm of the global environmental body with Professor Yuri Tabunchikov (who sits on the UN climate change committee) and Alexey Polyakov.

Before 2007, sustainable building design barely existed in Russia but, after the International Olympic Committee made green building a condition of hosting the Winter Olympic Games, the government had to act.

The RuGBC was, in part, set up to help the government deliver the green Games it had promised. In its Olympic Bid Book, Russia set itself sustainability targets, including the certification of venues to international standards, the use of renewables, and green procurement. In fact, SC Olympstroy (the Russian Olympic organising committee and delivery body) issued corporate requirements for the procurement of green materials, which has now become federal legislation.

'SC Olympstroy knew that the venues for the Olympics in Sochi had to be green and certified, but really didn't know how to go about that,' says Eames. 'They wanted partners and people with more experience.'

This is where the Englishman came in. He had just completed a Master's degree in Sustainable Development and Climate Change at Leicester's De Montfort University, and – as a Russian speaker – he was in the perfect position to introduce Olympstroy to



The main media centre taking shape in the coastal cluster

Western consultants who had a track record of delivering successful projects with low environmental impacts. He even organised RuGBC stands at Ecobuild to help accelerate Russia's understanding of UK best practice.

Mott MacDonald, Arup, Buro Happold, PRP Architects, and Aecom all responded, and advised Russian contractors and engineers on how they could embed green measures in their design and construction processes.

The RuGBC was responsible for 10 key Olympic venues being assessed using BREEAM by Buro Happold and Aecom.

'BREEAM and LEED are good toolkits for creating better-quality buildings, because they're really forcing the teams to look very carefully at every element of the construction



The Fight Olympic Stadium will host the opening and closing ceremonies and, in 2018, will be a World Cup venue



and EMS under ISO 14001 standard.

The Green Standard brings together many aspects of Russian environmental and energy legislation, including energy audits.

Eames said many developers eyed the certification suspiciously, regarding it as an unnecessary burden. 'Some of them even asked me whether it was a way of shaking them down to make money out of them. It's a common problem they face every day – people coming to them with extra requirements.'

Eames says the more progressive developers are changing their attitudes, and now see it as an opportunity rather than a burden.

A good example, says Eames, is Russian Railways, which is considering BREEAM certification for many of its buildings. 'Adler Station is an impressive example of a modern integrated transport hub – smoothly connecting long-distance and local trains, buses, ferry passengers, bicycles, pedestrians and vehicle traffic,' says Eames.

Looking at projects holistically was one lesson the Russians had to learn. Instead of specialists working independently, integrated design was introduced into the process with end users, facility managers, and energy experts working together at the design stage.

Eames says the Russian government is starting to see the economic benefits of energy efficiency, as it can make much more money exporting energy than it can by supplying it to heavily subsidised domestic markets. Energy efficiency means more export revenue.

The Russian construction industry is now looking at lifecycle cost analysis. 'At the moment, the criteria for a lot of state tenders – to create the cheapest possible buildings – don't necessarily take into consideration all of the sustainable aspects,' says Eames.

The widespread certification of Olympic venues to international standards has



The Bolshoi Ice Palace

stimulated an innovative construction industry in Russia – and beyond. 'The final buildings in Sochi may not be as green as the London venues, but the UK is one of the world's leading green building countries,' says Eames.

'In Sochi, they went from a zero base, with no history of green buildings, to a stage where they've incorporated a lot of renewable technologies, and started certifying buildings. So, in some ways, they've done more.'

Eames will be commuting from Stamford for a while longer – he was re-elected as the RuGBC head in November for a further two years, and is keen to build on the Sochi legacy.

Sustainable projects are already under way in Moscow, Rostov-on-Don, Tomsk, Ekaterinburg and Tatarstan. In St Petersburg, Russian developer Mirland is also preparing to undertake a 1m m² BREEAM residential development. And Eames is gaining more stamps on his passport as the green frontier moves east, with projects now taking shape in Kazakhstan, where he has just helped establish the Kazakh Green Building Council. **CJ**

● For more on the RuGBC's work, go to the app at www.cibsejournal.com/app or view on Android or browser via cibsejournal.com

process – such as the management of the building, the materials, energy, and transport,' says Eames. 'It's a way of incorporating best practice to create a better-quality building.'

A certification scheme more widely applied than BREEAM is the Corporate Green Standard, which covers the 200 investment projects delivered for the Games. This scheme – launched by SC Olympstroy and the Russian Ministry of Natural Resources in May 2010 – marked the first attempt to introduce detailed environmental guidance for the construction industry. Although voluntary, the standards have the potential to become legislation.

To support this, Olympstroy, with the help of RuGBC experts, introduced an integrated system of sustainable design based on 3D GIS

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Olympic GAINS

More than 2,000 athletes at the 2010 Winter Games in Whistler were kept warm by heat extracted from an existing sewage treatment plant. **Richard Perry** and **Tom Ren** look at the legacy of their heat network design, and reveal how the project achieved 50% savings in energy use

The Olympics aren't just about the athletes. For the hosts it is an opportunity to put their cities on the map, and create a string of world-class new sports venues. New buildings help leverage investment in new infrastructure, giving local authorities the chance to create more efficient and cost-effective methods of providing energy.

One town to benefit from an Olympic legacy is Whistler in Canada, where a heat-

recovery plant was installed to extract energy from a sewage waste treatment plant. The network was used to provide heating and cooling for more than 2,000 athletes and coaches at the 2010 Winter Games. Post-Olympics, it provides energy for hundreds of homes.

The system consists of a central service building, which houses circulating pumps, heat pumps and boilers; a distribution network; heat pumps in each of the residences; and connected heating, cooling and domestic water-heating systems.

Designing the Whistler system was extremely complicated because of the variability of both the energy source and the residential demands. Further complicating matters was the need for the system to perform in a cold climate.

The buildings in Phase 1 have been converted for residential use and have been in operation for more than a year, during which time the connected systems have been monitored on an hourly basis and the results documented.

The primary energy source for heating, cooling and domestic hot water is the district ➤



The Olympic buildings were heated and cooled using energy from the existing sewage treatment plant in Whistler Village



OPERATION AND MAINTENANCE

The project is controlled by a technologically advanced ESC automation management system that co-ordinates and optimises the DESS to ensure the maximum of energy saving along with maximum indoor comfort conditions. The control system utilises a fully open network protocol (BACNET), communicating with multiple distributed control panels, including third-party manufacturers controls (supplied with the units), for a fully integrated seamless control system. The DDC control system is monitored by the wastewater plant operators and independently by an outside consulting firm.

➤ energy sharing system (DESS), which takes low-temperature energy from the existing Whistler Village Sewage Treatment Plant and uses it for the heating and cooling of buildings in the project. The DESS was designed with capacity for a community of 400 residential units and their ancillary services – almost all of which are now sold.

Treated sewage is pumped from the existing treatment plant to an adjacent mechanical plant room, where it is filtered before passing through a bank of heat exchangers. A two-pipe, reversed-return, closed-loop system around the Athlete's Village supplies the energy required for all of the heat pumps in Phase 1 of the project.

Water from the heat exchangers in the mechanical plant room is pumped through high-density polyethylene piping, around the distribution loops, providing the energy source for the heat pumps within each of the village buildings. There are no circulating pumps or control valves between the connected building supply and the return to the DESS, with control governed entirely by the pressure difference between the supply and return mains.

The heat pumps in each unit were selected to provide 60% of the peak capacity for heating and/or cooling, with electric

heating elements installed in each building as backup. The largest pipe to discharge from in the system mechanical room is 356mm in diameter.

Phase 1 flow from the mechanical room is maintained at 76 l/s. Flow rate for the completed system will be 101 l/s. Space has been reserved for a future heat exchanger and pump. Two gas-fired standby boilers are located in the mechanical room.

District energy sharing system

The innovative aspects of this project rest in the district energy sharing system (DESS). The system is providing heating, cooling and domestic hot water to a very large development using the energy that is reclaimed from the sewage treatment plant. The first year's operation of the system is producing an energy saving of almost 50%, compared with that of a comparable natural gas system. As the system is expanded and the operation refined, this figure is expected to rise to a 60% saving.

The distribution piping creates thermal storage, which is used by the building heat pumps, functioning in either heating or cooling modes. The use of a non-freezing compound in the system was not considered necessary because of the temperatures ➤

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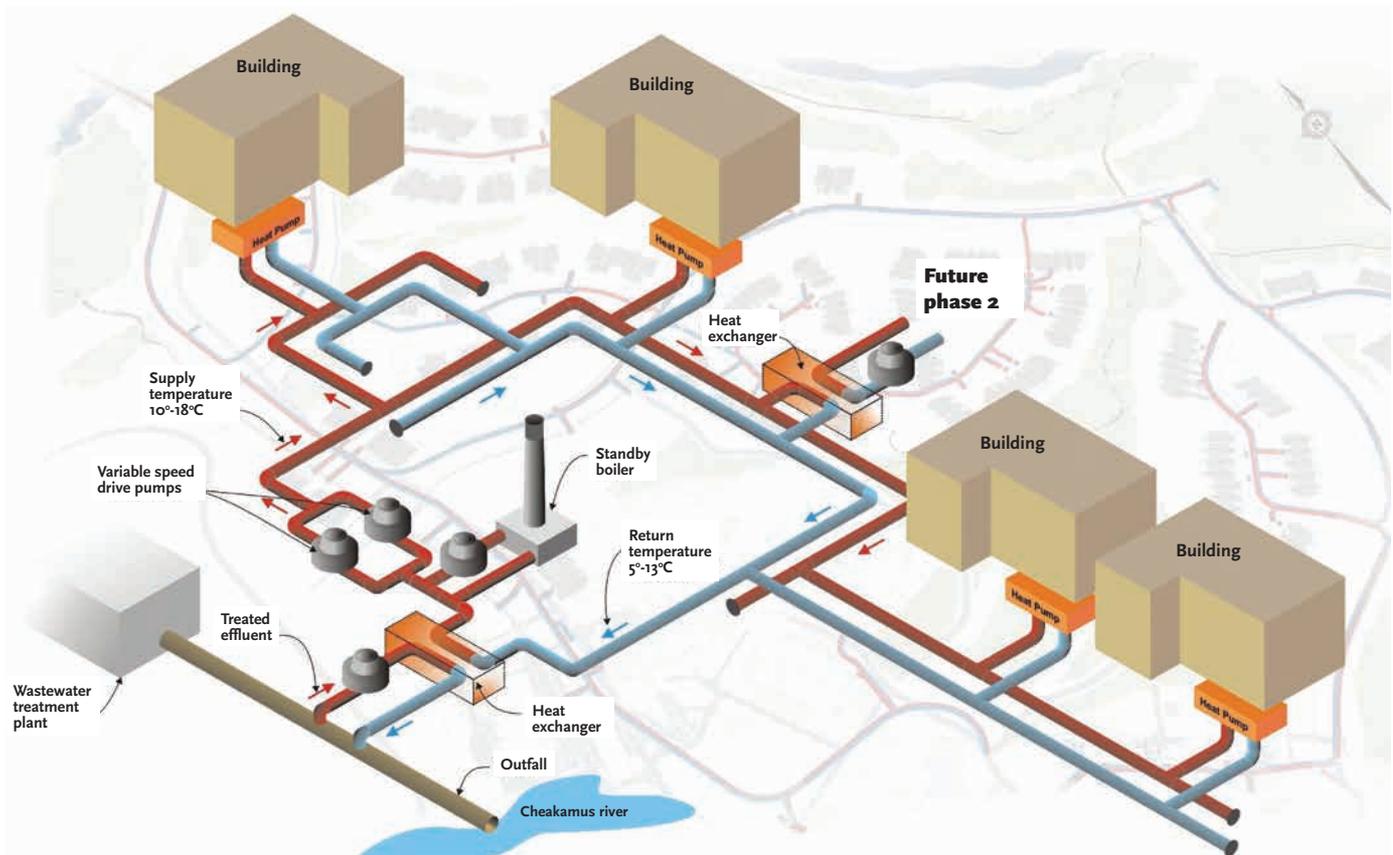
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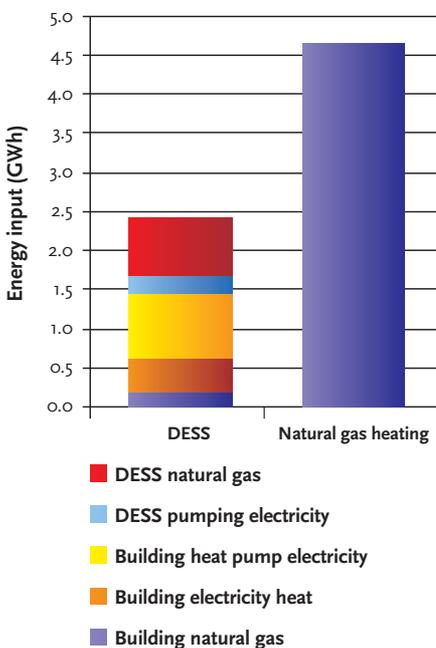




Whistler Athletes' Village district energy-sharing system (DESS) schematic
Two-pipe closed loop can provide both heating and cooling

Although there have been some hitches caused by start-up, control system adjustment and effluent filtering, they compare favourably with the original calculated figures

District energy vs natural gas heating



maintained in the DESS. It is estimated that the design life of the system will be at least 50 years, and will require minimum maintenance. The first year's operation demonstrated it would be inexpensive to operate.

The system, when completed, is projected to have provided a 70% reduction in greenhouse gases over a comparable district heating system, and up to 3,200MW hours of building energy per year, using energy that would otherwise be wasted.

Air quality and thermal comfort

Indoor air quality and maximum outdoor rate for the housing and hostel was determined using ASHRAE Standard 62.1.2004. Controls were set in each building to provide comfort conditions, according to ASHRAE Standard 55-2007. Each of the attached residential units has its own heat pump or pumps, taking energy from the DESS and distributing it to the individual spaces.

In the summer, when the heat pumps are in their cooling mode, the excess heat in the DESS system is returned to the sewage plant effluent through heat exchangers. The domestic water is heated by the energy drawn from the DESS. Domestic water maintained at 54.4°C is heated by the energy drawn from the DESS. The hostel is somewhat different. The ground floor

has been converted into a restaurant, while the upper floors are fitted with bunk beds, which are independently rented. Heat pump recovery units reclaim the heat from all of the exhaust air and use this air as ventilation for the rental areas.

An air-to-water heat pump on the roof provides hot or chilled water for the ground-floor fan coil units. To get the optimal thermal comfort of 60% thermal radiation and 40% thermal convection (ASHRAE HVAC Application 2007), heating is provided by radiant floors. Control set points for temperature are always within acceptable ranges that provide the thermal comfort, according to ASHRAE Standard 55-2004.

Actual results

Phase 1 of the project has completed two full years of operation, with the actual loads experienced being monitored. The connected buildings are 82% residential and 18% commercial/industrial. The loads used in arriving at the savings are actual and, although there have been some hitches caused by start-up, control system adjustment and effluent filtering, they compare favourably with the original calculated figures.

The savings experienced were in part, as a result of the energy extracted from the sewage, the use of variable-speed drives



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on all of the pumps and the reclamation of energy from the connected buildings. Measurements cover the period from August 2010 to August 2011.

As of June 2013, the DESS has shown a 47% reduction in energy, compared to traditional natural gas heating systems, and a 39% reduction compared to electric systems. The results, based on data received from the installed monitoring equipment, compare initial calculations with total energy savings. The site estimate for the completed project was calculated as being 4.69GW.

This total site load was estimated, using general energy intensity values per floor area and by inserting these figures into in-house energy software. The daily heating load was initially modelled for the site using 2004 temperature data and assumed balance temperatures. To estimate the total load for the measured year (August 2010 to August 2011), the initial weather data was replaced with 2010-2011 weather data, and the balance temperature was adjusted such that the modelled DESS loads matched the measured DESS loads.

Cost effectiveness

The capital cost for the completed village's DESS was estimated at US \$4-5m (£2-£3m). A comparable conventional district heating system was estimated at between \$25m (£15m) and \$33m (£20m) – \$20-\$25m (£12-15m) for insulated steel pipe and \$5-\$8m (£3-5m) for the energy centre. The DESS: uses high-density polyethylene, uninsulated piping; operates at ambient temperatures; benefits from energy sharing between buildings in heating and cooling modes; and requires fewer capital and operating costs.

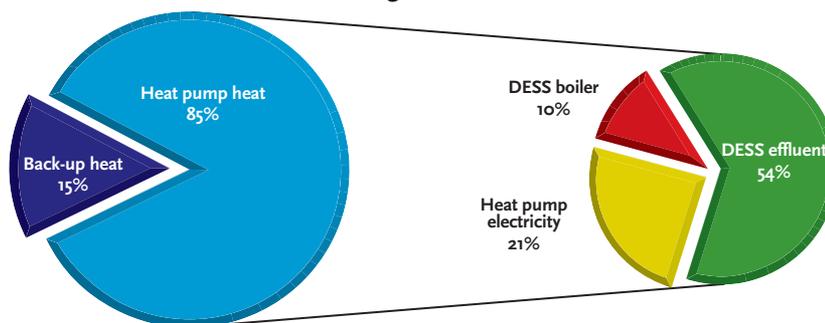
Environmental impact

Reduction in greenhouse gases is a key factor in the installation of the DESS. The provision of polyethylene for all of the underground piping and the possible future use of tertiary effluent for non-toxic water distribution – such as treated sewage water used for toilet flushing – are examples of impact reductions. The greenhouse gas (GHG) emissions associated with space heating, space cooling, and domestic hot water were calculated using electricity and natural gas consumption. Electricity in British Columbia is assumed to produce 0.022 tCO₂e. The GHG emissions for a 50/50 mix of standard distributed natural gas heating and electric heating and cooling were calculated as 497 tCO₂e per annum. The DESS, using wastewater heat recovery,



Polyethylene piping was laid across the site

Heating load source



Energy source	Annual loads
Electricity used by all attached heat pumps	836 MWh
Electricity used by all circulating pumps	220 MWh
Back-up electric heat	605 MWh
Back-up natural gas heat	213 MWh
Natural gas used by central boilers	759 MWh
Total	2,633MWh
Design heating load (calculated)	2.65 MWh
Total annual site load (calculated)	3,949 MWh
Total DESS energy consumed	2,633 MWh
Total DESS efficiency	150%

Energy savings of using district energy sharing system

reduced the typical emissions by 285 tCO₂e, which is a 57% reduction, or equivalent to taking approximately 57 cars off the road. On completion, it is projected to provide a 70% reduction in greenhouse gases. CJ

RICHARD PERRY C.ENG, P.ENG Fellow ASHRAE, a senior engineer emeritus and ASHRAE president from 1983-84; **TOM REN** P.ENG, Member ASHRAE is project engineer for alternative energy at DEC Engineering. Both are members of ASHRAE's British Columbia chapter

The DESS has shown a 47% reduction in energy compared to traditional natural gas heating systems, and a 39% reduction compared to electric systems

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Buildings WITH BRAINS

Professor **Derek Clements-Croome**'s Dreosti Memorial Lecture series in South Africa questioned whether intelligent buildings can provide alternative approaches to heating, ventilating and air conditioning. He considered 'intelligence' both in terms of new technologies, smart materials and robotics, and in the lessons designers can draw from nature. Here, he considers how these factors are already shaping the future of buildings



Smart Material Houses: BIQ, Bioreactor façade (IBA-Hamburg GmbH / Johannes Arl)



Asian Cairns by Belgian architect Vincent Callebaut

Architecture is the science and art of a building created by combining materials and systems to work in harmony with nature. Whether caves, igloos, mud huts or 21st-century commercial icons, all buildings use materials and technological adaptations to create environmental conditions suitable to their occupants' needs. A purely passive building uses simple means, like orientation, mass and forms to achieve the optimum environment without any technological systems.

In contrast to this, James Law, an architect working in Hong Kong, describes a new

Robots can be produced on a nano scale and can be inserted into ventilation and heating systems to give feedback for maintenance schedules

architecture that integrates the traditional elements of a building with new technologies that go well beyond the obvious, calling it Cybertecture. 'In the 21st century, buildings will be different from the 20th century,' he writes. 'They are no longer about concrete, steel and glass, but also the new intangible materials of technology, multimedia, intelligence and interactivity. Only recognising this will bring a new form of architecture to light, namely a Cybertecture.'

A highly significant area of development will be in smart materials, which will revolutionise the way that the building façade, and the materials used for equipment, can be designed. Material scientists can already alter the properties of materials by working at a molecular level. Nanotechnology is having a large influence on the properties of materials by allowing modification at a molecular level, and practical examples already being seen, include concrete that is lighter but many times stronger than traditional concrete (the work of Pacheco-Torgal in Portugal, for example). It can be expected that glass will eventually become as thermally efficient as other materials.

Self-healing building skins, akin to those found in nature, are feasible. Materials embedded with graphene, as well as nanotubes, will offer a wider range of properties than we are accustomed to. The development of prefabricated self-assembly units using 3D and 4D industrial printing is another significant area. According to the US architect Skylar Tibbits, 4D printing may lead to self-constructing buildings, made of units that are self-adjusting and even keep creating.

In contrast to this advanced technological approach, industrial hemp is a renewable crop material that offers low embodied energy, high thermal mass, is hygroscopic and sufficiently airtight – even if hemp constructions do allow a trickle of air through them. Strawbale construction has also been used successfully by architect Sarah Wigglesworth in the UK, for example. Rammed earth is another sustainable approach advocated by architects like Martin Rauch in the US and Anna Heringer in Germany. The Japanese architect Shigeru Ban is noted for his work with recycled cardboard. Waste composites also offer immense possibilities for construction.

Animals and plants can teach us a lot about how to be economic with the use of energy and materials. Biomimetics can be expected to offer lessons from nature that can be applied to architecture. For some time now, structural forms used in construction have mimicked those seen in plants and trees, but there is still much to learn.

These developments mean the façades of buildings will, as Law expressed, become communication channels between climate



The Cybertecture Egg by James Law
Cybertecture planned for Mumbai

Commercial organisations can encourage their staff to be more aware of green measures by offering green bonus schemes

and the occupants. Not only this, but they will also impact on the way we deal with heating, ventilating and air conditioning, because they give rise to a new generation of energy-producing buildings.

The occupants of buildings often say they have little control over their environment. There is currently a debate about the need for personal carbon footprints, plus a growing trend towards respecting the needs and responsibilities of the individuals who occupy buildings. The emergence of sensors that can be embedded into clothing, materials and equipment, together with wireless sensor

networks, will result in a ubiquitous network providing extensive and valuable real-time data on performance.

The captured data on occupants' responses to the changing environment can be analysed to reveal significant patterns that can be used to provide a degree of personal control. This will become normal practice over the next few years. Wearable electronics in clothing and personal accessories are already highly developed in the textile industry, and will help people to become more aware of the impact their actions on energy and water consumption, for example.

Smart metering in buildings will help us to understand the influence of occupancy behaviour on consumption levels, and guide people to ways in which they can reduce these levels and become more sustainable.

The benefit to the domestic consumer is that they can save money and, in the case of commercial buildings, organisations can encourage their staff to be aware of green measures by offering green bonus schemes.

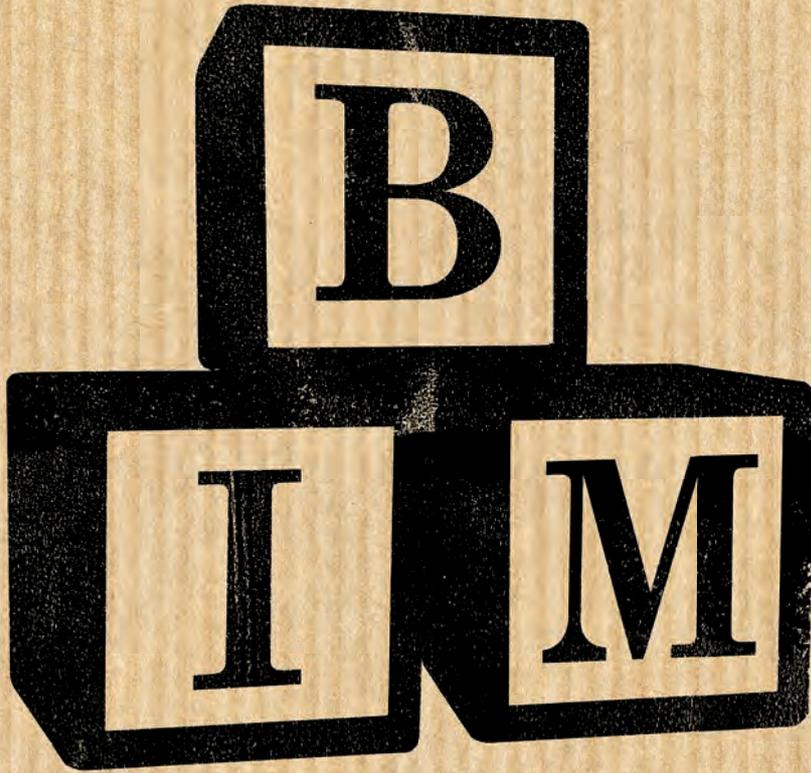
Also, by comparing the performance of the building and its systems with the responses of the occupants, one can easily define areas of dissatisfaction and see if more appropriate design criteria may be used. It is already

Friendly bacteria

We have tended to think of bacteria in a negative sense, but now there is much research showing applications using the chemistry of bacteria, such as the microbial fuel cell for generating electricity being researched at the Netherlands Institute of Ecology.

Algae is another exciting area. The BIQ apartment complex in Hamburg was completed in May 2013 and generates heat from its dynamic façade, which has – on the southern aspects – bioreactors in the form of transparent

glass containers that create a controlled environment for photosynthesis to take place and algae to grow aided by liquid nutrients, carbon dioxide and pressurised air. Part of the light not used for photosynthesis is converted into heat, so the containers double as solar collectors. The algae is collected periodically and fermented to produce methane, which can generate electricity. Firms such as US-based Grow Energy is marketing this Verde algae system for mounting on walls or roofs.



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► evident from water metering that considerable savings in consumption can be made.

Rapid advancements in information and communication technologies, such as the hafnium chip, will increase computer power and speeds of operation. Flexible fold-up electronic screens will make e-material portable anywhere. (Already Silicon Valley is being reborn as Hafnium Valley.) Voice activation is now common, but thought control of mobile devices will make communication and creative design more flexible and immediate to user needs.

Cloud computing means virtual data storage will not only decrease computer energy cooling loads, office space and administration time, but also offer the means for smart mobile devices to tap into the internet for required data. The networked world opens up a new avenue of understanding and opportunity to model complex non-linear dynamic systems for design and management processes. The development of virtual-reality scenarios will allow the client to have much greater participation in design and management processes, as well as allowing greater integration between the various systems.

Robotics offers a means of improving the maintenance and cleaning of systems. Robots can be produced on a human scale or on a nano scale, and can be inserted into ventilation and heating systems in order to give feedback for maintenance schedules and to conduct internal maintenance in systems

where access is difficult. MIT Media Lab is developing robotic walls to make spaces more flexible and adaptable.

Attention will need to be given to the education and training of the design and management team, the composition of which will likely change to accommodate other emerging environmental disciplines. In the future, we can expect to see foundation courses for architects, engineers, sociologists, economists, planners and developers, before they specialise in their appropriate disciplines, so they cultivate a common language.

Resource consumption, information and communication systems, client-driven knowledge-based design and construction processes are some of the current key issues, but these have to be viewed within the grand scene for the future described in *The Singularity is Near* (2005) by Ray Kurzweil, Google's director of engineering.

The 'singularity' is an event we cannot see beyond, such as when people will be at one with intelligent machines – according to Kurzweil, this will be in about 2045. He forecasts that we will be able to reverse-engineer the brain by 2029. Whatever the speculation, the future will be challenging, but will afford us opportunities to improve quality of life throughout the world. Intelligent buildings and cities are a vital part of this evolution. **CJ**

DEREK CLEMENTS-CROOME Professor Emeritus in Architectural Engineering at the University of Reading

Self-healing building skins, akin to those found in nature, are feasible



4D printing at MIT



The Capital by James Law Cybertecture



Google's 3D glasses



The Lilypad by Vincent Callebaut – designed for communities threatened by rising sea levels

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BANISHING BLACKOUT BRITAIN

It's easier than you might think to keep the lights on, says ECA Head of energy solutions, Bill Wright

Business continuity

As the EU Large Combustion Plant Directive compels us to cut emissions and close some of our power stations, and with others coming to the end of their useful lives, the UK will soon be entering a period where generating capacity may not meet demand, particularly during peak winter periods.

If this happens, parts of the country may experience 'brown outs', or energy fluctuations from reduced voltage; and we may even need to get used to periodic black outs.

While such incidences are not likely to occur on a large or national scale, businesses need to know that their premises and systems can continue to operate if they are affected by local energy supply issues.

Standby solutions

As the most effective energy security measures are tied into the building and its operation, it makes sense to incorporate standby power systems into commercial premises.

For any scenario, critical systems should be identified to ensure they can be maintained in the event of a power outage.

Backup power systems provide the ideal solution; be it the installation of a permanent standby generator set, or the provision of a means of temporarily

connecting an alternative power supply. These could be in the form of generating sets or Uninterruptible Power Supplies (UPS).

Lighten the load

And of course all buildings, existing or new, should seek to minimise their electricity demand and use energy as efficiently as possible.

The use of efficient lighting, variable speed drives and the incorporation of Building Management Systems (BMS) makes good business and financial sense and can be relatively easily retrofitted in many cases.

Installing renewable energy sources such as PV or Heat Pumps will ensure the building uses substantially less energy and reduce energy bills. There are also financial incentives such as the Green Deal on hand to finance these energy efficient sources.

Peace of mind

A little forward planning could help shield a building against the security risks and



loss of business that could otherwise be a reality should the lights go out.

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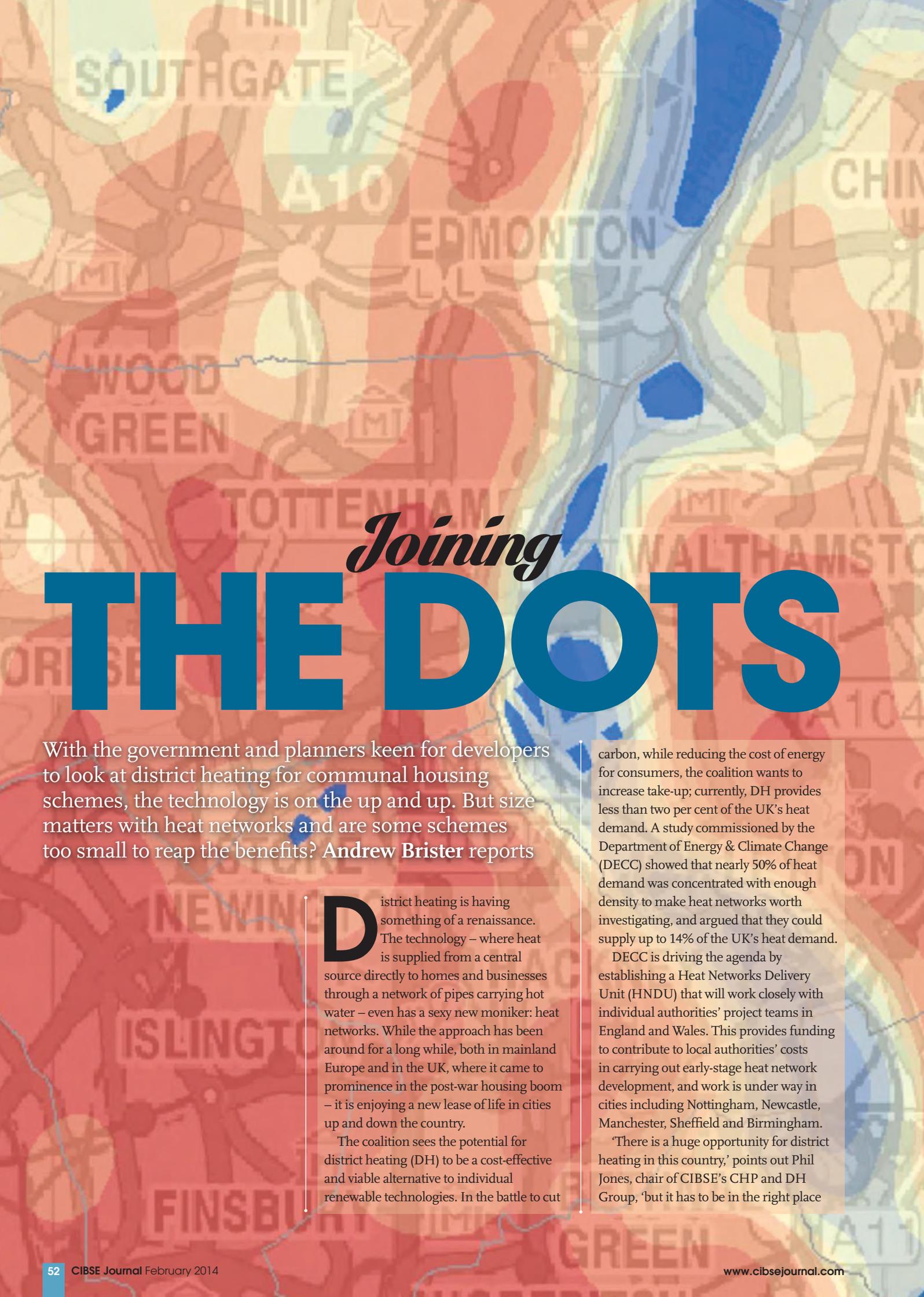
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Joining THE DOTS

With the government and planners keen for developers to look at district heating for communal housing schemes, the technology is on the up and up. But size matters with heat networks and are some schemes too small to reap the benefits? **Andrew Brister** reports

District heating is having something of a renaissance. The technology – where heat is supplied from a central source directly to homes and businesses through a network of pipes carrying hot water – even has a sexy new moniker: heat networks. While the approach has been around for a long while, both in mainland Europe and in the UK, where it came to prominence in the post-war housing boom – it is enjoying a new lease of life in cities up and down the country.

The coalition sees the potential for district heating (DH) to be a cost-effective and viable alternative to individual renewable technologies. In the battle to cut

carbon, while reducing the cost of energy for consumers, the coalition wants to increase take-up; currently, DH provides less than two per cent of the UK's heat demand. A study commissioned by the Department of Energy & Climate Change (DECC) showed that nearly 50% of heat demand was concentrated with enough density to make heat networks worth investigating, and argued that they could supply up to 14% of the UK's heat demand.

DECC is driving the agenda by establishing a Heat Networks Delivery Unit (HNDU) that will work closely with individual authorities' project teams in England and Wales. This provides funding to contribute to local authorities' costs in carrying out early-stage heat network development, and work is under way in cities including Nottingham, Newcastle, Manchester, Sheffield and Birmingham.

'There is a huge opportunity for district heating in this country,' points out Phil Jones, chair of CIBSE's CHP and DH Group, 'but it has to be in the right place

6 The London Plan doesn't say DH is mandatory. We can't have policy holding up development, and it has to be economically viable



Islington Council's district heating scheme links the hot spots on the London Heat Map

and done in the right way. With the right energy loads – high enough, flat enough and long enough energy demand patterns for heat – then it can be a highly-viable proposition. However, I believe that there are situations where it's been put in that are too small, with the wrong energy loads.'

Planners are keen for developers to consider the technology, and anecdotal reports suggest that they won't take no for an answer. Indeed, in London, the Mayor's target is to achieve 25% of London's energy supply from decentralised energy sources by 2025, with the London Plan the mechanism for change. 'Planners seem to be insisting on district heating for schemes as low as 50 homes, which are very hard to make viable,' says Jones. 'Heat loss is a high proportion of the total heat demand, the efficiency is poor and the capital cost of the unit and pipework is very high, relatively speaking.'

Matthew Pencharz is senior advisor on environment and energy to the Mayor at

Greater London Authority (GLA). 'The London Plan does not say that district heating is mandatory. We can't have policy holding up development, and it has to be economically and technically viable.' Peter North, senior manager, programme delivery at the GLA, is currently directing London's Decentralised Energy Project Delivery Unit (DEPDU). He argues that engineers need to carry out better feasibility work upfront. 'Applicants often aren't able to set out the numbers in a clear way to demonstrate to our planners.'

Huw Blackwell, a former sustainability consultant at Hoare Lea, is now decentralised energy project officer at Islington Council, where he is part of the team behind the next phase of the London authority's Bunhill Heat and Power heat network. 'I haven't yet seen any definitive work that says a 40-50 unit scheme is not financially viable,' says Blackwell. 'It's certainly technically viable. Yes, there are higher capital costs, but it's difficult to compare maintenance costs for DH with



CODE OF PRACTICE ON DISTRICT HEATING

Feedback from district heating/cooling schemes is providing strong evidence that some systems are not performing to expectations. Problems such as poor pipework specification and layout, lack of insulation continuity, high operating temperatures, poor pumping and flow control have been reported, as well as a lack of accurate metering and poor commissioning.

'There has been a growth in smaller domestic schemes and many of these are not delivering,' says Phil Jones, chair of CIBSE's CHP and DH Group. 'The sector needs underpinning standards on feasibility and planning through design, installation, commissioning and into operation, to ensure DH systems actually deliver.'

CIBSE and CHPA have formed a partnership to enhance the quality of heat networks. This aims to develop and implement standards for district heating/cooling to help take this sector to the next level. This would begin with a Code of Practice publication.

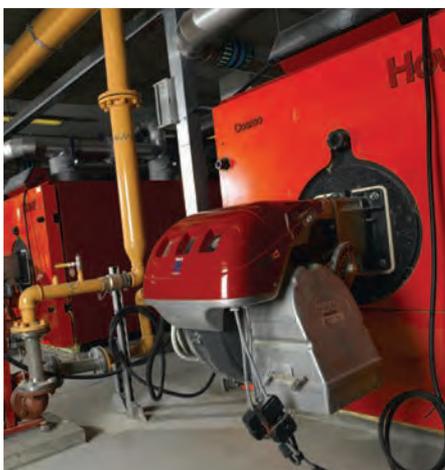
'The adoption of a Code of Practice by developers could be used to support marketing by providing assurance to customers and property purchasers that the DH scheme has followed a set of design, installation and commissioning standards,' says Jones. 'A condition of receiving private investment or public funding could be that the Code of Practice has been followed. The assurance provided by the standards and accreditation should therefore have a significant effect on the DH market.'

For more on this topic, visit www.cibse.org/chp





Combined heat and power units at Bunhill and Dalston



homes are overheated and people throw open the vents to discharge the heat.'

E.ON is one energy services company (ESCO) that is making DH schemes work, at least on a large scale (see box on page 56). Would it get involved on a 50-unit scheme? 'We look at schemes with 300+ units,' says Jeremy Bungey, head of community energy at E.ON Energy Solutions. 'That way we can offer a price position for customers that will be cheaper than gas-fired boilers. We could look at 200+ if there was a large commercial load, otherwise it's difficult for it to be viable because of the fixed costs.'

Planners hope that small heat networks will eventually connect to neighbouring schemes where they begin to make sense. The reality is that there is little incentive for developers to look to do so. Affinity Sutton is one of the largest housing associations in England. It has a number of district heating schemes in operation, several of which have less than 100 units. 'We struggle to make this viable on our smaller schemes,' says Jake Lock, development manager. 'Yet it's hard to argue against the planners.'

Planning is not the only issue affecting the viability of DH schemes. Problems such as poor pipework specification and layout, lack of insulation continuity, high

‘We struggle to make this viable on our smaller schemes,’ says Jake Lock. Affinity Sutton housing association hopes that small heat networks will eventually connect to neighbouring schemes, where they begin to make sense

▶ those of individual boilers in each home.'

Certainly, the London Plan stresses the need for lifecycle costing rather than capital costs to be considered when developing heat networks – a difficult tenet in cash-strapped times. 'The biggest single evil is the curse of someone saying: "Build me a system at capital cost X," regardless of performance. Corners are going to be cut,' says Blackwell.

Terry Keech, partner at consultant calfordseaden, is critical of the London Plan: 'They are not thinking this through. Some of the 50-unit schemes don't stack up economically and the charges end up being high for the consumer. Equally, you've got to question the CO₂ savings. These are highly-insulated homes with low heating requirements. With DH you are looking at 80/60°C flow and return temperatures –



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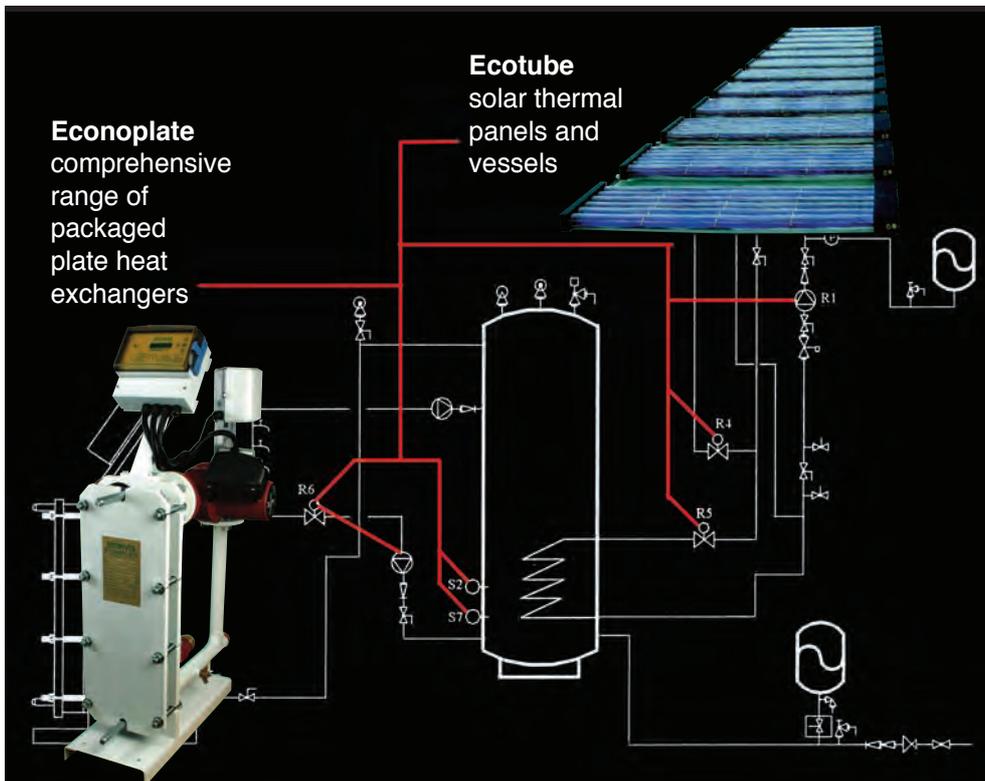
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operating temperatures, poor pumping and flow control have been reported, as well as a lack of accurate metering and poor commissioning. Hence the urgent need for CIBSE's forthcoming work on minimum standards (see box on page 53). 'There are challenges on the technical side, but they are quite achievable,' argues Bungey. 'You have to manage the system – monitor, control, look at the demand, alter the flow – and be sophisticated in terms of building control. If you have it set up incorrectly, problems can escalate.' Terry Keech calls for more post-

occupancy evaluation of schemes to learn what works and what doesn't.

There are also concerns that, as the market grows, there will be a lack of skilled engineers to do the job. 'We do find it difficult to find competent people,' says Bungey. 'It's quite difficult and we are looking abroad and considering apprenticeships.'

It's clear that today's heat networks face many obstacles, but also present a massive opportunity. CIBSE, the CHPA and others are doing their bit to make sure the sector does not end up in hot water. **CJ**

The London Plan stresses the need for lifecycle costing rather than capital costs to be considered when developing heat networks



District heating – not just a London thing

E.ON is working with five developers to build one of the largest district heating schemes outside London. The scheme at Cranbrook, near Exeter in Devon, will see 3,500 homes, and the 107-acre Skypark business park – comprising 1.4 million sq ft of commercial and retail units – all connected to a district heating network via E.ON's energy centre.

Outline planning consent was granted in June 2010 and construction began in the second half of 2011 on the first 2,900 homes. The first residents moved into their new homes in 2012.

It is expected that work on the residential area will be completed within eight years, and the Skypark development within 16 years. The scheme is recognised as a location for large-scale employment and is expected to provide more than 6,500 new jobs.

E.ON is responsible for the design and operation of the heat distribution network and energy centre, including heat interface units that will pipe heat into the individual homes and commercial premises.

The £3m energy centre is located on the £120m Skypark development. The low carbon



The energy centre below is located on the Skypark site

heat source will change over time as the developments grow, with gas-fired boilers being supplemented by gas-fired combined heat and power (CHP), and later by biomass-fuelled CHP.

Renewable microgeneration technologies will also be added to the Cranbrook and Skypark properties to further meet low carbon targets.

The scheme is projected to deliver up to 13,000 tonnes of CO₂ savings over a conventional approach.



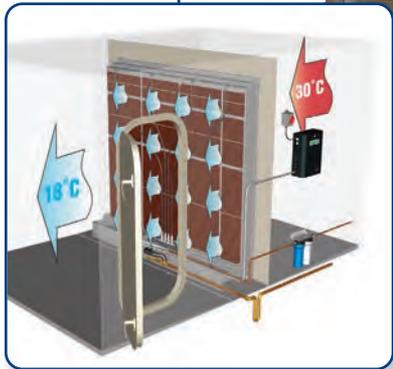
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Talking HEADERS

Low loss headers play a vital role in ensuring that boilers operate at a constant flow rate, so why is there such a lack of design guidance? **David Palmer** sets out some rules

6 An immediate consequence of low flow velocity is the potential for sludge and debris to collect in the header

Low loss headers, often referred to as common headers, are advocated as design best practice because they enable boilers to be controlled in their own constant flow rate circuit while flow rates in load circuits vary. The preferred hydraulic circuit arrangements in CIBSE Guides B and H show boilers and load circuits connected by a low loss header. However, there is an absence of guidance on how to design them. Coupled with a lack of understanding of how they should operate, this can result in the very circuit interactions and boiler controllability issues the designer is attempting to eliminate.

Why they are needed

The principal function of a low loss header is to provide hydraulic isolation between both primary (containing heat generators) and secondary (load) circuits: water will flow in a closed circuit only if there is a pressure difference across it. The following are simplified examples to illustrate the benefit of a low loss header.

Figure 1 shows a boiler without a low loss header. It comprises a boiler and pump in a

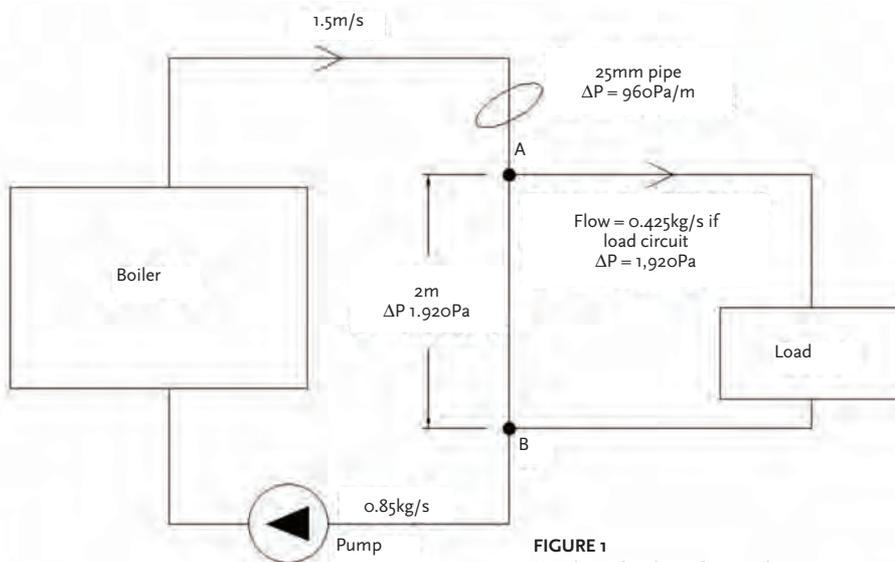


FIGURE 1
Circulating header with secondary connections

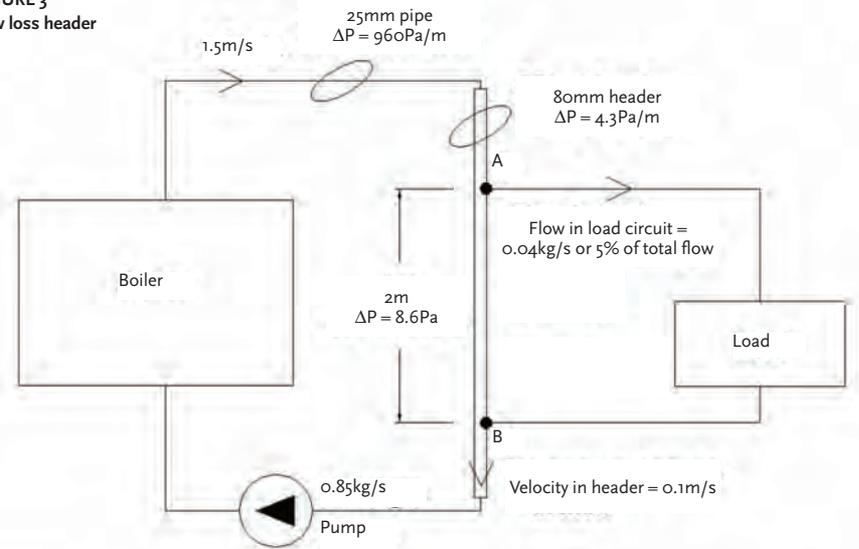
primary circuit, and a secondary circuit attached across the primary pipe. If the primary circuit has a flow rate of 0.85kg/s at a velocity of 1.5m/s in a 25mm pipe, the pressure loss will be 960Pa per metre length of primary pipe (ignoring bends and fittings). If the secondary circuit connection points A and B are 2m apart, a pressure difference of 1,920Pa will appear across the secondary circuit. Then, if the pressure loss in the secondary circuit is also 1,920Pa, 50% of the flow will pass through the load.

However, if points A and B are close together, say 100mm apart, the pressure difference across the secondary circuit will be only 96Pa, producing less flow in the load circuit (figure 2). However, even with the secondary flow and return pipes close together, an unwanted flow of 22% of the primary flow can still be produced in the load circuit.

A low loss header achieves hydraulic isolation by reducing the pressure loss along the header to a very low value. Figure 3 shows the same circuit but with an 80mm header, which reduces the pressure drop to 4.3Pa/m at a flow velocity of 0.1m/s. With the secondary circuit connections again spaced 2m apart, the unwanted flow in the load circuit is now just 5% of the primary flow. At realistic secondary circuit pressure losses the unwanted secondary flows by using a low loss header will be 1% or less of the primary flow



FIGURE 3
Low loss header



many boiler manufacturers who recommend header length and connection spacings for their own boilers. Some general rules inferred from their data are:

- The greater the output of the boilers, the larger the header diameter and the longer the header needs to be
- The greater the system design temperature drop, the lower the flow rate, the smaller the header diameter and the shorter the header
- The greater the total load, the more widely spaced the secondary connections need to be
- For a constant flow temperature system on the load side, the secondary connections should be inside the primary connections
- For a constant return temperature system on the load side, the secondary flow connection should be above the primary flow connection.

Boiler manufacturers' guides mostly

and a pump is required in each secondary circuit to achieve the required flow.

An immediate consequence

of low flow velocity is the potential for sludge and debris to collect in the header. For this reason, a low loss header should always be mounted vertically with a sludge trap and drain cock at the bottom (figure 4). The lowest connection point on the header must be above the level at which sludge collects.

Header length and separation distances

Header design information is provided by

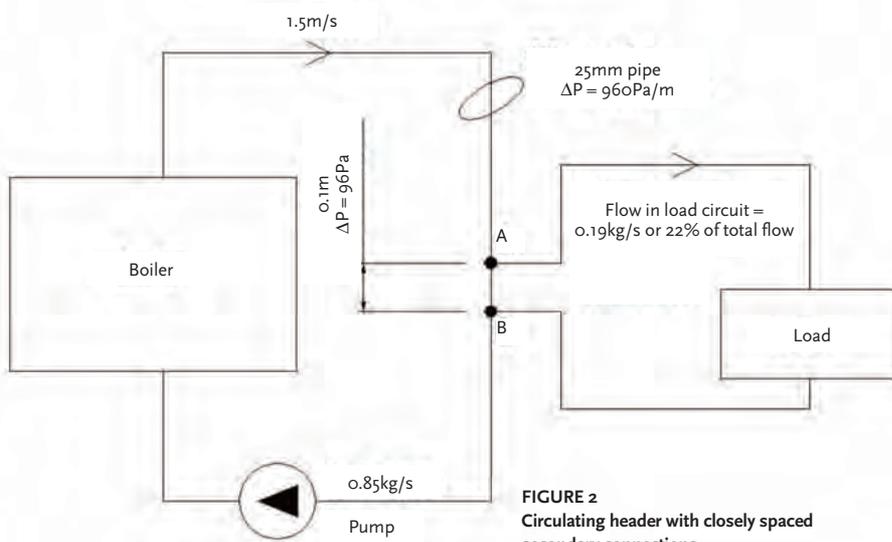


FIGURE 2
Circulating header with closely spaced secondary connections



DESIGN RULES

Key considerations include:

- Is the system to be designed for constant flow or constant return temperature?
- Do all of the load circuits operate at the same temperature, or is there a mix of higher temperature (such as air handling units) and lower temperature (underfloor heating or oversized radiators) circuits?
- Are multiple boilers to be used on the primary side?
- Is a biomass boiler to be included in the boiler mix?
- What turnaround ratio will result on the primary side of the header?
- Will all load circuits operate at the same temperature difference?

To achieve true hydraulic separation a low loss header and its associated circuits should be designed as follows:

- Rule 1: For constant flow temperature operation, the flow along the header must always be in a forward direction, requiring $Q_p > Q_s$ at all times, and the secondary flow connection must be sited below the primary flow connection as in figure 5
- Rule 2: For constant return temperature operation $Q_s > Q_p$ and the secondary flow connection must be sited above the primary flow connection as in figure 7
- Rule 3: The flow velocity along the header should not exceed 0.15m/s at full load. A rule of thumb is that the header diameter should be at least three times that of secondary flow connection
- Rule 4: The header should be mounted vertically to trap sludge at the bottom, while air in the system will rise to the top from where it can be removed
- Rule 5: The header should operate at neutral pressure with the suction (inlet) side of all pumps connected directly to the header
- Rule 6: System pressurisation should be directly onto the header with the pressurisation connection below the primary return and above the sludge trap

Placing pumps in any other configuration will result in unintended and unwanted circulation between circuits with unpredictable and unintended consequences

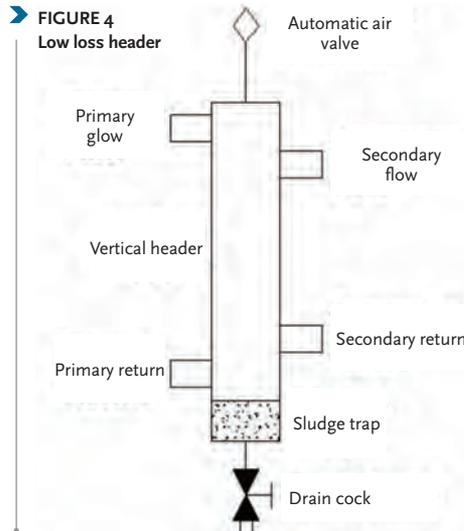


FIGURE 4
Low loss header

FIGURE 5
Correctly configured low loss header and associated circuits

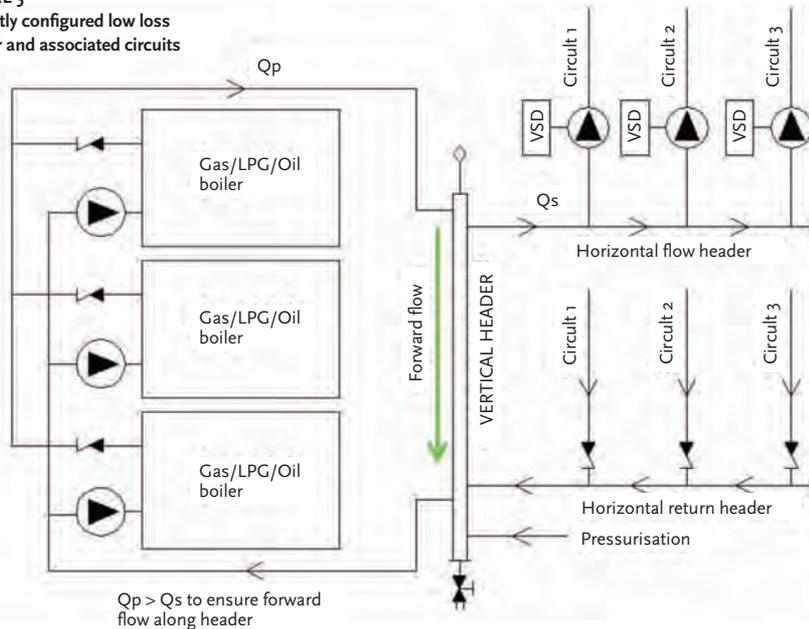
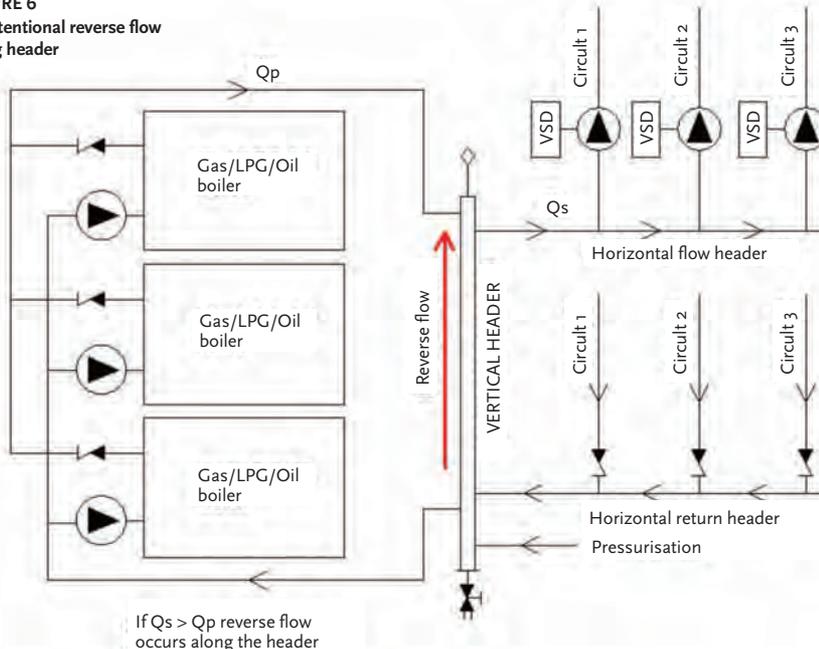


FIGURE 6
Unintentional reverse flow along header



show load circuits connected as in figure 5, where separate flow and return headers are connected to the secondary side ports on the low loss header, and not along the header itself. This allows a relatively short low loss header to be mounted vertically while the flow and return headers can be mounted horizontally. However, current UK design practice is to allow multiple primary and secondary connections on the circulating header. In order to accommodate multiple header connections, circulating headers are mounted horizontally which, in turn, requires sufficient flow velocity to prevent sludge deposition in the header. Unwanted primary/secondary circuit interactions may then occur because this arrangement does not provide the primary/secondary hydraulic isolation desired.

Constant flow temperature vs constant return temperature

The direction of water flow along the header depends on the ratio of primary flow rate (Q_p) to secondary flow rate (Q_s). If $Q_p > Q_s$, flow will be in the forward direction (figure 5). Most designs require water to arrive at each secondary circuit at the same temperature it has left the boiler – that is, at a constant flow temperature. This, in turn, requires $Q_p > Q_s$ under all operating conditions to ensure that reverse flow, and the resulting flow temperature dilution, cannot occur.

Three individually pumped boilers are shown which, operated in sequence, could achieve an overall turndown of 12:1 or better. Hence, to satisfy the condition $Q_p > Q_s$ at low loads, flow modulation of the secondary circuits is required with an overall turndown ratio of at least this value. If all, or most, of the secondary flow is on a single constant temperature (CT) circuit, this will require both large and small capacity variable speed secondary pumpsets, while splitting circuits into a number of smaller pumped circuits can avoid the cost and control complexity of large parallel pumpsets on a single circuit.

On variable temperature secondary circuits, the mixing valve will achieve the necessary modulation. It is particularly important that $Q_p > Q_s$ at all times when multiple secondary circuits are connected because reverse flow along a header can occur (figure 6).

When $Q_p > Q_s$, the mixed return temperature to the boilers at the bottom of the header will vary depending on load, but if a fixed, and low, return temperature is required – for example, for condensing boilers – $Q_s > Q_p$ at all times and the flow along the



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► header will be in the reverse direction (figure 7), achieving a constant return temperature.

To achieve continuous condensing operation in condensing boilers, the return temperature must be below 54°C at 10% excess air, while 90% latent heat recovery does not occur until the return temperature is 34°C. The flow temperature to the secondary circuits will be diluted by the recirculating flow along the header, while the secondary flow mixed circuit temperature can be calculated by nodal analysis, as can temperatures in any low loss header system. One condensing boiler manufacturer recommends that Q_s should be 30% greater than Q_p at full load.

A measure sometimes employed to avoid reverse flow along a horizontal circulating header is to insert a non-return valve in the centre of the header between the last secondary circuit flow take-off and the first secondary circuit return (figure 8). Unfortunately, this does not produce a sound engineering solution because the header is split into separate flow and return headers producing the primary/secondary circuit interactions the header is intended to avoid when $Q_s > Q_p$.

System pressurisation

To prevent unintended primary-primary, primary-secondary or secondary-secondary circuit interactions, no point on the header should be at positive pressure with respect to any other point on the header by more than a few Pa. The header should be designed as the neutral point of the hydraulic circuit with system pressurisation connected as shown in figure 5, 6 and 7. Pump inlets should be connected to the header, which places them on the return to boilers and on the flow to each secondary circuit. Placing pumps in any other configuration will result in unwanted circulation between circuits with unpredictable and unintended consequences.

There is a need for clear design guidance on how to determine the length of low loss headers and the spacing of pipe connections on the header, and to identify any other critical design rules not covered in this article. To this end, CIBSE would like to identify any fundamental research that has been carried out, or to receive details of any published technical advice from other than a boiler manufacturer. Readers are invited to e-mail their comments to consultants@campbellpalmer.com. **CJ**

DAVID PALMER is director of the Campbell Palmer Partnership and a member of CIBSE Council

FIGURE 7
Low loss header configured for constant return temperature

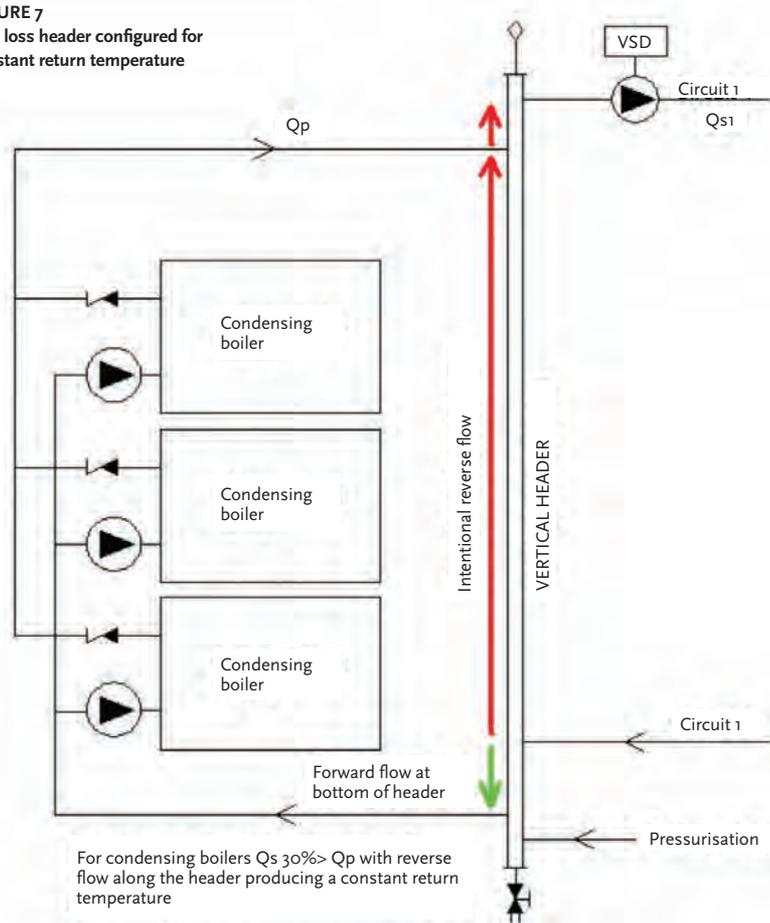
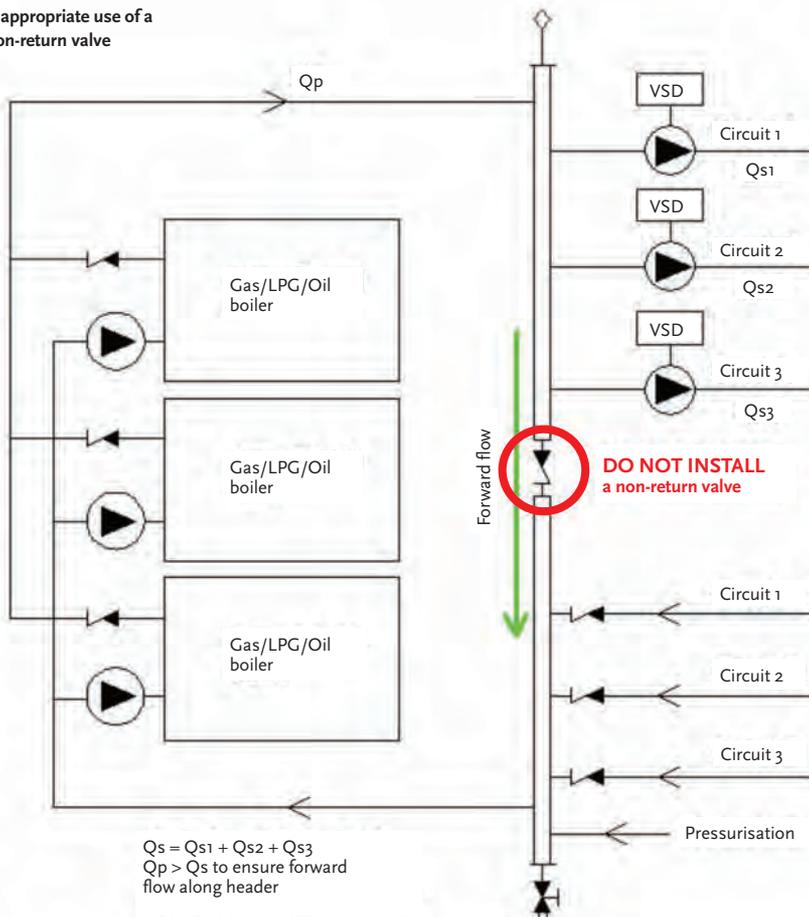


FIGURE 8
Inappropriate use of a non-return valve



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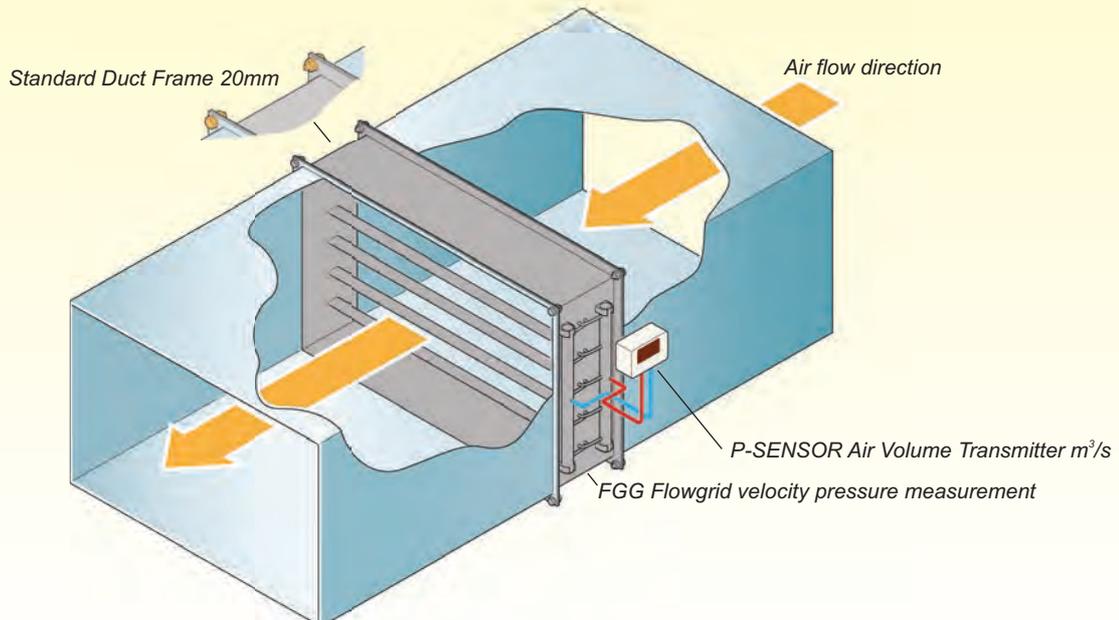
The CMR Ovalprobes are fitted across the internal duct frame area in predefined spacing. Each Ovalprobe has a number of pressure inlet points to measure the impact and static pressure at the same time and provide an average velocity measurement.

The result is a velocity pressure which ultimately provides a total air volume measurement. Both static and impact pressure have an independent pressure averaging tank which provides a smooth pressure signal of the whole measured area.

Another great advantage of the FGG Flowgrid is, that it can measure bi-directional as it is manufactured equally on both sides. This means, the air flow is measured in one direction and should there be a reverse flow, this can be detected and measured when using the CMR P-SENSOR. The Flowgrids are manufactured in standard height increments of 100mm going up to a maximum height of 1200mm.

The width of the Flow Grid is manufactured in increments of 50mm up to 1200mm. Width up to 2500mm on request. The Ovalprobes are fitted across the width and are equally spaced over the height. If the duct height is 1000mm then there will be 10 Ovalprobes fitted into this flowgrid section. The length of the Flowgrid is always 300mm but could be made in longer length.

CMR FLOWGRID and P-SENSOR providing accurate average air volume measurement in a straight duct.



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Continuous airflow measurement in ventilation and air conditioning systems

This module considers the methods and practicalities of measuring airflow

When air conditioning and ventilation systems are designed, there are often assumptions made that the airflow rate delivered through the ductwork system will match the design intent. However, this is not likely to be the case, leading to inefficient or ineffectual ventilation. This CPD article will consider the methods and practicalities of measuring airflow, specifically concentrating on applications of continuous monitoring.

The opportunity for continuous airflow measurement

It is only in cases where there are specific – and possibly special – needs to monitor the air flow rate continuously that there would normally be permanent air volume flow rate monitoring devices. This would often be where a particular air volume flow rate or room air pressure (normally as a means of maintaining positive movement of air and contaminants) must be assured to meet varying laboratory ventilation or process needs.

However, the challenges of supplying sufficient outdoor air proportions are not restricted to laboratory or process use. Variable air volume (VAV) systems are notoriously demanding to design and operate to ensure optimum outdoor air fraction, as individual zones vary their demands on the total supply air flow rate. Actively monitoring volume flow rates in the outdoor air inlet duct together

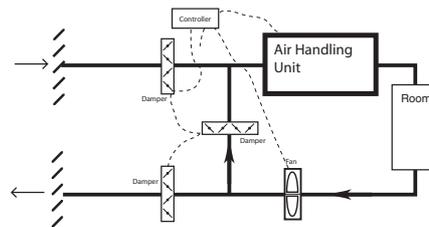


Figure 1: Simplified recirculation 'economiser' system

with zone flow rates provides information for the control system to properly modulate the outdoor and recirculation air fractions. Such control may be driven by the needs of extract systems where variable flow fume hoods are being used. In this case, there is not only a requirement to maintain appropriate total supply flow rates (and resulting room pressures), but also the most energy efficient fresh air proportions in the variable volume supply air to the room where the fume hoods are located (see *CIBSE Journal CPD*, October 2013, for further details of variable volume fume hoods).

Alternatively, and more generally, accurate airflow measurement can provide essential real time information for the commonly used systems such as the recirculation air system shown in Figure 1.

The system, known as an economiser system, will only properly economise if appropriate volumes of outside air are mixed

with the recirculated air – the proportions being set by the indoor and outdoor temperatures (or by comparing enthalpies or possibly moisture contents) and the required amount of fresh air. Without a direct measure of the incoming air volume flow rate, it may take some time – in some cases, many years of operation – before, for example, a poorly performing damper or a faulty actuator is discovered. This could result in long-term inefficient operation. This may manifest itself as in the simulated data in Figure 2 for an economiser system.

The actual flow rate through the outdoor air intake can be adversely affected by such common phenomena as varying outside outdoor wind velocities; stack induced flow within the building altering the building's pressure profiles; obstructed air intake and discharge louvers; frosted air filters; malfunctioning dampers/actuators; and faulty control loops.

Beyond the day-to-day operational needs when the building has a change of use, a variation in occupancy, altered indoor environmental quality demands or undergoes a refurbishment, real time air flow rate measurement (through both main ducts and individual sub-networks and branches) can enable the building operator to obtain information to inform the recommissioning of the system to satisfy new operational conditions.

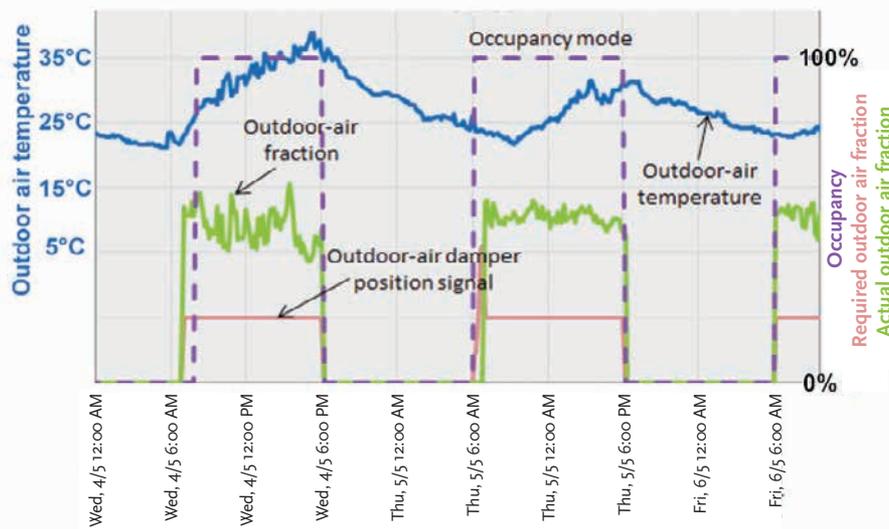


Figure 2: Example of poor performance of outdoor air regulation. The ‘required outdoor air fraction’ should be matched by the ‘actual outdoor air fraction’, but the actual airflow is significantly higher – possibly due to a faulty damper assembly (Based on material from PNNL training document)

The streamlines of ducted airflow

When air passes through a duct – whether it is rectangular or circular in section – it does not have a uniform velocity over the cross-section of the flowing air, but will have a ‘velocity profile’. The profile will depend on the upstream and downstream ductwork, its roughness and shape, and the qualities of the air. For example, as discussed by Legg², if an airstream enters the duct through a smooth intake – as in Figure 3 – the velocity profile will develop as the air flows through the duct (the length of the arrows is proportional to the average velocity at that point). It is not until some distance down the duct – possibly greater than 30 times the diameter of the duct with a smooth intake, somewhat less if the intake is more abrupt – that the flow will be ‘fully developed’.

Although air is often shown schematically as flowing in a set of parallel streamlines (as in Figure 3) that may infer to some that it is ‘laminar flow’, the typical velocity of the air in an air distribution network will determine that the flow will be ‘fully turbulent’. This means that although the bulk of air is moving forward at an average velocity, there is a continuous eddying and mixing within the airflow. Reynolds number (Re) is used to characterise the flow regime. Reynolds number is a ratio of the inertia of a fluid to its viscosity – as the ratio increases, the viscous forces will be overcome by inertia and the air will be able to more readily move around, independent of the adjacent air molecules. A Reynolds number value in excess of 4,000 would typically confirm that the flow is turbulent, and this is the normal situation in HVAC ductwork (see example calculation in box, above right).

Such a turbulent regime will have a ‘flatter’ velocity profile than that of a laminar flow, since the air is moving in all directions – while

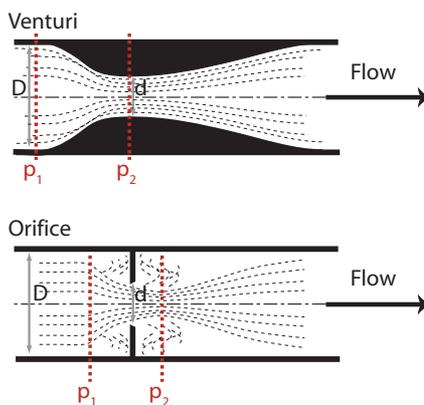


Figure 4: Simplified sketches of orifice plate and venturi measuring devices

generally moving forward – so reducing the variations in streamline velocities across the duct. Due to the shear stresses of the air at the wall of the duct (where at its closest the air is practically static) there will be a steep increase in velocity between the turbulent air moving down the duct and the duct wall.

Methods of measurement

The principal measurement techniques for permanent devices are based on basic principles that relate the cross-sectional area, A (m²), of the duct and the velocity, c (m·s⁻¹), of the travelling air to determine the volume flow rate, q (m³·s⁻¹), simply from q = A x c. The actual measurement of the air velocity will be achieved either by using a measurement of pressure drop across a device, or determining another secondary parameter that enables the velocity to be determined.

Pressure drop method of determining air volume flow rate

Any obstruction in an air stream will cause a pressure drop in the flowing air, due to the

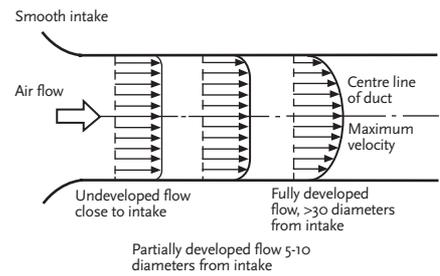


Figure 3: Development of air flow regimes in a ducted air system with conical inlet. The length of arrow is proportional to the average velocity at that point (Source: Legg²)

frictional resistance and turbulence.

By characterising the obstruction and calibrating the pressure drop against known flow rates, the value of pressure difference may be used to determine the air volume flow rate. For ducted air systems, such measuring devices include venturis and orifice plates – as shown in Figure 4.

Considering the example of the orifice plate, as shown in Figure 4, the volume flow rate of the air may be readily obtained from the differential pressures measured across the two tappings, by combining the continuity equation

$$A \cdot c = \text{constant}$$

and Bernoulli’s equation

$$p/\rho g + c^2/2g = \text{constant} \text{ (assuming the ductwork is level)}$$

where p is pressure (Pa), ρ is density (kg·m⁻³), g is gravity (9.81m·s⁻²)

This is used with a flow (or discharge) coefficient, Cd, that relates to the energy lost as the air passes through the constriction (that is dependent on the Reynolds number and design of orifice), and the expansibility of air, ε, (that is practically 1 for ventilation air ductwork applications).

So for an orifice plate of diameter d (m) that is installed in a duct diameter D (m) (and the ratio β = d/D) with pressure measurements p₁ and p₂ (Pa), the volume flow rate, Q (m³·s⁻¹), can be obtained from

$$Q = C_d \cdot \epsilon \cdot \pi \cdot d^2/4 \cdot 1/\sqrt{(1-\beta^4)} \cdot \sqrt{[2(p_1 - p_2)/\rho]}$$



Figure 5: A commercial venturi for ducted air flow measurement close-coupled to a control damper (Source: CMR Controls)

This relationship, although relatively straightforward, is simplified in its application to operational HVAC ductwork, as most of the parameters are fixed or vary little in the normal range of air temperatures (and pressures). So a measuring device (such as an orifice plate) will be calibrated by the manufacturer and will normally be supplied with a single coefficient that, when applied to the pressure drop, will provide a direct value of volume flow rate.

The same fluid flow principles apply to venturi devices. There have been many developments of the simple venturi since the original devices, which were relatively long and expensive. Modern devices used in ducted air systems (as in the example shown in Figure 5) are robust and very low maintenance, and have a length similar to the outside diameter of the ductwork.

The pressure drop as seen by the system (adding to the power demands of the fan and known as ‘permanent loss’) will be somewhat less than the measured ($p_1 - p_2$) across the device, as there will be a recovery of (static) pressure as the air velocity reduces following the constriction. For an orifice plate, this may be in the order of 70% recovery (worsening with decreasing value of β), and a venturi will recover at least 90% (as there will less turbulence) – so, in practice, the permanent losses will be relatively small with a venturi-based device.

Pitot tube devices

A classic pitot-static tube, as shown in Figure 6, is made of two concentric steel tubes with an outside diameter of approximately 10mm.

It measures two pressures – the static pressure, p_s , that is measured at right angles to the direction of flow through the outer tube (preferably in an area of low turbulence) and the total pressure, p_t (also known as the impact pressure), measured through the ‘nose’ of the inner tube that is open ended and facing directly into the oncoming air. Since the total pressure at a point in a fluid is the sum of the velocity pressure, p_v , and the static pressure, so $p_t = p_v + p_s$ and from this, the air velocity may be obtained as $p_v = 0.5 \cdot \rho \cdot c^2$

If pitot-static tubes are made to appropriate ISO standards, they will not require any calibration coefficient, and so the velocity of the air may be directly obtained at a single point in the duct from $c = \sqrt{2 (p_t - p_s) / \rho}$

However, as noted earlier, the velocity varies across the cross-section of the duct so to determine an average velocity, multiple measurements need to be taken. The required positions for measurement have been established in numerous standards and, specifically for commissioning purposes, are clearly illustrated in *BSRIA Guide to Commissioning Air Systems*³ for a ‘pitot traverse’.

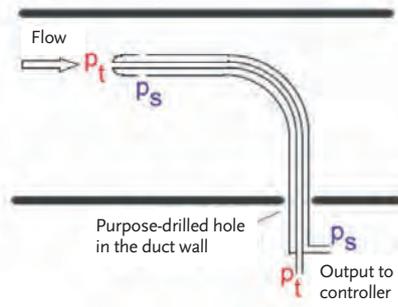


Figure 6: Basic pitot-static tube measurement of airflow



Figure 7: A commercial velocity grid (Source: CMR Controls)

To enable this in a permanent application, frameworks of measuring points have been developed (known as velocity or flow measurement grids) that take measurements across the whole face of the ductwork, as shown in Figure 7. The measuring points are distributed to ensure a representative average velocity sample.

Such grids are likely to measure total pressure and static pressure separately, using appropriately orientated holes drilled into sets of sampling tubes. Velocity grids will be supplied with their own calibration factors to convert the measured pressure into velocity or volume flow rates. They have a significant advantage over single measurements, as they can produce a much higher pressure signal, providing a greater resolution and so feasibly less error – giving measuring accuracies of $\pm 0.2\%$ of full range.

A similar concept is the averaging tube that can be added to an existing duct or new installation. This is a simple tube, flanged at both ends to fix securely into the duct walls, and specifically drilled with sampling points at locations designed to provide a representative measure of the velocity profile across the duct. Two or more of these are normally installed to provide a reasonable sample of velocity pressures over the cross-section. Properly applied, these can provide a similar resolution and accuracies to the velocity grid.

Reynolds calculation

Determining the Reynolds number for $0.2 \text{ m}^3 \cdot \text{s}^{-1}$ air at 20°C in an example rectangular duct 400 mm wide x 200 mm high.

Air kinematic viscosity at 20°C (from tables) = $1.51 \times 10^{-5} \text{ m}^2 \cdot \text{s}^{-1}$ (this is the dynamic viscosity/air density)

Hydraulic diameter of duct = $4 \times$ (flow area/wetted perimeter) = $4 \times [(0.4 \times 0.2) / [0.4 + 0.2 + 0.4 + 0.2]] = 0.267$

Average velocity = volume flow rate/duct area = $0.2 / (0.4 \times 0.2) = 2.5 \text{ m} \cdot \text{s}^{-1}$ – a velocity that would be typical in a final or branch distribution duct

Reynolds number, $Re =$ (velocity x diameter)/kinematic viscosity = $(2.5 \times 0.267) / 1.51 \times 10^{-5} = 44,205$

Since turbulent air is considered as having an Re value of greater than $4,000$, this is clearly turbulent flow.



Figure 8: A signal processor that takes the high and low pressure connections (red and blue) and is calibrated to provide direct readings of air flow parameters (Source: CMR Controls)

The pressure signal is typically processed in a local device (such as that shown in Figure 8) that may have a local readout of velocity, pressure difference and volume flow, having been commissioned with the duct dimensions and calibration factor for the measuring device, known as the ‘K factor’ – the airflow required to produce a set value of pressure difference. This is then able to transmit information to the building management system.

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References

- 1 Building retuning training guide: AHU minimum outdoor air operation, PNNL-SA-88958, buildingretuning.pnnl.gov/documents/pnnl_sa_88958.pdf, accessed 4 January 2014.
- 2 Legg, R.C., *Air-conditioning systems – designing commissioning and maintenance*, Batsford, 1991.
- 3 Parsloe, C., *BSRIA BG49/2013 Guide to Commissioning Air Systems*, BSRIA, 2013.

Turn over page to complete module ➤

Module 61

February 2014



1. In the figure providing an example of poor performance of outdoor air regulation, what was the approximate outdoor air fraction being delivered when the signal was requesting 20% outdoor air?

- A 10%
- B 30%
- C 50%
- D 70%
- E 90%

2. In the list below, what is the lowest value of Reynolds number for air flowing in ductwork that would indicate turbulent flow?

- A 1
- B 10
- C 1,000
- D 10,000
- E 100,000

3. In the orifice flow equation, what does β represent?

- A Ratio of duct static pressure before and after orifice
- B Ratio of orifice diameter to duct diameter
- C Ratio of orifice area to duct area
- D Ratio of orifice circumference to duct circumference
- E Ratio of orifice air expansibility to duct air expansibility

4. What approximate air static pressure recovery is practically possible when using a venturi measuring device?

- A 100%
- B 90%
- C 80%
- D 70%
- E 60%

5. What approximate measurement accuracy would be obtainable with a properly installed commercial velocity grid?

- A $\pm 0.2\%$ of full range
- B $\pm 0.7\%$ of full range
- C $\pm 1.2\%$ of full range
- D $\pm 1.7\%$ of full range
- E $\pm 2.2\%$ of full range

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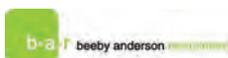
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Wessex ModuMax is a winner for Cheltenham racecourse

When the plant room at Cheltenham racecourse was in need of an upgrade, local contractor Mechanical Installation Heating Services (MIH) called on Hamworthy Heating for assistance. The grandstand accommodates 6,800 people in bars, restaurants and private boxes. MIH installed six Hamworthy Wessex ModuMax 250kW gas-fired condensing boiler modules with a total output of 1500kW. As well as providing the heating for the stadium, the boilers are the indirect primary heat source for a Hamworthy Powerstock PS300 calorifier and two 2,000-litre hot-water cylinders.

● Call 0845 450 2865, email sales@hamworthy-heating.com or visit www.hamworthy-heating.com



Damper control upgrade is major boost for fire safety systems

A new control system has been launched by smoke and fire damper manufacturer Actionair to meet increasingly testing end user requirements. The Actionpac LNS4 intelligent addressable system is a significant step forward in sophistication for smoke and fire damper control, and provides a number of features and benefits not previously available to installers and building owners/operators. It provides the user with a simple interface to damper operating data and configurations.

● Visit www.ruskinuk.co.uk



Titan Products expands TPZ-Net Zigbee Wireless Range

Titan Products continues to develop its TPZ-Net range of wireless sensors with the release of the TPZ-PIR occupancy sensor. Designed to detect movement in a space, the completely wireless, battery-powered sensor transmits a wireless signal to the TPZ-Net co-ordinator when movement is detected. The co-ordinator then communicates this state over a BACnet network that allows applications such as lighting and HVAC equipment to be controlled when occupants enter the room.

● Visit www.titanproducts.com, call 0161 406 6480 or email admin@titanproducts.com

Mikrofill at the Hazlitt Theatre

The Hazlitt Theatre in Maidstone, Kent, presents an eclectic mix of entertainment for all the family. However, it was decided that certain aspects of the theatre required updating. The existing inefficient plant was replaced with Mikrofill equipment and housed in a newly constructed rooftop plantroom. The mechanical equipment was specified by expert consulting engineers, Mervyn Hayes Associates, on behalf of Maidstone Council. Three Ethos 130kW stainless steel, wall-mounted condensing boilers with a combined turndown ratio of 21>1, were installed by mechanical contractors Hadene Building Services of Chatham, Kent.

● Call 08452 606020 or visit www.mikrofill.com



Heavenly solution for Manchester

Delivering 300,000 ft². of high-quality office space over 15 floors, the new glass-fronted £105m Co-operative Group HQ is leading the charge to deliver the company as a newly reinvigorated brand. The building, on Angel Square, was opened by the Queen. It has received wide recognition for its design, innovation and sustainable credentials and has been dubbed 'the world's greenest office'.

The building is the result of a lot of thought going into every aspect, and has achieved a BREEAM rating of 95.16% – the highest awarded to date.

Grundfos Pumps were delighted to have been involved with this project and worked in conjunction with BAM Nuttall to supply a complete range of energy-efficient pump solutions. The company's broad-ranging solutions are at the heart of this award-winning project and are providing all the HVAC, boosting and pressurisation needs.

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





Panasonic joins Smart Electric Lyon consortium

A ground-breaking project, billed as the largest European experiment on the electrical systems of the future, has started in Lyon. Supported by Panasonic Heating and Cooling, the President of Greater Lyon, EDF and its 20 partners, Smart Electric Lyon officially launched with the opening of its showroom on 28 October, 2013.

Panasonic will provide the project with a variety of its energy-efficient heating and cooling products, including the Aquarea Air Source Heat Pump – a super-efficient system for providing heating and/or cooling facilities, as well as the production of domestic hot water.

● Visit www.panasonic.net

New Forest priced for Ideal Commercial

Ideal Commercial Boilers has supplied five Evomax 80kW high-efficiency condensing wall-hung boilers to New Forest District Council, for Totton Health and Leisure Centre, Southampton. The Evomax boilers have provided the solution to a challenging array of installation requirements, as well as contributing to a 15 per cent reduction in running costs. Rob Sowden, commercial gas engineer for New Forest District Council, specified the five Evomax 80kW boilers because he knew them to be reliable and because of the space and energy-saving capabilities they offered.



● Email commercial@idealheating.com, call 01482 492251 or visit www.idealcommercialheating.com

Crescent extends LED tube retrofit range

On show at Ecobuild, London 4–6 March, Stand S449. UK-based Crescent Lighting has launched a range of Energy Focus LED retrofit tubes, which are robustly designed and offer industry-leading light quality of up to 130 lm/W. They are ideally suited for many commercial lighting, re-lamping and energy performance applications, including warehouses, factories, cold rooms, education, healthcare, office and municipal facilities, car parks, stations and depots.

The range sets the standard for quality and price performance, combining light quality with significant savings on maintenance and energy costs. The products are direct descendants of the LED tubes originally developed for the US Navy by parent company Energy Focus as part of a multimillion DARPA-funded programme.

- LED retrofits for T8 and T12 fluorescents
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● For more information, call 01635 878888, email sales@crescent.co.uk or visit www.crescent.co.uk



Smedegaard UK New Hydro Range

Smedegaard has launched a range of Fluid Category 5 compliant break tank booster sets. The Hydro Family of booster sets comprise four units: the HydroTech85, HydroBox20, HydroBoost FC5-85 and HydroBoost FC5-210. This wide range of variable and fixed-speed break tank packaged booster sets combine a high performance while being compact, easy to use and easy to maintain. The Hydro range offers all that customers could require from a Category 5 compliant break tank booster set. Each unit uses the Smedegaard HydroSmart pump and controller module package.

● Visit www.smedegaard.co.uk

Toshiba introduces high-efficiency compact outdoor condensing units

Toshiba Air Conditioning (a division of Toshiba Carrier UK) has introduced a new range of compact outdoor condensing units, designed to be easy to carry and install. The Series 4 units are as much as 8kg lighter than previous models – representing a reduction of some 11% – a major advantage for installers transporting and installing the units. This enables units to be installed above one another, in a double-deck configuration, saving space on buildings and outdoor plant areas.

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



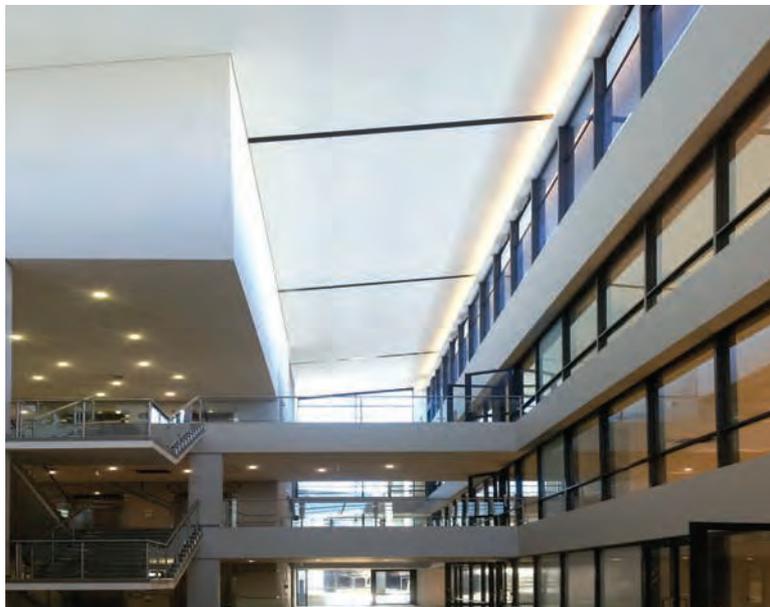
Summit Place reaches peak of safety with SE Controls

An advanced smoke ventilation system from SE Controls Africa, based in Durban, South Africa, is helping ensure that, in the event of a fire, occupants of Pretoria's prestigious Summit Park office development are provided with smoke-free escape routes to optimise evacuation times and enhance safety.

Designed by architects, Boogertman & Partners and constructed by GD Irons, the new Summit Place development is a landmark multi-use project in the area, incorporating a hotel and offices, and is located opposite Pretoria's well-known Menlyn Shopping Centre.

The three, multi-storey office buildings within the development, use high-end, energy-efficient glazing in the design, which includes the high-level glazed atriums that run along the length of each building. SE Controls worked closely with the project's specialist glazing contractor, Diri Aluminium, and Smoke Ventilation specialists Curvent International, to create a fully automated system for the three buildings, which is linked into Summit Place's smoke and fire monitoring system.

● Visit www.secontrols.com or call +27 (0)31 4661857 or +27 82 451 7001



Efficiency savings with add-on economiser

Atlantic Boiler's RT add-on air condensing economiser is capable of converting a high-efficiency boiler, with flue gases leaving the boiler at temperatures up to 240°C, into a condensing boiler, with flue gases leaving at temperatures between 30°C and 50°C. Boiler efficiency rises from around 83% GCV to the range 92% GCV and 96% GCV, or more. The principle is that outside air is drawn for combustion at temperatures of 30°C to -5°C or lower. The air is pre-warmed by boiler flue gases, reducing the heat requirement of the burner fuel.

● For more information, visit www.atlanticboilers.com/rt_eshot.html, call 0161 621 5960, or email info@atlanticboilers.com

Elco launches new website

Elco UK, formerly MHS Boilers, has launched a new website: www.elco.co.uk. The new site features an updated design for an improved user experience, as well as enhanced resources and functionality for easy navigation. Visitors can browse the full range of Elco UK products, discover recent case studies and example installations, plus view the latest service and maintenance offers. Additional features include a new 'product filter', which helps users narrow down the products best suited to their requirements.

● Visit www.elco.co.uk



Remeha boilers help cut carbon at TV's Animal Clinic

Remeha boilers have been installed at Liverpool University's renowned School of Veterinary Science to help save energy and reduce carbon emissions. Two Remeha Gas 210 Eco Pro boilers were specified by Brian Jones, of Mouchel Technology, to serve the Large and Small Animal Hospitals and main administration building of the Leahurst Campus, the location of the *Animal Clinic* TV series. The small dimensions of the boilers, installed by Ellesmere Engineering, enabled the university to carry out a redesign of the pipework and pumps layout for easier plant access and maintenance.

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



RAX - The versatile downlighter from Riegens

Riegens has announced the launch of RAX, a flexible downlighter that utilises the latest LED technology to offer optimum energy savings. Created specifically to meet both current and future demands of specifiers and lighting designers, the optical design of RAX is based on a newly developed reflector that has been devised by the Riegens design team. RAX combines an upper convex elliptical with a concave parabolic lower section, while the main concave reflector increases control to provide excellent uniform light distribution.

● Email riegens-lighting@riegens-lighting.com

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New record pipe run set by air-conditioning chiller system

A new Turbomiser chiller installation at Swansea Civic Centre is believed to have the longest pipework run ever used on a Turbocor-based air-conditioning project. Designed and project-managed by the council's in-house mechanical and electrical design and maintenance section, the project uses two 420kW 'split' Turbomisers, installed by Cool-Therm's Wales branch in the building's plant room. They are connected to two air-cooled condensers some 70 metres away on the rooftop.

● Email enquiries@cooltherm.co.uk or call 0117 9610060



Videos focus on heat-pump technology

Mitsubishi Electric has launched two online videos to highlight the benefits of renewable heat-pump technology. The first focuses on how the Ecodan range can offer reduced running costs; ease installation; and lower carbon emissions for social housing providers and landlords. Organisations operating in this sector need to help combat fuel poverty among tenants, and face increasing pressure to lower their organisation's overall carbon footprint. The second looks at the issues from a homeowner's point of view and highlights how Ecodan can provide a cost-effective alternative to oil heating.

● Visit www.heating.mitsubishielectric.co.uk



EcoCharger extends Lochinvar range

Boiler and water heater manufacturer Lochinvar has added to its extensive range of gas-fired water heaters, following the launch of its latest model. EcoCharger is a range of seven gas-fired condensing water heaters with integral storage capacities from 220 to 488 litres. Hot-water recovery rates range from 540 to 2,100 litres per hour at a 50°C temperature rise. The EcoCharger addition extends the choice of condensing water heaters to 30 separate models from six product ranges, providing further flexibility of choice to heating and hot water system designers.

● Visit www.lochinvar.ltd.uk

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Associate Electrical Consultant Engineer
Leeds | **£50,000 Plus Package**

Our client is one of the world's leading engineering and design consultancies. An excellent opportunity has recently arisen for an Associate Director in building services to join its team based in Leeds. You will work in a joint leadership capacity within a mechanical, electrical and public health (MEP) discipline team, providing design and technical advice in a project manager capacity on a wide range of projects in the commercial, residential and leisure sectors.

Associate Electrical Engineer | London,
£55,000 Plus Package

A well-known UK based international engineering consultancy are currently looking for an Associate to lead a team of 5 Electrical Design Engineers on projects within the residential, commercial and healthcare sectors. This is a great opportunity for the right candidate, as they are about to start a planned expansion period. The right candidate will be given the opportunity to lead their own MEP department.

Associate Mechanical Engineer (Aviation)
City of London
£55,000-£60,000 Plus Package

A well-known international engineering consultancy are currently looking for an Associate level Mechanical engineer to join their specialist aviation department. Candidates will be given the opportunity to work on some of the largest and well known aviation projects in the world. This is an expanding department, which presents the opportunity for rapid career progression for the successful candidate.

Electrical Design Engineer | Manchester
£35,000 Plus Package

This is a fantastic opportunity for the right candidate to join large and successful Building Services consultancies. This is a chance to work for an award winning company with a team of highly experienced engineers where your work will be exciting and varied, from high technology projects in communications and health, to commercial offices and sports stadia.

Principal Electrical Engineer
Cardiff
£45,000-£50,000 Plus Benefits

A medium sized pure building services consultant, who has recently won of string of awards, is currently looking for a Principal level Electrical Design Engineer to work on commercial, residential and local authority projects. This is a great opportunity for a proven Electrical design engineer to progress on to an associate very quickly, due to recent project / framework successes. Great opportunity to join a genuine pioneer within the building services industry.

Find more jobs online at:
www.conradconsulting.co.uk



For a confidential discussion about your career, contact george@conradconsulting.co.uk | 0203 159 5387

Dorset County Council



dorsetforyou.com

■ **Senior Engineer (Mechanical)**

Dorchester

£33,128 - £38,422

Ref: 60012304

We are looking for an experienced Senior Mechanical Engineer to work as part of our multi-professional design team to take the lead on major capital and refurbishment projects bringing innovation and new ideas to the process.

You will be a Chartered Engineer with extensive experience since qualification. You will be able to work independently, under pressure and to deadlines with an ability to work on a number of different projects at once and have experience of supervising technical staff.

Experience of using AutoCAD, Electrical Computer Aided Design packages and Microsoft Office applications will be essential. The role will require the development and implementation of expertise in a wide range of technologies.

Knowledge of applicable legislation and British Standards, H&S, CDM, Building Regulations, CIBSE and DFES design codes is essential.

Experience on school design and construction and partnering contracts would be advantageous.

For an informal discussion please contact Steve Rufus, Principal Engineer on 01305 225236.

This post has a significant travel requirement and you are contractually required to have a vehicle (or transport deemed to be suitable by the County Council) available for use as required.

This post involves working with children or vulnerable adults and/or having access to significant information about them and will be subject to a Disclosure and Barring Service check.

Please note Dorset County Council does not accept CV's in place of an application form as we require the same range of information from all our candidates.

Closing date: 9th March 2014

Interview date: 27th and 28th March 2014

To view the relevant details and apply online please visit www.dorsetforyou.com/jobs or ring the application hotline on (01305) 228535

We value diversity and welcome applications from all parts of the community.



INVESTORS IN PEOPLE | Bronze

Mechanical & Electrical Design Engineers - All Levels

Axis M&E Consulting Engineers Ltd are a privately owned consultancy practice based in the East Midlands specialising in M&E building services engineering design to a diverse Client base.

Our values are based on integrity, collaboration, and Client care. Our non-hierarchical structure gives staff the freedom to excel in an environment that's flexible and recognises individual needs.

As a result of continued workload book we are looking to recruit and expand the team at all levels, with genuine opportunities for career progression.

Applications are welcome from talented, self motivated and enthusiastic Engineers at all levels to work in our busy and friendly office environment. Candidates must have

- Relevant design experience
- Good communication skills
- Initiative and enthusiasm

Axis offer an attractive benefits package. Salary and benefits will be dependent upon experience, skills, and qualifications.

Applications (in confidence) to

mail@axisconsult.co.uk

No.8 Poplars Court
Lenton Lane
Nottingham, NG7 2RR



www.axisconsult.co.uk



Mechanical Design Engineer

Post Ref: 1833
37 hours per week
£32,072 - £35,784 p.a.
Closing date: 14th March 2014

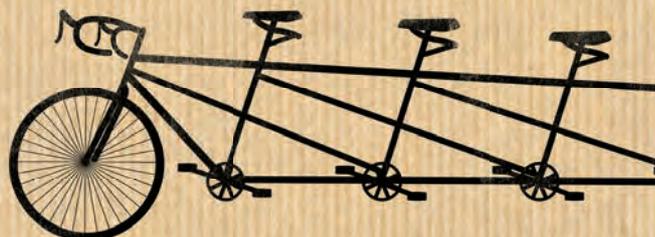
As an experienced Design Engineer with a building services design qualification to a minimum of HND level, you will be responsible for the design of various mechanical schemes, such as: boiler replacements, kitchen ventilation, new heating systems, renewable energy schemes and hot water systems. CAD skills are important for this role.

To find out more about this post please visit our website.

www.jobsatportsmouth.co.uk

AREA SALES MANAGER

South East



We're looking to expand even further.

Following recent expansion, we're on the search for an additional Area Sales Manager. Successful candidates will need to be self-motivated, not to mention highly articulate. And driven by the challenge of further smashing both volume and growth targets. Proven sales experience in a specification environment is essential, while competent IT skills are a must. Reporting to our National Sales Manager, the job involves selling into consultants, local authorities and contractors in the following postcodes: CO, CM, SS, ME, CT, TN, CR, BR, DA, RM, IG and select SE. Salary and package will be appropriate to candidate's individual experience and qualifications. Naturally, full product training on the full Remeha Commercial range will be provided. If you are interested in the role please forward your CV and covering letter to Chris Meir, National Sales Manager at chris.meir@remeha.co.uk

Application deadline 7th February 2014.



b-a-r beebey anderson recruitment

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

Intermediate Mechanical Engineer

Brighton, £28k to £35k + Benefits

Would you like to join one of Europe's largest design consultancies? My client has an urgent requirement for an experienced intermediate mechanical engineer for their expanding team in Brighton. They have an exciting variety of projects across the UK and have a well-regarded, structured program of development for their engineers. BARKH/1611

Public Health Engineer

London, £25k - £35k + Benefits

A central London based Building Services consultancy who are part of a successful building engineering group are seeking a junior to intermediate level Public Health Engineer to work alongside the Mechanical team producing public health drawings. You will need to have at least 1-2 years' experience and be proficient with the use of CAD. This is an excellent opportunity for someone who is at the early stages of their career that is looking to develop their skillset and progress within a reputable firm. BARCB/1620

Senior Design Engineer

Birmingham, £40k - £45k + Benefits

A national multi-disciplined design consultancy is actively seeking Senior Electrical & Mechanical engineers to join their busy team in Birmingham. You will be required to lead projects within the education, residential, government, healthcare and commercial sectors. Ideally you will be chartered or working towards chartered status. In return, an excellent salary and benefits package coupled with a clear path for progression is offered. BARKH/1510

Electrical Associate

London, £55k - £65k + Healthcare + Benefits

Established in the 70's with a reputation for delivering high quality projects my client are seeking an Electrical Associate responsible for managing clients, developing engineers, and delivering a high quality design and consultancy service. This opportunity is available to an engineer that is recognised at Principal level and preferably Chartered, with experience in high end residential projects, developing design from concept, and managing engineers from graduate to senior level. BARCB/1531

Head of Electrical Engineering

Macau, Asia, 100,000HKD (PCM)

A fantastic opportunity has arisen with a world renowned Hotel/Casino chain, who are currently extending their operations in Asia by creating a prestigious new hotel/mixed use development. Our client requires an experienced electrical design engineer, to take on a project management role and represent their interests as this project develops. You will be a technical expert, who has previous experience delivering large scale projects, that is able to articulate themselves in a professional technical manner. BARPA/1619

Intermediate Mechanical Building Services Design Engineer

London, £28k - £34k + Benefits

This is a career defining opportunity for an Intermediate level mechanical engineer to join a well-established, award winning consultancy in Central London. They can offer progression, industry leading training and development, along with the opportunity to work on some of the most iconic projects in London and the UK at this time. BAR1574/JA

Thinking of your future

www.b-a-r.com

Senior Mechanical Engineer

Full time, permanent, competitive salary package



Cofely, a GDF Suez company, is a leading service business in the UK across public, private and healthcare sectors. Cofely is committed to developing innovative solutions that improve the efficiency of cities, buildings, industry and infrastructure across the UK.

In Grimsby, Cofely work in partnership with North East Lincolnshire Council to deliver a range of property and regeneration services. The Architectural Consultancy is a multi-disciplinary design team working for clients in the public and private sector. We are looking for a Senior Mechanical Engineer to lead a small M&E team. Responsibilities will include:

- Undertake mechanical installation appraisals, energy performance analysis, develop design briefs, prepare designs, specifications, contract documents and reports
- Lead and take part in design reviews
- Promote and incorporate sustainable design wherever possible
- Monitor emerging legislation and engineering standards
- Understand client requirements and expectations and prepare project agreements
- Effectively co-ordinate workload within the team
- Manage resources, costs and change control to ensure that projects are delivered on time, within budget and to quality
- On site inspections

The successful candidate will have a degree in Mechanical Engineering (or equivalent), preferably with Chartered Engineer Status, excellent interpersonal and communication skills and a proven ability in negotiating positive outcomes. Experience in the design and delivery of projects in the public and private sector, commercial awareness, and ability to manage projects in a proactive way is important. A working knowledge of relevant software applications is expected.

To apply, email your CV with a covering letter to Janine.barker@nelincs.gov.uk.

The closing date for applications is Monday, 3 March 2014.



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www.cibsejournal.com/jobs



Dorset County Council



dorsetforyou.com

Senior Engineer (Electrical)

Dorchester

£33,128 - £38,422

Ref: 60012305

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INVESTORS IN PEOPLE | Bronze

PFI PERFORMANCE & QUALITY TEAM

PFI Hard FM (M&E) Manager

Job Ref: 321-MNS-150-A
Salary: Band 7 £30,764 - £40,558 pa **Hours: f/t 37.5pw**

We have a vacancy within the PFI Performance & Quality team at the Oxford University Hospitals NHS Trust for an M&E Hard FM Manager working Monday to Friday 8.30am to 5.00pm. You will ensure value for money is being achieved with all 3 PFI Contracts and services are being provided in line with statutory regulations and Trust policies

The successful candidate will be knowledgeable about PFI process with excellent written and oral skills, flexible, quick learner, work on own initiative and a solid team worker. Successful candidates will have significant relative Estates and Facilities management experience, the majority of which being within NHS or equivalent.

For more information or to arrange an informal visit please contact Antony Hudgell, PFI Hard FM Client Manager on 01865 737636, email: antony.hudgell@ouh.nhs.uk

Closing Date: 28 February 2014

To apply please visit: jobs.ouh.nhs.uk and search by vacancy reference: 321-MNS-150-A.

Some posts will be subject to criminal records bureau checks. Equality of opportunity is assured and we are committed to improving your working life. Our no smoking policy advances a healthier environment.

www.ouh.nhs.uk



Electrical Design Engineer | Southampton | to £40k | ref: 4186

Renowned for delivering bespoke solutions a large multidisciplinary consultancy are seeking an ambitious Building Services engineer with education, commercial and residential experience. Within this role you will be assisting with the detailed design of iconic projects. Exceptional opportunity for self-development and progression.

Mechanical AD | London | £Competitive Salary + Benefits | ref: 4746

One of the market leading, industry recognised consultancies with an enviable reputation for project delivery and engineering excellence is currently seeking an Associate Director. Projects include some of the most admired and innovative international developments. The right candidate will have a proven background in running projects as an associate, lead or project engineer. Exceptional opportunity for a highly motivated, driven individual.

Public Health Engineer | London | to £45k | ref: 4651

An award winning, environmentally focused multidisciplinary consultancy working on prestigious projects including data centres, leisure, residential and commercial. Candidates will have an understanding of sustainable design principles; solar hot water, rainwater harvesting and grey water recycling. Great opportunity for a passionate and driven engineer.

Mechanical Associate | Hampshire | £Competitive Salary | ref: 4440

An independent, award winning multidisciplinary consultancy with a reputation for engineering excellence. Working on some of the most innovative developments, they are seeking a Mechanical Associate to join their thriving team. This is a key appointment requiring excellent technical knowledge. Exceptional opportunity.

Mechanical Design Eng | North London | to £35k + Car Allowance | ref: 4896

Prestigious UK multidisciplinary Building Services consultancy, with an enviable reputation for innovative design. You will be required to liaise on technical issues and project manage, whilst developing and encouraging sustainable designs.

t: 02392 603030

e: cv@blueprintrecruit.com

www.blueprintrecruit.com



Canterbury College



INVESTORS IN PEOPLE

We are a Further and Higher Education College in the heart of Kent with around 10,000 students across 500 courses. Our new city centre campus is home to nearly 800 staff and we have great career opportunities.

Teaching Opportunities

Trainer Demonstrator Mechanical Engineering ref: 11/75

37 hours per week. Established post. Salary grade: £20,131- £21,921, pro-rata per annum.

Support Opportunities

Combustion & Mechanical Engineer ref: 13/89

37 hours per week. Salary grade: £25,782 - £29,439 per annum.

2 X Electrical and Mechanical Officers ref: 00/178

37 hours per week. Established post. Salary grade: £22,647 - 24,951 pro rata, per annum.

Mechanical & Electrical Coordinator/Refrigeration Engineer ref: 13/88

37 hours per week. Established post. Salary grade: £25,782 - £29,439 per annum.

Closing date: 12pm on Tuesday 4 February 2014

For an information pack please call the Human Resources Office quoting the above reference, or visit our web site.

Staff benefits include:

- Pension & Life Assurance Scheme
- Close to City Centre
- Generous Holiday Allowance
- Sports Hall & Gym



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Events & training

NATIONAL EVENTS AND CONFERENCES

CIBSE Building Performance Awards 2014 11 February, London

The prestigious awards evening returns to recognise the businesses, teams, products and projects that demonstrate engineering excellence in the built environment. Last chance to book a table or a place.

www.cibseawards.org

CIBSE at Ecobuild 4-6 March, London

CIBSE continues its support of Ecobuild, the world's leading event for sustainable design, construction, energy and the built environment. CIBSE is exhibiting at stand N310/11, where the membership team will be holding membership clinics offering advice on joining CIBSE or upgrading your existing membership. To book a slot with an adviser, visit www.cibse.org/membershipclinic

CIBSE at NEMEX 1-3 April, Birmingham

CIBSE Certification will be exhibiting at NEMEX, the innovation and energy management event. Dr Andrew Geens, head of CIBSE Certification, will be chairing a seminar on achieving compliance in the most efficient way. www.sustainabilitylive.com

CIBSE/ASHRAE Technical Symposium 3-4 April, Dublin

The popular annual Technical Symposium heads to Dublin. See boxout below for more details.

www.cibse.org/symposium2014

CIBSE GROUPS AND SOCIETIES

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

Ventilation technical workshop 5 February, East Anglia

YEN East Anglia holds its first technical workshop of the year, featuring a speaker from Elta Fans. www.cibse.org/events

Management performance and the 21st century 5 February, Birmingham

An evening event organised by the West Midlands region. www.cibse.org/events

WiBSE Northern & WiP workshops 5 February, Manchester

An interpersonal skills workshop providing leadership development for women in construction. www.cibse.org/events

YEN NW Part L update seminar 6 February, Manchester

CIBSE technical director Hywel Davies will present a guide to the current status and legal

requirements of Part L of the Building Regulations. This is a free event, but booking is essential. www.cibse.org/events

WiBSE London role model series: Fiona Cousins 11 February, London

The WiBSE role model series continues. This time, Fiona Cousins, principal at Arup New York, is the guest of honour. www.cibse.org/events

Bradford University technical seminar 11 February, Yorkshire

www.cibse.org/events

BREEAM simple 13 February, Brighton

An evening event organised by the Southern region. www.cibse.org/events

Trotter Paterson lecture: Colin Blakemore 18 February, London

The SLL presents the not-to-be-missed 2014 Trotter Paterson Biennial lecture, given by Colin Blakemore, and taking place at the Bishopgate Institute. Colin is a professor of neuroscience and philosophy at the University of London and Emeritus Professor of Neuroscience at Oxford University. Attendees will be welcomed by SLL president Kevin Kelly and there will be a reception with canapés after the lecture. www.cibse.org/events

ASHRAE Group – Differences across the Atlantic: International perspectives on Building Energy Labelling 19 February, London and online

An exciting, live transatlantic event at a City of London venue with speakers from around the world. This event will also be streamed online. www.cibse.org/events

Student competition presentations 20 February, Merseyside

The final three shortlisted students will present their projects. An event organised by the Merseyside and North Wales region. www.cibse-mnw.org/events

Colour therapy 20 February, Southampton

An evening event organised by the Southern region. www.cibse.org/events

Heating and hot water plant refurbishment 25 February, Colchester

A joint event with CIPHE organised by the HCNE region. A presentation by Stuart Turner of Hamworthy Heating will be followed by an informal discussion over cheese and wine. www.cibse.org/events

Part L update 26 February, Birmingham

An evening organised by the West Midlands region. www.cibse.org/events

SLL Master Class: Quality UP, Energy DOWN 27 February, Leeds

The series continues with a focus on energy reduction in quality lit environments. www.cibse.org/events

CPD TRAINING

For more information, visit www.cibsetraining.co.uk or call **020 8772 3660**

Preparing FM and maintenance contracts 12 February, London

Understanding and application of psychrometric charts 20 February, London

Energy efficient façade design 25 February, London

Writing a comprehensive and compliant A/C report 25 February, London

iSBEM training 25 February, Birmingham

Fire Safety Codes for Building Design and Management: BS9999 26 February, London

Air conditioning inspection for buildings 10 March, London

EPC training 11-12 March, London

HVAC systems and building services 31 March, London

The CIBSE/ASHRAE TECHNICAL SYMPOSIUM 2014

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

The fourth annual Technical Symposium, held on 3-4 April, aims to encourage the participation of young and experienced researchers, and industry practitioners, to share experiences and

develop networks. The event is supported by the Future Cities Catapult and sponsored by Medem and Rinnai.

More than 50 papers, posters and case studies will be presented in sessions covering:

- Enhanced building engineering solutions through modelling
- Innovation in passive and active building systems
- Design of future cities
- Improving the operation of the built environment
- Maintaining and improving legacy building systems
- Development and impact of

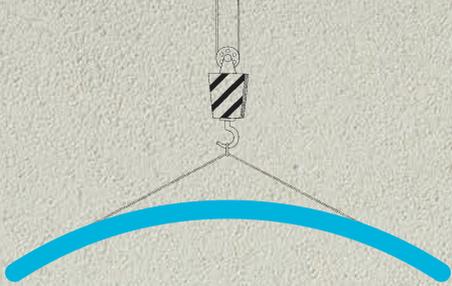
benchmarks, standards and regulatory measures

- Communication, skills and workforce development

For the first time this year, there are opportunities for the presentation of relevant case studies supported by keynotes (as opposed to a formal paper). Presenters of case studies will produce a two-sheet summary to go with the oral presentation.

Submissions will be peer-reviewed and published electronically through CIBSE. For more information, visit www.cibse.org/symposium2014





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10 years of championing a greener built environment

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- Over 100 conference and seminar sessions, drop in advice clinics and live product demonstrations
- Dozens of features and attractions

Register for your free ticket: www.ecobuild.co.uk

INTERNATIONAL PORTFOLIO



ecobuild

China

31 March–03 April 2014, SNIIEC, Shanghai
www.ecobuildchina.com



ecobuild

India

9–10 May 2014, Nehru Centre, Mumbai
www.ecobuild-india.com



ecobuild

Southeast Asia

17–19 Sept 2014, PWTC, Kuala Lumpur
www.ecobuildsea.com

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CMR Controls manufactures low air pressure and air volume measurement sensors and control systems for standard air conditioning, clean rooms, sterile laboratories, containment facilities, and fume cupboard extract systems.

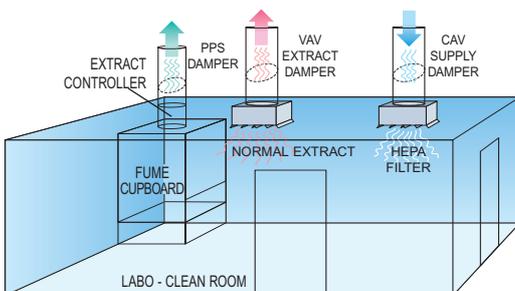


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A complete turn-key system to control room pressure to +/-1Pa. Fume cupboard face velocity to 0.5m/s at high speed and provide constant air changes into the labo - clean room.



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CAV AND VAV DAMPERS

Accurate air flow measurement with the unique CMR Venturi built into the airtight shut-off damper to control room pressure or constant volume.



Metal Damper

PPS EXTRACT DAMPER

Poly-propelene control and shut off valve incorporating the CMR Venturi Nozzle. This is essential when dealing with corrosive extract air especially from fume cupboard systems.



PPS Damper

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