

CIBSE

JOURNAL



The official magazine of the Chartered Institution of Building Services Engineers

December 2009

Greening the grid

Solutions for cutting the footprint of electricity

SUSTAINABILITY

KPMG's new HQ goes for tri-generation

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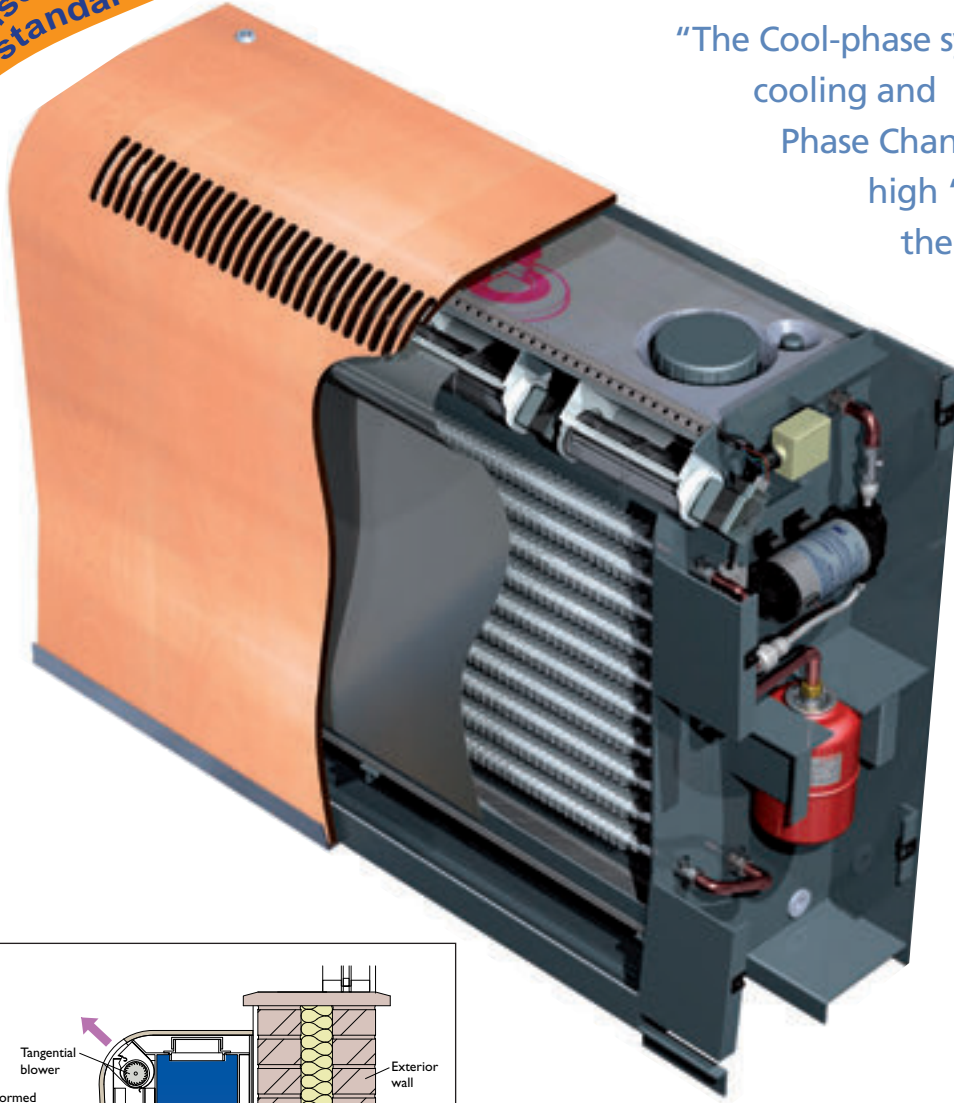
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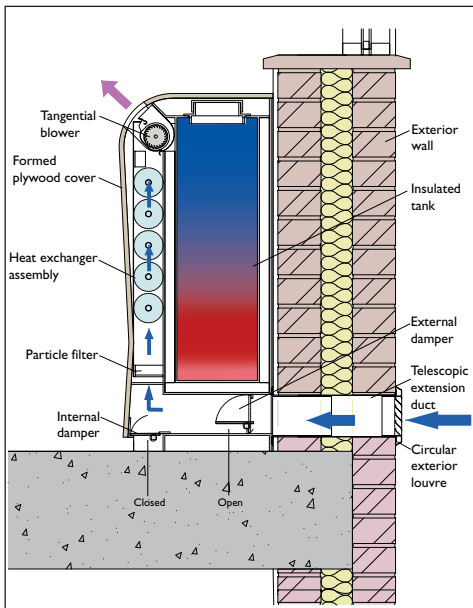
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From the editor



We'll put politicians to the test

Since we can expect an unofficial general election campaign to kick off in the UK in the new year, we can no doubt also look forward to some clarification from the three main parties about what they intend to do to slash the carbon emissions from our existing buildings.... or perhaps not. As with the Copenhagen climate change talks this month – at which any binding agreement on emissions looked unlikely at time of writing – there is no sign yet of any programme of radical action from Britain's three main political parties.

The Liberal Democrats need to boost their green credentials by coming forth with a serious programme for the built environment to match their passionate attack on City excess. The best we've heard from the Tories so far is a framework for a pay-as-you-go scheme for householders to insulate their homes now by paying it back later through their (hopefully reduced) energy bills.

No doubt most parties will want to adopt this approach, and to take forward smart metering and renewable energy. But radical action this isn't. What the Tories will also need to spell out is what they mean by their intention to have the Building Regulations 'simplified and reduced', as their frontbench spokesman Greg Barker was recently quoted as stating in the trade press.

For a Labour government that has been in power for so long, the record is woeful: lots of good intentions, targets and consultations but nowhere near radical enough when it comes to cutting emissions from existing buildings.

Ministers have also bottled out on certain key plans that would have made a huge difference – perhaps the most notable being a U-turn on making homeowners increase the energy efficiency of their buildings whenever significant changes are made to their properties (known as consequential improvements). And why the delay to Part G of the regulations, on water services in buildings? We should be told.

The latest policy, outlined in the new Energy Bill, to back carbon capture is not radical, it's simply pie in the sky, in technology terms. As our cover story on 'greening the grid' suggests, Britain

is not going far enough or fast enough in enabling suppliers and users of electricity to 'manage' power usage in a truly sustainable way (page 20).

In the new year the Journal will be challenging the main parties to spell out how they plan – if in fact they do – to significantly reduce carbon emissions from the existing building stock. Targets and good intentions won't be enough. We need detailed radical action plans that, in the jargon of the

policymakers, have a clear 'trajectory', with a series of short-term practical milestones that can be met. We will also want to hear readers' views on what they want from the party manifestoes.

On a lighter note.... as some of you won't have got round to reading this until the Christmas break, all of us at the Journal and at CIBSE wish all our readers, wherever you are, a very merry festive season.

Bob Cervi, Editor
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Targets and intentions won't be enough. We'll need detailed radical action plans that set short-term milestones which can be met



International

Saudi invests in schools

Saudi Arabia has announced a SR20bn (£3.2bn) project to construct 3,200 schools for 1.7m pupils in different parts of the kingdom. The ministry of education has undertaken a plan to design new school buildings, supervise their construction and carry out their maintenance. It has already signed contracts with private companies for the maintenance of 30 school buildings.

WYG makes £12m profit

International multidisciplinary consultancy, the White Young Green Group, has announced a £12m profit in its annual results along with a proposed refinancing agreement. The group has spent the last 12 months restructuring its business and negotiating a new deal with its lenders after accumulating more than £90m of debt.

Plain sailing for F+P

Foster + Partners has designed a new sailing yacht, Panthalassa, which was launched at Perini Navi's boatyard in Viareggio, Italy. The 56-metre-long vessel uses skylights to introduce natural light below deck, which has three levels, a fly deck, the main saloon and the guest and crew quarters. They are connected by an oval stair, which is surrounded by light-reflecting acrylic rods to mirror daylight back into the living areas.

Growth for China and India

China will overtake the US to become the largest construction market by 2018. But construction in India will grow faster than in China up to 2020, says the report by Oxford Economics. www.globalconstruction2020.com

Correction

In last month's news section it was stated that WSP had rebranded itself WSP Lincoln Scott following a merger that took place two years ago. The *Journal* would like to point out that it was in fact the Australian arm of the WSP Group that rebranded itself WSP Lincoln Scott, and the Group name remains unchanged.

Copenhagen 'should create a carbon-cutting road map'

A road map for delivering ambitious carbon reduction targets needs to be made at the Copenhagen climate talks or the world faces continued deadlock over detailed policy, according to an analyst at Fulcrum Consulting.

In Copenhagen this month, more than 180 countries will gather to negotiate and agree a new international deal to tackle climate change, replacing the Kyoto agreement which expires in 2012.

Jules Saunderson, sustainable design engineer and technical policy analyst at Fulcrum, believes Copenhagen is the ideal place to create a road map for delivering the targets – not just deliberating about policy – starting with redefining the role of engineers.

He said: 'The conference should attach as much importance to facilitating delivery of solutions as to setting targets, or we're in danger



of staying locked in debates about policy detail rather than working out how to approach the actual task.

'This can be seen with the zero carbon targets in the UK: three years after they were first announced, we're still arguing about the definition.

'With Copenhagen, there's an even stronger case for backing up targets with a cohesive strategy for delivery. This road map would start with new ways of engaging with engineers – redefining their role as

distillers and communicators of complex ideas.' Peter Head, leader of engineering consultant Arup's global planning business, agreed that a fully binding agreement was probably out of reach of the Copenhagen talks, but was hopeful of a 'sufficiently robust and credible' framework being achieved that will ultimately lead to a 50 per cent cut in carbon emissions by 2050.

'Ideally a full agreement would be in place by the end of 2010 with governments starting to implement necessary legal and policy changes in the interim,' he said.

Meanwhile, UK-based environmental group Friends of the Earth has released a report, *A Dangerous Obsession*, which concludes that carbon trading markets pose the same financial risk to global economies as the sub-prime mortgage crisis, and only serve as a smokescreen for inaction on climate change. www.foe.co.uk

Trust report to call for more joined-up policy

The Carbon Trust is soon to issue a report to government mapping out the steps needed to reduce carbon emissions from non-domestic buildings.

The report is expected to advise government that joined-up thinking – from the architect down to the facilities manager – is vital in reducing carbon.

Stuart Farmer, head of building strategy, said they all need to understand the complex flow of

heat and air through a building: 'If we start off with a plan of a very energy efficient building, which then, by fault or not knowing, is changed by putting a roof or a wall in the wrong place, then the whole system is upset.'

The report will also say that current government energy efficiency policies are good, but not good enough alone to achieve the 35 per cent reduction in CO₂ needed by 2020.

Farmer added: 'What we are now looking for is how we can pull these policies together so they cover the people constructing the buildings and using the buildings. The regulatory elements are largely already there, we just need the implementation.'

The report was compiled using a computer model called DeCODE, devised by consulting engineers Arup, to break down the building stock sector by sector.



BDP goes to Bollywood

BDP has won its first architectural commission in India at the heart of the Bollywood film industry. The scheme is a 154,000 sq m retail-led mixed-use development in Mumbai, for Indian developer Khubchandani. Three parcels of land will be developed by the interdisciplinary practice, creating an urban oasis, a luxury high end mall, office space, residential and leisure areas. The aim will be to achieve a LEED platinum rating.

CIBSE casts doubt over plan for new metric

More needs to be revealed about a new 'common carbon language' before industry can assess its significance in comparing emissions from buildings worldwide, according to CIBSE.

The 'common carbon metric' has been agreed by an alliance of green building councils and the BRE Trust to measure the carbon footprint of buildings internationally.

The World Green Building Council (WGBC) described it as a complex framework that has huge significance for companies with international property portfolios. It should enable companies to compare the emissions of cross-border buildings despite different tools, such as LEED, BREEAM and Green Star, being used to rate them.

But CIBSE's technical director

Hywel Davies questioned how this framework had been achieved. He said: 'It is an interesting development, but the devil's in the detail.'

He added that different carbon measurement systems have been devised worldwide for good reason, including to take account of climate, and the types of construction materials used.

He also questioned how the agreement related to International Standards: 'The real crunch will be when it's done in ISO Technical Committee 59, Sub-Committee 17, which is responsible for standards for sustainable building.'

'If they were to come up with something, then that would be an international standard.'

Any international standard set by the ISO has to achieve a thorough

consensus, which Davies argued has not yet happened.

But Tony Arnel, chairman of the WGBC, said: 'The significance of this agreement should not be underestimated. The coming together of so many leading green building organisations is unprecedented.'

The new metric will be piloted by the green building rating tools, and is recognised by the UN Environment Programme Sustainable Building and Climate Initiative.

Meanwhile, the UKGBC has published research showing that a high level of public support exists for green utilities, such as district heating and water harvesting, with more than 70 per cent of people supportive of a district heating system. www.ukgbc.org

NG Bailey chief steps down

NG Bailey has announced that its chief executive of nearly six years, Mark Andrews, is leaving the consultancy.

According to statements, the exit was 'mutually agreed' between Andrews and the family-owned company, with NG Bailey acknowledging Andrews's 'major contribution'.

Andrews said: 'Following the implementation of a right-sizing programme, to bring the business in line with what the market is demanding, the decision to hand over the reins at this juncture was mutually agreed.'

Andrews left at the end of November. NG Bailey's Chris Newton will now step up as acting chief executive, from his position as chief financial officer.



Andrews... leaving 'by mutual consent'



Plan for 'carbon-negative' community

Planning permission has been granted to create an 'exemplar' £14m carbon-negative development in North London. Crouch Hill Community Park will use on-site renewables and a gas-fired CHP plant to provide heat and power to the buildings on site and to neighbouring, existing housing blocks.

Cash boost for affordable homes

More than 90 housing schemes that fell foul of the recession will receive funding under the government's Kickstart programme, with a further 63 projects in the pipeline.

The government's Homes and Communities Agency (HCA) announced the figures after assessing 270 housing developments that stalled during the recession. The additional 63 projects have been approved, subject to conditions.

As a result, £207m will now be allocated to directly fund 6,618 new and affordable homes. A further £241m could be allocated for the 5,144 homes in those schemes that have been approved subject to conditions.

A second round of funding is available, for which the HCA has now received more than 660 bids. These schemes, which could unlock up to 55,000 homes, are now being scrutinised by the HCA.

News in brief

Carbon capture pledge

The UK government announced a new Energy Bill in the Queen's Speech. Under the plans, a Labour government would back the construction of four carbon-capture and storage schemes. Energy companies would also have to give rebates on charges for poorer customers.

See 'New energy policy', page 9

Davis Langdon cuts jobs

Sixty-four jobs, including partners, are to go in the UK at Davis Langdon. The consultancy said that some of the cuts would come from natural wastage and redeployment overseas. Staff are currently going through a 30-day consultation period.

New rating for office fit-outs

A new system to rate the environmental impact of the multi-million pound office fit-outs industry has been launched by the Royal Institution of Chartered Surveyors (RICS). The Ska Rating comprises 99 good practice measures across energy and CO₂, waste, water, pollution, transport, materials and wellbeing. A fit-out can be awarded either a Gold, Silver or Bronze. www.ska-rating.com

London aims to slash energy

Up to 10,000 London homes will have their energy bills cut by installing loft and cavity wall insulation, switching to low energy light bulbs and fitting stand-by switches. The Mayor and the London Development Agency have committed £9.5m to kick-start the new programme, which eventually aims to reach at least 200,000 homes in all areas of London by 2012.

'Carbon-fairness' forum

A new forum to provide expert advice to ministers has been created by UK government to ensure that the opportunities presented in transforming Britain to a low-carbon economy are distributed fairly around the UK. Representatives from trade unions, education and skills groups and industry will sit on the forum, which meets for the first time on December 10.

International

AECOM acquires Ellerbe

AECOM Technology Corporation in Los Angeles has acquired Ellerbe Becket, a 100-year-old architecture, interiors and engineering firm. Ellerbe Becket has seven offices in the US and Middle East, and 450 employees. AECOM also announced it has clinched US\$60m (£36m) worth of key contracts from the Hong Kong Special Administrative Region to provide infrastructure design and construction supervision consulting services for the Kai Tak redevelopment project.

Aid for tsunami-hit province

Mott MacDonald has been awarded a technical assistance contract by the World Bank to help regenerate the Indonesian province devastated by the 2004 earthquake and tsunami. The multidisciplinary consultancy will help co-ordinate the economic recovery process by channelling the \$50m (£30m) donor fund towards projects aimed at income generation and employment creation.

Abu Dhabi F1 hotel opens

A hotel designed by RMJM Architects in Abu Dhabi has welcomed its first guests in time for the city's first Formula One Grand Prix. The Aloft Hotel is one of the world's largest, constructed in less than a year.

Wind power moves closer

An assessment for a wind power project on the Seychelles island of Mahe is to be carried out by Masdar, Abu Dhabi's energy company, and the Seychelles government. The assessment is part of an agreement to develop renewable energy in the Seychelles.

Hot development for MENA

Plans to generate electricity for the Middle East, north Africa and Europe using solar and wind technology in the deserts of the region have moved a step closer. Twelve firms and the DESERTEC Foundation, which developed the vision, have launched a new venture to manage the project, called the DESERTEC Industrial Initiative.

National energy efficiency standard to be launched

An announcement on a new national energy efficiency standard for the fabric of homes in the UK is imminent, according to a zero carbon taskforce set up by government.

The development of a Fabric Energy Efficiency Standard is described by the Zero Carbon Hub (ZCH) as a key step to delivering zero carbon homes from 2016.

It is expected to provide the industry and housebuilders with a clear view of how to develop designs, as well as contribute to the government's proposed 70 per cent cut in carbon emissions compared with current standards. However, rules on U values, air-leakage rates and thermal bridging are not expected to be as low as the Passivhaus standard, and the definition of zero carbon is still to be released by the government



– although this is expected to be announced in December this year.

'A broad range of people have already played an active role in developing the minimum energy efficiency standard and we have been able to utilise their expertise and knowledge,' said David Adams, the ZCH director chairing the task group.

'We feel we have come to

a robust, pragmatic yet still challenging conclusion that we are now going to share with the industry and other key stakeholders for further input.'

The core team on the taskforce included representatives from the building services sector, such as AECOM, BRE and the Construction Products Association.

A recent consultation was held on the issue, which CIBSE contributed to, and which covered: buildability and building practices; future-proofed construction; occupant health and well-being; upfront build cost; maintenance and energy costs; energy security; and broader environmental issues.

The development of a national Fabric Energy Efficiency Standard is a result of the consultation on the definition of zero carbon held in the summer. www.zerocarbonhub.org

CABE unveils new design guidance

New guidance to promote consistent high standards in design has been developed by CABE, the Royal Institute of British Architects, the Royal Town Planning Institute and the Landscape Institute.

The guidance, *Design Review: Principles and Practice*, has been produced following an explosion in the growth of design review panels, which have more than doubled in the last five years. More than 80 panels now exist, providing almost

every local authority in England with access to independent design advice.

The guidance looks at the role of design review, and how to get the best out of it. It uses nine case studies of design review in practice.

The publication will be of interest to anyone running a panel or wanting to establish one. This includes local authorities, architects, developers, planners, clients and other design professionals using

the planning system who need to understand the network of panels and how to access them.

Meanwhile, CABE has set up a dedicated design review panel to provide expert advice on the quality of designs for the government's proposed eco-towns. The panel will review the proposals for: Whitehill-Bordon in Hampshire; Rackheath in Norfolk; North West Bicester, Oxfordshire; and St Austell, Cornwall. www.cabe.org.uk



New academy aims for CO2 cut

The Langley Academy in Berkshire, UK, is a new school that is designed to save about 150 tonnes of CO₂ annually, compared with a traditional academy. The environmental design was a collaboration between Foster + Partners and Buro Happold. Services include solar collectors on the roof; filtered grey water for sanitation and irrigation; and a system of horizontal louvres for shade. It is designed to save 20 per cent in water consumption.

New energy policy 'is a wasted opportunity'

An association representing renewables in the UK has condemned the newly announced policy on energy infrastructure by government as a 'wasted opportunity'.

Six draft National Policy Statements (NPSs) – the first of their kind – have been published by the Department of Energy and Climate Change (DECC) to make the planning process for energy infrastructure fairer and faster. They look at the infrastructure for electricity generation using fossil fuels, renewables, gas, oil and nuclear power, and propose 10 new sites for extra nuclear power facilities (see below).

But the Renewable Energy Association (REA) said that, while the NPSs will speed up decisions on energy transmission lines, it will not have an effect on pushing through renewable power projects.

The REA said: 'Local authorities will still determine the vast majority of project decisions, and that



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regime is crying out to be made more consistent and efficient. The guidance could have been written with this objective in mind, but the opportunity was wasted.

'Local authorities should deal only with location-specific issues, and the NPSs could have been used as a means of enforcing this.'

However, a group of engineering institutions has forged a new alliance that praises the new NPSs, believing they will form the foundation of a new planning

regime. The alliance, Engineering the Future, believes the energy NPSs will be vital in setting the agenda for developing all forms of low-carbon and renewable energy sources.

Tom Foulkes, director general of the Institution of Civil Engineers (ICE), a member of the alliance, said: 'Our existing energy infrastructure is ageing and requires a major overhaul to meet future needs. Speeding up the planning system is crucial if we are to meet the UK's future energy needs.'

Engineering the Future includes the ICE, Institution of Mechanical Engineers, Institution of Chemical Engineers, Institution of Engineering and Technology, the Engineering and Technology Board and the Royal Academy of Engineering.

DECC is now holding a consultation into the NPSs. The consultation closes on 22 February 2010. www.energy-nps-consultation.decc.gov.uk

See cover feature, page 20

... as nuclear 'may divert us from renewables'

The government's plans to power all UK homes using nuclear will divert attention away from energy efficiency and renewables, according to an associate director in sustainability at AECOM.

Rob Shaw said that, in his view, nuclear was the wrong path to transform Britain to a low-carbon

economy, after the Department of Energy and Climate Change (DECC) announced 10 potential new sites for nuclear power generation.

Three nuclear operators have expressed an interest in the UK, according to DECC, with nuclear potentially powering the equivalent of all 26m homes in Britain. But

Shaw said: 'There are too many risks associated with it. We're substituting one non-renewable with another. It diverts attention away from energy efficiency and renewables. I think that we can get CO₂ reductions by 2020 and 2050 from renewables if the effort and resources are directed efficiently and effectively.'

Welsh Office tops BREEAM rating

Architect Stride Treglown's Welsh Office has achieved the highest ever BREEAM Outstanding rating at design stage. Design and building services include a wood-pellet biomass boiler for space and water heating, natural ventilation and a small array of roof-mounted photovoltaics. Multidisciplinary consultancy WSP Group delivered the mechanical and electrical design, the buildings physics development and sustainability solutions for the building.



WSP Group

News in brief

Mott MacDonald in deal with biggest NHS trust

Mott MacDonald is to work with the UK's largest hospital trust, Leeds Teaching Hospitals NHS Trust, to improve the region's healthcare facilities. The multidisciplinary consultancy will provide mechanical and electrical engineering design services, and civil and structural engineering design services during the next four years.

Long Kesh clean-up

Consultancy WYG has helped to devise a strategy to clean up the regionally important regeneration site, Long Kesh near Belfast, with works expected to begin this month. The site used to house the Maze Prison, an army base and a Second World War US Air Force base.

Crossrail invites tenders for tunnel and subway works

Crossrail has invited tenders for construction work on tunnels, shafts and subways at its Liverpool Street and Whitechapel stations in London. The works include constructing a platform, a concourse, and escalator tunnels using sprayed concrete lining techniques.

Skills awards draw near

The deadline for nominations for the Summit Skills National Training Awards in Building Services Engineering closes on 31 December. Categories include: Heating and Ventilation Operative of the Year, Technician Engineer of the Year, and Professional Engineer of the Year. The awards will take place on 17 March 2010 in London, with guest speaker Ben Law, an environmental expert. www.summitskills.org.uk

Building bridges is child's play for TV Atkins

Atkins engineering helped television presenter James May create his latest toy marvel – a bridge constructed completely of Meccano in Liverpool. The bridge, made completely of half-inch-wide Meccano strips, girders and bolts, was shown on BBC2's *James May's Toy Stories*.

News in brief

Funding for wind farms

The UK government is to offer up to £1.4bn of loans to support onshore wind farm construction in the next three years. The European Investment Bank will provide up to £700m of the new finance, with the remainder matched by RBS, Lloyds Banking Group and BNP Paribas Fortis.

RICS new qualification

The Royal Institution of Chartered Surveyors has launched a qualification which aims to open the surveying profession to those without a degree. The entry-level AssocRICS replaces the TechRICS, and will be rolled out across a number of areas.

Engineering excellence

A subway station in Korea, a sustainable water project in Scotland and a bridge replacement scheme in Bangladesh were among the winning projects honoured during this year's Institution of Civil Engineers awards. The awards celebrate excellence in civil engineering and promote those who have demonstrated a high level of commitment to the profession. www.ice.org.uk

Temporary solution

'Pop-up' hotels are expected to transform UK tourism as a result of the recession, according to business intelligence provider Euromonitor International in its latest trends report. Pop-up hotels are temporary pre-built units incorporated into a steel frame that can be easily demolished and reduce construction time by almost 50 per cent compared with traditional methods.

Scoring at Twickenham

Shepherd FM has won a new contract with the Rugby Football Union (RFU) for technical services and building maintenance at Twickenham stadium, home to English rugby. Meanwhile SES, the building services arm of the Shepherd Group, recently installed the mechanical and electrical services to the stadium's new south stand.

Stop raising the bar on green products, says trade body

A trade association leader has called on the UK government to 'draw a line in the sand' on making greater environmental demands on manufacturers, which need to concentrate on selling green products already in the marketplace.

Paul Wenden, president of the Heating, Ventilating and Air Conditioning Manufacturers Association, (HEVAC), said the government wanted the UK to take a lead internationally on environmental issues and product innovation.

'We see this as the government trying to play one-upmanship, which is fine, but it can lead to duplication of cost among manufacturers,' Wenden said.

'Moreover, we already have cost-competitive and energy-efficient solutions out there. We need to see the marketplace and the customers accepting these solutions.'

He added: 'If the good technology we have is good enough,



Paul Wenden... manufacturers already have high-tech solutions out there

people are not going to want to pay for the even better technologies.'

Pointing to the regularity with which politicians appear in the media calling for higher carbon targets to be achieved, Wenden said: 'It's time for the government to draw a line in the sand, and to stop changing the goal posts on

these targets on a weekly basis.'

Wenden was speaking at a press event organised by the Federation of Environmental Trade Associations (FETA), of which HEVAC is a member.

Bob Arthur, vice-president of the British Refrigeration Association, also a member of FETA, said there were signs that the UK government might be prepared to give support to his industry's opposition to the banning of HFCs in refrigeration units.

He said ministers appeared to now favour 'controlled and managed use' of HFCs rather than an outright ban of them. The key problem was ensuring that leakage from units is addressed.

FETA chief executive Cedric Sloan added: 'I think the penny has dropped in the UK that HFCs are the central refrigerant in our stock and we need them – it's not economically feasible to replace them.'

Sainsbury's to replace fridge F-gases

Sainsbury's has pledged to stop using F-gases for refrigeration in all its stores as part of a commitment to cut carbon emissions.

The supermarket group said it would switch to using carbon dioxide as the sole refrigerant for all its fridges by 2030. It has earmarked 135 stores for conversion to CO₂ by 2014.

The most commonly-used F-gases in supermarket refrigeration are hydrofluorocarbons (HFCs) and

hydrochlorofluorocarbons (HCFCs). Sainsbury's move comes ahead of the January ban on the use of virgin HCFCs in refrigeration and air conditioning systems. The use of HFCs is to be banned in 2011.

Announcing the move, Sainsbury's chief executive Justin King blamed the UK government for not dealing with the skills shortage that had been an obstacle to companies being able to switch to non-F-gas refrigeration.

'Government needs to seize the opportunity here by helping people retrain to work in the rapidly-expanding green sector,' he said.

Supermarkets in Britain have already switched some of their stores to non-F-gas refrigeration. Examples include plans by Waitrose to be HFC-free for its new and refurbished stores from next year, while Tesco is planning to introduce CO₂ refrigeration in several stores in the coming financial year.

Buro Happold



The height of engineering

Multi-disciplinary engineering consultancy Buro Happold has installed a new giant 280sq m 360-degree LED screen at the top of the BT Tower in London. The screen, believed to be the highest of its kind in Europe and the Americas, required a new structural support system to be built from components and assembled like a Meccano set behind an enclosed scaffold around the top of the tower.



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President: Mike Simpson FCIBSE, FSLL, FILE, FIET Chief executive and secretary: Stephen Matthews



CIBSE wishes all its members a very merry Christmas and a prosperous New Year

Calling potential ambassadors

CIBSE is introducing a new company ambassador scheme to help the institution continue to grow its membership in 2010.

It wants to encourage members to introduce the institution to colleagues and new people entering the profession. CIBSE is one of the few institutions whose membership has grown in the last year. The aim is to build a sustained message about the value of belonging to an international professional institution that now covers a 'broad church' of disciplines.

CIBSE would like to appoint at least one ambassador in each company to be the key point of interaction with members and potential members, promoting membership and the benefits of it, helping candidates with their applications and/or organising membership briefing sessions.

By championing the institution, members can work together to raise CIBSE's profile, strengthen membership and increase its reach within the industry. Contact bwright@cibse.org

Build Up your knowledge

Built environment professionals are being offered the chance to take part in a range of free courses to help build their knowledge and skills base during the recession.

The University of Westminster's Build Up programme is aimed at the unemployed or under-employed. Up to 1,500 places are available on a range of topics, including networking and career assessment, business skills and community engagement. Eligible participants include architects, surveyors and building engineers.

For more information contact the Build Up team on 020 7911 3456 or visit www.build-up.org.uk

Research journals go from strength to strength

The two research journals refereed by CIBSE have been making their presence felt in the industry.

Building Services Engineering Research and Technology Journal (BSER&T), and Lighting, Research & Technology Journal (LR&T) are CIBSE's two refereed research journals. CIBSE members benefit from free online access to BSER&T, while SLL members can access LR&T.

BSER&T is CIBSE's quarterly journal containing papers on all aspects of building services engineering. It is recognized by the science citation index, and in its

first year registered an impact factor of 0.705, ranking it 17th out of 38 in the Construction and Building Technology category. Work published in BSER&T has proved influential – one of the proposals in the recent consultation on changes to Part L of the Building Regulations involves a change to the way that party walls are treated in heat loss calculations. This change is the direct result of work first published in BSER&T on the 'party wall thermal bypass'.

LR&T is CIBSE's international quarterly lighting journal containing papers on all aspects of lighting research, with an impact factor of 0.733.

It is also possible for members to view new papers, once refereed and accepted, online, prior to the printed publication.

One such paper currently available in the OnlineFirst section discusses corrections to the Meteorological Offices equations for the calculation of degree days.

Online access to the CIBSE technical journals has already proved popular, with increasing numbers of downloads and a significant increase in their visibility.

Take advantage of this resource today by visiting the members' area at www.cibse.org

Geoff Prudence receives Silver medal

Geoff Prudence has been awarded the Silver Medal by CIBSE for his personal achievements and commitment to the institution and industry.

Prudence, who has an engineering background, has experience in design, projects, building maintenance, operations, facilities management (FM) strategy and implementation, working in both private and public sector organisations.

He challenged the norm in facilities management and achieved a new approach by promoting and developing a more dynamic model to encourage innovation, leading from a hard services basis and management of risk for operational building services.

He actively promotes CIBSE, BSRIA, BIFM (British Institute of Facilities Management) and other forums, academia and the FM message to colleagues, mentors, young engineers and the world



Geoff receives his award from Mike Simpson, president of CIBSE, and John Armstrong, past president, who gave the citation at the awards dinner.

at large. He is chairman of CIBSE Facilities Management group and involved in BIFM through their Data Centre special interest group and network activity. He is also a member of the CIBSE Maintenance Task group, regularly makes seminar presentations, and has

authored many published articles.

CIBSE members Geoff Levermore and Neil Sturrock were also honoured with Silver medals on the night in recognition of their personal achievements, services and commitment to the institution.

Policy making keeps technical department busy

CIBSE's technical department has recently submitted responses to a number of consultations, including:

- Department of Community and Local Government (CLG) proposals for amending the Approved Document J of the Building Regulations (combustion appliances and fuel storage systems).
- Department for Children, Schools and Families' Carbon Management Strategy for Schools – CIBSE was able to draw upon a significant piece of research by the Schools Design Group and University of Central London and submit an evidence paper along with the consultation question responses. This will inform the development of a carbon management strategy for

the schools sector, which will help to guide policy.

- CIBSE has also commented on proposed amendments for 2010 to the energy performance sections of the Building (Scotland) Regulations 2004 and the Technical Handbooks.

CIBSE supported a proposal from the Department of Business Innovation and Skills to appoint the United Kingdom Accreditation Service (UKAS) as the national accreditation body under EC Regulation 765/08. CIBSE Certification is UKAS accredited, and currently remains the only energy assessor body under the Energy Performance of Buildings regulations (EPBR) to achieve this. CIBSE called for CLG accreditation arrangements for the EPBR to

be overseen by UKAS as soon as reasonably practicable.

The technical department also continues to monitor all standards and directives emanating from Europe, including construction products, water, energy-using products and eco-labelling of buildings. CIBSE contributed briefing material and attended a meeting with the European Parliament rapporteur on the Energy Performance of Buildings Directive.

Visit www.cibse.org/knowledgebank for details of current consultations and responses, or contact mcdonough@cibse.org CIBSE has issued a free briefing for members on the CRC Energy Efficiency scheme at www.cibse.org/crc

News in brief

Guide A reviewers sought

CIBSE is revising *Guide A: Environmental Design* and would like to hear from potential subgroup members and reviewers. To get involved, send an email to cruston@cibse.org outlining your expertise and confirming which chapter you are interested in assisting with.

Secondment to CIBSE technical department

CIBSE is looking for companies to nominate a secondee to its technical department in the New Year. Based in Balham, the candidate will provide support on a wide range of technical issues, including publications, energy performance issues and work on government consultations. To find out more contact David Davies at ddavies@cibse.org

CIBSE Patrons celebrate 30th anniversary

CIBSE Patrons recently celebrated their 30th anniversary with a special dinner at the Institution of Mechanical Engineers.

It was attended by more than 100 guests, including the judges and finalists involved in the CIBSE/ASHRAE Graduate of the Year Award, in association with H&V News and sponsored by Baxi Commercial, which took place on the day.

Linking in with the patron's initiatives on education and training, the dinner was addressed by special guest speaker, motivation guru Humphrey Walters.

Addressing the dinner, Nick Mead, patrons' chairman, said: 'Over the past few years we have worked closely with CIBSE to help develop a range of materials that can be used in schools and

colleges. These include factsheets, display stands and a professionally-produced PowerPoint presentation.'

Proposing a vote of thanks, Stephen Matthews, CIBSE chief executive, congratulated the patrons on their many achievements and added that he hoped that in the future, CIBSE and the patrons would work even more closely together.

12 honoured in bursary awards

Twelve students recently shared £9,000 in bursaries from the West Midlands region as part of CIBSE's commitment to young people.

The fourth annual presentation saw Chris Beadsmore, Baljit Singh Bhogal, Parvinder Bhamra, Simon



The bursaries will help the students progress within the industry.

Waldron, John Taylor, Cairan Van Rooyen, Matthew Whyley, Lee Holloway, Matt Leathern, Steven Bayliss, David Heitt-Jones and James Lawton rewarded.

The bursaries are aimed at assisting students with their studies, encouraging professional development, and helping them to progress within the industry.

They were sponsored by: Airedale; Mikrofl; Total Climate Solutions; and Zip Water Heaters. Together they contributed £4,500, which was matched by the CIBSE West Midlands region.

SoPHE sixth anniversary celebrations

The Society of Public Health Engineers (SoPHE) sixth anniversary dinner was held at the Royal Garden Hotel, London, on 5 November.

Chairman Martin Shouler spoke of achievements over the past year and the guest speaker was Professor Rodney Cartwright, immediate past master of the Worshipful Company of Plumbers.

Professor Geoff Marsh was presented with an Honorary Fellowship of SoPHE and the society was also delighted to have CIBSE president Mike Simpson as their guest of honour.

The event was sponsored by Aliaxis, Andrews Water Heaters,



Martin Shouler presents Geoff Marsh with his Honorary Fellowship.

A O Smith, Blücher UK Ltd, Douglas Delabie, Geberit Sales Ltd, Hamworthy Heating, Heatrae Sadia, Honeywell Control Systems Ltd, Horne Engineering, Hydrotec

Ltd, Lochinvar Ltd, Oventrop Ltd, Pipex Ltd, Polypipe Terrain, Saint-Gobain Pipelines and Zip Heaters Ltd. WaterAid will now receive a £1,000 donation.

Sustainability stars

Who will be the lucky winners at the CIBSE Low Carbon Performance Awards ceremony early next year? We unveil the shortlisted candidates, the judges – and what they are looking for

Innovative and inspirational solutions for promoting sustainability are at the heart of the many entries to the CIBSE Low Carbon Performance Awards 2010, which will be held at London's Grosvenor House on 3 February.

The awards recognise and reward proven achievements in delivering carbon savings in buildings. When it comes to the awards for New Build Project and Refurbishment Project, the judges have focused on evidence of building performance and how this measures up against the requirements of the Building Regulations. Evidence of occupant satisfaction is a key factor.

The awards, now in their third year, also recognise the contribution of clients in pushing the sustainability agenda. The Client of the Year – Energy Performance award focuses on issues such as educating and motivating staff to be aware of energy-saving strategies, while the

Client of the Year – Low Carbon Operation award is for clients who can show a firm commitment to minimising actual carbon emissions, backed by operational data.

Two new categories this year also recognise the contributions of other key players in the industry. The Contractor of the Year award is aimed at those companies that can demonstrate a commitment to sustainability in their projects and their own operations. Similarly, the Consultancy of the Year award is aimed at firms whose work demonstrates a commitment to producing aspirational and sustainable buildings.

Individual energy and facilities managers who can demonstrate such leadership and achievement in their own work are recognised in the Low Carbon Operator/Manager category. The Champion of Carbon Saving Champions award will be presented to an individual



The winners show off their trophies at the 2009 CIBSE Low Carbon Performance Awards

who, through being involved in the CIBSE 100 Hours of Carbon Clean Up Campaign, has demonstrated outstanding leadership determination, application and initiative in changing their work culture as well as helping to reduce carbon emissions.

Also focused on the Carbon Clean Up Campaign, the Best Carbon Saving award will be presented to the organisation whose 100 Hours programme is judged to be delivering the best ongoing carbon-saving performance as a result of the initiative undertaken. All building types and sectors were eligible for this category.

Two further awards aimed at individuals seek to recognise the success of energy assessors in

cutting emissions – particularly through the application of Display Energy Certificates and Energy Performance Certificates. In the Low Carbon Energy Assessor – DEC of the Year and LCEA – EPC of the Year categories, the judges have focused on evidence of how the certificates have been applied, including the implementation of recommendations in the accompanying reports.

The February 3 awards ceremony once again promises to be a true celebration of the advancements and achievements of the best in low-carbon performance. To book your table at the event, download a booking form at www.cibse.org/awards2010 or email events@btinternet.com

The judges

Cal Bailey, NG Bailey



Cal has been marketing and sustainability director of NG Bailey since 2007. He is affiliated to many industry bodies and is a founder member of Buildoffsite and the UK Green Building Council, as well as a member of CIBSE, the Institute of Family Business and the Institute of Chartered Accountants for England and Wales.

Hywel Davies, CIBSE



Dr Hywel Davies is CIBSE technical director with responsibility for the technical development of CIBSE's publications, guidance and policy for engineers. He was closely

involved in the development of industry guidance on the implementation of the European Performance of Buildings Directive, including energy assessment and air conditioning inspection guidance.

Dave Farebrother, Land Securities



Dave has been environmental director at Land Securities for 12 years, and was previously the

group's energy manager. He was named the 2007 Institute of Environmental Management and Assessment Environment Manager of the Year. He holds fellowships at the Royal Society of Arts and the Energy Institute, and is a member of the sustainability panels for BPF and the British Council of Offices.

Simon Hancock, Atkins



As design director at Atkins, Simon's focus is on design excellence and he currently chairs the design and

innovation board for the group. He is also on the board of the engineering and major projects division. During his career he has designed office buildings, schools and universities, museums and art galleries, hotels and leisure, business parks, airports and industrial facilities.

Steve Irving, AECOM



Steve has been with Faber Maunsell/AECOM for over 30 years, and for the past 10 he has been working with government on successive revisions of Part L, and

also had a major input to the implementation of the EPB Directive in England and Wales. He is a Fellow of the Royal Academy of Engineering and has been awarded a CIBSE Silver Medal and the IMechE Construction and Building Services Divisional prize.

Mike Simpson, Philips Lighting, CIBSE President



Mike has worked in the lighting profession for the past 30 years with several European manufacturers. He has been involved in preparing both national and international design standards and guides, and preparing legislation on energy saving. He is a past president of both the Society of Light and Lighting and the Institution of Lighting Engineers.

Awards: the shortlists in full

(candidates in alphabetical order)

New Build of the Year

Arup: Acharacle Primary School
Atkins: The Hub
Max Fordham: City Academy, Hackney
Norman Disney Young: EDS SMC4 data centre
Tesco: Tesco Ramsey

Refurbishment

London Fire Brigade: Croydon fire station
Transport for London: Palestra
Weblight: Bullring Shopping Centre

Product of the Year

Blygold Energy Saving Coatings
Daikin: Daikin Alterma HT (High Temperature) Air Source Heat Pump
Kingspan: EnergiPanel
Klima-Therm, Cool-Therm,
Geoclima: Turbomiser
Spirax Sarco: FREME

Design/Technical Innovation

BDP: Waterford Institute of Technology
Marks & Spencer: Non-HFC air-handling unit (Submitted by Troup Bywaters + Anders)
Norman Disney Young: EDS SMC4 data centre

Consultancy of the Year

AECOM
Atkins
Delap & Waller
Max Fordham
Mott MacDonald

Contractor of the Year

Laing O'Rourke
NG Bailey
WATES

Low Carbon Energy Assessor – Energy Performance Certificate

Ross Bates: Lambeth College, London
Bruce Elrick: The Hub, Bristol
Hulley & Kirkwood: Border Schools, Scotland
Darren Jones: Eland House, London
Angus Melville: The City Academy, Hackney

Low Carbon Energy Assessor – Display Energy Certificate

Mahdi Choudhury: Bradshaw Hall Primary School
Andrew Gardner: Sheffield Park Hotel

Client of the Year – Energy Performance

Imperial College
Lancaster University (nominated by UPP)
Sainsbury's (nominated by Red Engineering Design)
Tesco (nominated by Andrew Gardner)
Transport for London (nominated by NDA Consulting)

Client of the Year – Low Carbon Operation

Sainsbury's (nominated by Red Engineering Design)
Swire Properties
Transport for London (nominated by Logan Energy)

Training Initiative

Calor Gas: CPD & development programme
Crownhouse: Crownhouse learning programme
Nu-Heat: Nu-Heat training centre
Star Refrigeration: Star Learning Solutions
TACE: TACE Training

Low Carbon Manager

Glynnan Barham, Natural History Museum
Stuart Dunkley, Leicester Marriott Hotel

Best Carbon Saving Programme (100 Hours Campaign)

BDP
Natural History Museum
Spire Healthcare
Transport for London

Champion of Carbon Saving Champions (100 Hours Campaign)

Glynnan Barham, Natural History Museum
Philip Belton, Spire Healthcare
Stuart Dunkley, Leicester Marriott Hotel
Green Lobby Group, Marriott Hotel, Manchester



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Letters

Where are the performance data in the *Journal's* case studies?

The proponents, advocates, designers, owners and managers of green or sustainable buildings and spaces represented in the *Journal* describe their size, construction cost, and how beneficial they are, especially from an energy, carbon or emissions perspective. However, they often fail to provide factual measured or metered energy data to support their claims, even when those data can become readily available.

If the building has been in full operation for at least one year, the article should include monthly metered electricity and fuel consumption data per gross sq ft for 12 consecutive months, so that readers can make comparisons with their own or comparable facilities. If the building has been in operation for less than one year, they should provide monthly metered electricity and fuel consumption data per gross sq ft for 12 consecutive months within two years. A simple table of the factual metered data, along with the building size in gross sq ft, should suffice.

The data need to include all of the energy used, including HVAC and hot water, whether purchased from utilities, or generated on site, unless stated otherwise. If all or part of the energy is not metered or measured, the article should so state, with reasons for the omission.

If the energy data are not provided and published after two years, a brief statement to that effect should be published by you.

The article should also clearly identify any rebates, subsidies, or unique circumstances that might limit broad transferability or applicability of the technologies involved. In addition, it should provide evidence that the building is providing the environmental conditions and functionality intended.

Eur Ing Int PE Larry Spielvogel, PE, CEng, FASHRAE, FCIBSE, FSSL
L G Spielvogel, Inc, US

Editor's reply:

*It is right to state that the case studies of buildings that we publish in the *Journal* do not, as a matter of course, provide the full range of energy data and operational assessments specified above. It is also fair to point out that this information would be a valuable resource for readers. We are seeking to obtain this information for many of the buildings we profile, but such data are often not available –*



The shortlisted candidates for the CIBSE/ASHRAE Graduate Award 2009.

*although energy-performance and display-energy certificates are helping to fill the gap on energy-usage data. Sadly, very few buildings are subject to full post-occupancy evaluations (POEs); and where these exist, the clients who own the data are often reluctant to release them. But the *Journal* continues to seek out this data; and if any readers feel they have useful POE case studies to offer, please do not hesitate to contact us.*

Give graduates a seat on the CIBSE Board of Trustees

How good to see the November 2009 *Journal's* cover feature of the young graduates shortlisted for this year's CIBSE/ASHRAE awards [see above]. Whatever their future, far better to involve our young engineers in the strategic decision-making processes that affect them. A dedicated seat for them on the CIBSE Board of Trustees should be included as part of a much-needed package of corporate governance reforms.

Ian Brown MSc, CEng, FIMechE, FCIBSE

Encourage young engineers to overcome their inhibitions

Young engineering professionals who are in building service fields need to appreciate Morwenna Wilson's comments in her opinion column (*Journal*, October, page 24). They do

need to overcome their natural inhibitions if the profession is to thrive.

My perception, from where I'm based, is that young engineers in Gulf countries prefer to be good listeners rather than to express their creative ideas during meetings. Perhaps they need several brain-storming sessions to help them come out of their shells.

Universities should perhaps encourage engineering students to be involved more in debate and discussions on practical case studies as a part of their curricular activities. Universities should be the starting point for training engineers to overcome their inhibitions.

Dr M Ramaswamy PhD, MCBISE
Technical expert, Royal Court Affairs, Muscat, Oman

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

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

Maximum urgency

Refurbishment of existing buildings is key to cutting emissions. But, says CIBSE/ASHRAE Graduate of the Year **Emma Marshall**, too often this is a wasted opportunity



In October 2008 energy performance and display energy certificates (EPCs and DECs) became mandatory. This system, while potentially embarrassing for building owners who receive a low rating, does not actually enforce any obligation to improve the rating. Many building owners are reluctant to make changes to their buildings and invest in what are often expensive improvements when it is not them but the tenants who will reap the rewards of lower energy bills. Without incentives, significant changes are unlikely to occur.

It is estimated that around 40 per cent of the building stock in the UK will predate the Part L legislation by 2050. Without legislation dictating the standards to which buildings must be refurbished, the improvements being made may not be enough to sufficiently reduce carbon consumption.

There is a huge range of low-carbon and energy-efficient systems available, but they are not always practical for the application in which they are used. The target to reduce carbon consumption in refurbished schools by 20 per cent, for example, often leads to impractical choices. Designers are not allowed sufficient time to carry out a full design, and it is often easier to install a token renewable system.

Installing biomass boilers in schools seems to be a current trend but in a recent BBC Radio 4 programme, one headmistress spoke of how she has to wander around with a screwdriver to unblock the biomass boiler feed twice a day. This doesn't sound like an efficient or practical design.

We must avoid installing eco-bling for the sake of it – hi-tech systems that are specified because they exist rather than because they are the best solution. Simple solutions, such as improving glazing or improving controls, can be the most effective. Complex systems may seem simple to operate to you or me but in the hands of an untrained individual (our clients) the results can be potentially worse than the original design.

Viewing a building and its occupants as a whole, rather than as individual systems, is imperative to ensuring an efficient design. The theme of reducing

CO₂ must run through every part of a building. We are all personally encouraged to do our bit; we receive leaflets offering to install solar heating with the promise of grants available, a system which is unsuitable for most domestic situations. Yet to make a simple and effective improvement such as replacing an old boiler with a condensing boiler you are expected to pay full tax.

The holistic view of a building can be taken one step further, by examining the building over the course of its life. Often clients are very specific with their requirements, but when the building usage changes the space is no longer suitable and requires further refurbishment. Exceeding the minimum performance standards when refurbishing a building, and making the building flexible in its design and use, could save time and money in the future.

Yes, refurbishment of existing buildings is the way forward; but how we encourage it and ensure its effectiveness is very important. We need a very large carrot and if necessary a big stick, as it were, to ensure a sustainable environment. Incentives must be clear and simple, and encourage people to make changes of their own accord. Guidelines must be available to ensure the correct improvements are being made, and that these are practical and efficient in both their design and application.

However, there must also be legislation backing up these incentives. The legislation should not only state the minimum compliance, but must also consider the future and ensure the standards being met today will satisfy future needs. People can be encouraged to make changes and improvements, but without clear legislation and regulations the type of change needed to ensure a sustainable environment will not always be achieved. ●

 **Legislation should not only state the minimum compliance but also ensure the standards being met today will satisfy future needs** 

If the cap fits

The Carbon Reduction Commitment Energy Efficiency Scheme will have a major impact across the supply chain. Hywel Davies looks at some of the key issues for the sector



Created as a 'cap and trade' mechanism to improve energy efficiency in large organisations, the CRC targets about 5,000 of the UK's largest businesses. It provides financial incentives to cut energy use and put a price on energy-related emissions. But is it just another green stealth tax?

Under the CRC – which is administered throughout the UK by the Environment Agency – organisations buy allowances for their annual emissions. Total allowances are capped, and within the cap, participants determine the most cost-effective way to reduce emissions. They may buy extra allowances or invest in reducing their energy use. Qualifying organisations must, by law, comply, or face financial and other penalties.

Allowances will be recycled to participants based on an annual energy-efficiency performance league table, so those who cut emissions most get most back. The proportion of the total fund awarded to top performers will rise with time, encouraging energy-management strategies that reduce energy consumption. The league table puts energy efficiency on public display, which should stimulate interest and create a more positive environment for engineers and facilities managers to make the case for investing in energy efficiency.

A three-year introductory phase begins in April 2010, with the first sale of allowances in April 2011 at a fixed price of £12 per tonne of CO₂ for 2010-11 and 2011-12. From April 2013, there will be an annual auction, with a cap on total allowances available, to ensure annual emissions fall. There is a cash-flow implication – allowances must be bought several months before recycling payments are made, requiring a payment of five to 10 per cent of energy bills up front.

Organisations fall within CRC if they or a subsidiary have at least one half-hourly electricity meter settled on the half-hourly market (70kVA meters in Northern Ireland), or total half-hourly electricity consumption exceeding 6,000 MWh in 2008, roughly equal to an annual electricity bill of £500,000.

Responsibility for CRC compliance falls on the organisation with the utility contract. So this will have a major impact on landlords unless energy is bought

directly (not through service charges) by tenants. This may stimulate the installation of energy meters and separate supplies in tenanted commercial buildings. The new CIBSE TM39 Building Energy Metering will help engineers to design metering strategies where these are required by clients (see Meters feature on page 36).

This summer the Environment Agency wrote to all UK billing addresses with half-hourly meters. Organisations contacted must give the agency evidence of electricity consumption from 1 January to 31 December 2008, and those without this information must get it from their electricity supplier. Those falling within the scheme must register online.

Each year, participants must record all their business's energy use (electric, gas, oil, coal, LPG etc), calculate emissions and make an online return to the scheme administrator. They must buy allowances to cover their emissions from energy use, report their actual emissions, and then surrender allowances equivalent to actual emissions at the end of the year. Those with too many or too few allowances will need to trade allowances with other businesses to meet the shortfall, or recoup the cost of allowances not required.

So CRC will focus the minds of finance directors across the UK on energy efficiency, and on what the business does to reduce it, as well as on the public perception of what the business is doing for the environment. There will be a demand for services engineers who can identify real opportunities to cut energy bills, save money and reduce emissions. Perhaps it is time to review the energy consumption of your larger clients now? ●

CIBSE has developed a one-day CPD course for 2010 giving details of the legal requirement and the practicalities of CRC reporting, with examples of how CRC affects end users and service providers. It covers carbon footprinting and creating a wider carbon management strategy. CIBSE is also holding a CRC event on 3 December 2009 – for information visit www.cibsetraining.co.uk/conferences

Hywel Davies is technical director of CIBSE.

Perhaps it is time to review the energy consumption of your larger clients now?

FURTHER INFORMATION

More details on the CRC are available at www.decc.gov.uk, which offers a downloadable draft user guide and an implementation timeline.



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Greening the grid

How can high-tech solutions such as super-smart metering and 'dynamic' control of electricity make energy generation more sustainable? In this *Journal* roundtable debate, leading experts tease out some key solutions



Bob Cervi, editor, *CIBSE Journal*: We're here to discuss the issue of dynamic demand management, DDM. One simple definition of DDM is a system of high-tech control of both electricity supply and demand to save energy. For example, devices in our fridges could momentarily switch them off to ease instantaneous peaks in demand across the electricity grid, thereby saving wasted energy and reducing the need for back-up generators to support the grid. Consumers could also proactively use renewable power sources to feed excess electricity back into the grid, saving both energy and costs. But how far are we from such a dynamically-managed power supply system, and what difference could this make to a nation's energy carbon footprint?

Terry Wyatt, consultant to Hoare Lea and a CIBSE past president: I believe it is we on the demand side who must take the first steps. It is a problem for the

supply side because we demand what we want, when we want it, everywhere – which is a crazy way to go on living. I realise how far short we fall in assisting the supply side – for a start, we're not putting systems in buildings that are capable of being sensibly dynamically managed. We have to improve the link between the demand and supply sides, where there is a big gap, and this must take priority before we go ahead and put in lots of new power stations.

Rachel Stanley, electrical engineer, emergent technologies team, E.ON Engineering Ltd: One of the huge problems from the supply side of things is that there is a large number of different players involved – from the power stations that are feeding into the grid but contracting with supply companies, to the grid feeding into the local network, to suppliers selling to individual customers. There may be huge benefits to be gained from demand management, in terms of >

Discussion on demand... clockwise, from bottom left: Rachel Stanley, David Frise, Damon Hart-Davis, Paul Kingston, Paul Lazarevic, Terry Wyatt, Stuart Bailey, and Bob Cervi.





Electricity suppliers have an opportunity to work with the demand side of the industry to cut waste and inefficiency

> being able to add more renewables onto the grid. One of the UK government's aims is to increase the amount of wind power going onto the grid, and there are challenging targets for 2020. However, what happens with a wind-power-dependent grid when the wind is not blowing? Something has to move somewhere else. Many of the solutions that we have at the moment are carbon-intensive, so demand management may help to deliver a low-carbon solution.

BC: Is DDM a panacea in terms of resolving many of the issues around energy inefficiency for the future?

Stuart Bailey, balancing services manager, National Grid: There is a difference between demand reductions as a result of efficiency, and DDM – it's important to understand the different roles that each has. Is the ability to flex demand a prerequisite to delivering the changing generation pattern? Yes. Is it the panacea? Probably not. It is part of the solution. How big a part it needs to be depends on other things that come along: Will electric vehicles be here in significant numbers by 2020? Will energy storage be commercially viable?

BC: What fundamental changes do we need to make to infrastructures, tariffs, incentives and so on?

Paul Lazarevic, sales and marketing director, RLtec, a clean-technology specialist: Zero, I would say. There was a barrier but National Grid fixed that barrier in April of this year when the Grid's firm frequency response tender framework agreement was changed to incorporate dynamic demand. Therefore there is now a means to market.

SB: I guess that depends on whether you mandate that DDM should be rolled out as part of the equipment,

or whether you say it needs to find a commercial route to market. What we have done with Paul's technology is find a commercial route to market for it.

BC: Is it the ultimate goal to get rid of energy reserves? The reserve is there to meet fluctuating demand.

SB: Reserves are there partly to meet fluctuating demand but primarily for plant failures.

PL: Is DDM a panacea? No, but I agree that it is part of the answer to cutting energy usage. You would never want to put all your eggs in one basket. So it is an answer to the problem, but it is not the only one.

TW: I wonder what is so different about the electrical supply industry from, say, every other organisation that I deal with? I get the option that I will not travel before 9.30am, for example. But when it comes to electricity, and it is probably the same for gas as well, there is nothing I can do about it. For everything that I do I have choices, except in buying electricity.

Damon Hart-Davis, consultant with ExNet, the IT and energy consultancy: With dynamic demand, no one knows ahead of time when they will need to bump you off a train. If National Grid calls up the train operator and says, 'I am sorry, I cannot give you two megawatts for this train', you will have to push a third of the passengers out onto the platform at the next stop.

Paul Kingston, managing director of K8TRAM Intelligent Green Solutions: Yes, but with building infrastructure, and certain manufacturing and shop processes, they monitor and know how their business works. They can predictably work out where they can

■ You will need to have a little chip in your appliances for your smart meter to talk to your appliance ■
– David Frise

safely make those shifts. The issue here is trying to use what energy we have most effectively.

SB: If somebody knows what their demand profile will be on the day, and they know that between certain hours of the day they are willing to interrupt that demand or to reduce it by a certain amount, there is already a route to market to provide that service.

BC: Should we not be designing buildings now that are DDM-ready for the future?

David Frise, formerly head of energy services at NG Bailey: It wouldn't be hard but you cannot sell it to a client at the moment. It is very difficult to get them to put in anything but the absolute bare minimum, because you won't win the job. Quite often the tenant does not pay the bill, or does not have an interest in how much energy is used because it is a flat rate. Therefore the whole thing needs to be joined up. I believe we as building services engineers hold the key, certainly in commercial buildings, and we will hold the key in the domestic environment when you start to get home area networks. It is a huge opportunity for us without a doubt, otherwise companies like Cisco, Microsoft and Google would not be bothering with it – they are investing in smart grids and they see that the technology around that is key to it.

BC: How are building services engineers the key if they will be entirely at the behest of the client?

D H-D: Have your air-con driven by DDM.

DF: Exactly that. What we have to do is talk to clients strategically about why they need to do this. We can have all the technology in place to make it work but, if we don't win the hearts and minds, we aren't going to do it.

BC: What sort of power infrastructure tariff system would work best to promote DDM, even if it means completely changing the way things operate at the moment?

RS: From a technical point of view – I cannot comment on pricing structures and so on – if there were a single framework in which every level of that market could contribute, the headache so far as the building services issues are concerned – around how to enable buildings and clients to play into that market – could be overcome much more smoothly. Such a framework would be some kind of system in which energy users could make available that opportunity to alter the time of demand.

We have talked about systems where the end-user, for instance the person buying the fridge, does not even know or care whether there is a demand management device in their appliance, and we have talked about buildings where the profile is known and where energy savings can be achieved in a transparent manner. I would welcome a framework that would marry these opportunities together into a system that can be offered to the grid.

BC: What policy changes do we need to make this happen?

D H-D: You need to force the players to talk to one another. Where possible, I would want all the domestic

goods to have dynamic demand built into them, by law from 2011, and try to make that EU-wide. I would also try to force everyone to agree on one of two protocols, so you could then start to have a family of consumer retail end-products around it.

Then, on the commercial side, you could have interfaces to things like your air-con system so that it would not be a special thing to put DDM in. If you made those things happen and said you have to provide that technology, then small players can come in and start making innovative solutions around the technology. However, at the moment, it is easy for everyone to say it is hard, we'll have another consultation, we'll blame it on the grid, or we'll blame it on E.ON or on someone else – and the infrastructure is not there to start hanging the bits off.

RS: E.ON very much wants to change energy to deliver a low-carbon UK, and is interested in demand management. Flexible demand is an area that E.ON is currently looking into – it is about shifting the time of use of power, rather than reducing the overall consumption. The shift in demand will lead to a potentially lower carbon generation mix and more efficient electricity supply industry, which has to be good for everyone.

TW: That is what we want, that is what DDM is about, >

“ We are not putting systems in buildings that are capable of being sensibly dynamically managed ” – Terry Wyatt

Terry Wyatt argues for DDM, alongside Paul Lazarevic, left, and Stuart Bailey.



■ The solutions that we have at the moment are carbon-intensive, so demand management does offer a low-carbon solution

■ – Rachel Stanley

Should dynamic demand management be in place before more power stations are built?

> and I feel it's best to stick with the major commercial users at the moment, the retailers like Sainsbury's, Marks & Spencer, and the major manufacturers and industry – I believe that they could incorporate DDM without too much expenditure, but the effects would be colossal, because they are the major users. They will have the power to come to the supply side and demand an appropriate tariff that will make it worthwhile; whereas approaching every householder, as the UK government seems to be doing with its 'smart meters' plan, is not very likely to bring about the circumstances for homes to be able to assist the supply side and so have the opportunity to negotiate their tariff.

BC: Terry, what do you feel CIBSE ought to be doing about this issue?

TW: We might be able to set up a communication forum in some way. Our industry represents the demand side – we specify the equipment that consumers, those on the demand side, use. I don't know how we get the supply side to a level where we could make things happen, but it has to be done so that they start making some commitments. We desperately need to know the supply side is going to do that. And we can assist them because we really do have that ability.

In my view there is an urgent requirement for CIBSE to produce a guide to the application of DDM in buildings and building systems, new and existing, and we should get the contracting side involved, which would then bring in the manufacturing side.



Energetic debate... Rachel Stanley and David Frise.

D H-D: It sounds to me as though establishing those channels is vital and something that CIBSE could really do.

PK: You need to start at grassroots with people designing buildings and the generation coming through for future buildings and retrofitting of buildings. It needs to change what they put in buildings, and if that means a couple more controllers or whatever – the way they look at buildings needs to be slightly different from the past.

BC: So, will DDM happen, and if so, when?

SB: The question is how quickly will DDM penetrate the market rather than will we get it and when. We have forms of demand-side management now. Will it grow? Yes. How quickly? That depends on factors such as the speed of roll-out of smart meters. As a consumer, if you're willing to vary your demand in response to a signal, you need to have a way of doing that that doesn't necessarily require you to go around your house switching appliances off. You could have two electrical circuits in your house – a sensitive load and a non-sensitive load circuit – but this would be prohibitively expensive. So you will need to have a little chip in your appliances for your smart meter to talk to them.

DF: I think DDM will happen. It is about being able to speak in a common language that our customers will understand and, when they have a degree of understanding, it will be about making a business case for them to invest in it. If we do that, then people will go for it, making sure that there is no perceived risk to them from it.

RS: I would very much like to see flexible demand. I believe that it has huge potential as a solution to lowering the carbon of our electricity supply network. As various people have already mentioned, when it happens is dependent upon so many factors. From a personal point of view, I don't see why it couldn't happen in the next five years, given the right incentives. ●



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Burning questions





The fire at Lakanal House in Camberwell, south London (pictured here and top right) started in a home on the ninth floor and spread to floors five and 11. Questions have been raised about the role of refurbishments within the block and the ability of the fire to spread.



Press Association

A fire at a residential block in London has focused attention on the state of some council housing in Britain and the role of refurbishments. **Simon Ellery reports**

In July this year a fire in a block of high-rise flats in Camberwell, south London, killed six people. The official investigation into the blaze is continuing, but the tragedy has raised concerns about fire safety in such public sector housing.

Lakanal House, the 14-storey tower block where the fire occurred, was built in 1959 and underwent a £3m refurbishment in 2007. According to some experts, poor maintenance and refurbishment work at the block, together with a flawed safety regime, meant that new building services, such as ductwork or cabling, could have compromised fire safety.

A faulty television on the ninth floor started the fire. It then spread not only up to the 11th floor but also down to the fifth. This hampered rescue services because they could not tackle the blaze on the ninth and higher floors until they had controlled the fire on the lower floors. By this time some of the occupants on floor 11 had died.

The Regulatory Reform (Fire Safety) Order 2005 (RRO) requires the tower block owner – usually a local authority – to ensure a ‘responsible person’ carries out a fire-risk assessment (FRA). Moreover, when major refurbishment work is carried out, a new assessment should be conducted. But since town halls have done away with experienced in-house clerks of work, that task usually falls to a third party.

In many cases fire authorities then audit third-party assessments. If ‘serious shortcomings’ are found, an >

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A firefighter tackles an unknown blaze. Most dwelling fires do not spread beyond their room of origin (see box, bottom right).

> enforcement notice can be issued. Many of these have been issued in the wake of the Camberwell fire. If the risk of fire is found to be serious enough, a prohibition notice can be applied to shut down the building.

However, the 'responsible person' is unlikely to be professionally trained in fire safety design, according to James Crane, principal fire consultant at Hilson Moran consulting engineers. He is concerned about the expertise of third party assessors – some of whom are housing officers that have completed short courses.

'Many are also ex-fire brigade people and, while there is some guidance, there is not a national register with specifically qualified professionals,' says Crane. 'The responsible person is liable and not the third party, and this is an issue that directly affects building services engineers.'

Building services are central to any solution to ensure other tower blocks do not repeat the tragedy, says Peter Stephenson, principal fire safety engineer at Kingfell Consulting. They must not only comply with Part L of the Building Regulations, but also with Part B on fire safety.

Stephenson is clear about the fallout of the Camberwell fire. 'The severity of the fire has put the focus on ensuring that there are adequate means of escape from high-rise buildings, there is sufficient fire compartmentation [where there is a fire barrier] within buildings and there is an effective fire risk assessment in place,' Stephenson says.

He adds that building services – such as cable, pipes, ducts and other services that pass both vertically from floor to floor and horizontally within a floor area – form an essential part of any building: 'Wherever services breach any structural fire compartmentation, there is the potential for uncontrolled fire spreading through a building.'

Stephenson says that to minimise this risk, the building regulations require certain measures to be implemented within a building's design: 'Where

services pass through a compartment floor, the services should either be contained within a protected shaft or adequately fire stopped at each level.

'It is very important during any ongoing fire risk assessment that the responsible person identifies any deficiencies caused by poor fire stopping around services.'

Surveyor Arnold Tarling argues that flawed alterations to the original design of Lakanel House 'removed the fire protection between flats'. He bases his view on an inspection of sister block Marie Curie House, which had been refurbished alongside Lakanel House. According to an unofficial report handed to the London Fire Brigade, Tarling says that fire-resistant boards had not functioned properly because they weren't sealed; and boards used as firebreaks had been smashed to make way for cabling.

That view is shared by Royal Institute of British Architects Council member Sam Webb. He adds that the work included a timber-framed false ceiling fitted

■ The key issue is why the fire spread to other floors. That's why people died ■ – Sam Webb

20 years ago in central corridors linking flats and covered pipes from a new heating system.

In effect, fire proofing between flats and the corridor was compromised and this allowed the blaze to spread into the ceiling cavity, causing flashover, leading to a fireball. He says the cause of the fire is largely irrelevant: 'The key issue is why it spread to other floors. That's why people died.'

Other experts say replacing open slats at the end of every corridor – which was a standard feature to allow smoke from a fire to escape – were replaced with windows. This can mean people being fatally affected by smoke inhalation.

Southwark council and the London Fire Brigade have since inspected Marie Curie House to ensure that any >

Fires

Official figures show that fires are generally confined to the room where they start.

According the Department for Communities and Local Government, during 2007 there were 52,700 fires in dwellings such as houses, flats and maisonettes.

A total of 443 people died after being involved in a fire and 331 (75 per cent) of these deaths were the result of dwelling fires.

However, 87 per cent of dwelling fires were confined to the room of fire origin. Of these fires, half did not spread beyond the item first ignited while four per cent did not result in any 'appreciable' fire damage.

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An anonymous example – not connected with the Camberwell fire – of poor ‘compartmentation’ (see box, bottom right). The fire separation has been breached, allowing an unprotected route for fire to spread from one risk area to adjacent accommodation via voids and ducts.

> potential structural issues have been identified and, where necessary, corrected. But a BBC investigation, using requests under the Freedom of Information Act with 32 London boroughs, has found that more than 250 high-rise social housing units have not been risk assessed by their local authority.

But what can building services engineers do – particularly in public sector buildings – to contain fires? Firstly, Tarling warns that a standard FRA would not have identified the defects in Lakanal House, as they would not have opened up the false ceilings. He says that a chartered surveyor, architect or structural engineer competent in fire compartmentation would have raised questions. He argues that all fire-resistant panels should be clearly labelled as to the function they perform, as well as what to do and who to contact if they are damaged.

‘It would be wrong to assume that a telecoms engineer, electrician or plumber called in to rectify a small defect would know what they were dealing with,’ he says. ‘Building services engineers should always demand that FRAs are undertaken prior to their work being carried out, during the works and at the end of the works.’

When making holes through compartments, services engineers must always ensure that they are fire proofed – for example with dampers, intumescent material, class o boards, and iron sleeves. The issue of fire protection should also be raised with the contract administrator or main contractor. ‘If in doubt, fire proof in any event,’ adds Tarling.

Retrofitting fire safety features into 1950s and 1960s tower blocks can be prohibitively expensive. But installing modern alarm systems for both individual flats and across the block, and adding emergency lighting and ensuring that escape routes are always clear, are cost-effective measures, according to John Hopkinson, fire risk engineering regional director at AECOM consulting engineers.

He adds that escape routes should ideally be pressurised to keep smoke out. All properties above six stories should have sprinkler systems installed to

the common corridors and lobbies – but this is more difficult and costly to install. Tenants should also be familiar with their own fire escape routes, which should be sign-posted in common-way areas. Many fire safety surveyors bemoan the fact that much of the work councils are currently doing under the government’s Decent Homes programme fails to improve fire safety. Some argue that due to the lack of FRAs undertaken and the scale of the work identified, councils will be unable to rise to the challenge of making all tower blocks fire safe without considerable extra funding.

But it’s essential that lessons learnt from Lakanal House are incorporated quickly and building services incorporate fire security. Building services also have a crucial part to play in introducing new fire safety measures. ●

CIBSE holds various training courses relating to fire safety – the next being on 14 January – on Part B of the Building Regulations. This course will include recent changes to the regulations and Approved Document. For more information on this and other courses, and to book a place, visit www.cibsetraining.co.uk

Compartmentation

The spread of fire within a building is restricted by sub-dividing it into compartments separated from one another by walls and or floors of fire-resisting construction.

The object of this sub-division is:

- To prevent rapid fire spread which could trap occupants of the building; and
- To reduce the chances of fires becoming large.

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Setting an environmental challenge... Professional services firm KPMG's new headquarters in London's Canary Wharf.



A measure and a half

The new UK headquarters for KPMG features a tri-generation system, active chilled beams and a number of other energy-saving features to achieve a design that will exceed Part L (2006) requirements by more than 50 per cent. **Paul Haddlesey** reports

When the professional services firm KPMG produced a brief for the design of its new headquarters at 15 Canada Square in London's Canary Wharf, the firm presented consulting engineers AECOM with quite a challenge: to exceed Part L (2006) requirements by 50 per cent using techniques that would deliver a sensible return on investment.

In line with KPMG's sustainability management plan for the development, a BREEAM Excellent rating is achieved and complies with new office criteria for occupation densities, fresh air supplies and cooling loads. 'We set very clear standards for what we required in terms of internal conditions, environmental impact and energy usage, and then challenged the design team to meet those criteria within a sound economic case,' says Alastair Young, KPMG's head of property, Europe.

The building is a 15-storey structure clad in solar-control glass and architectural metals. KPMG will occupy around 37,000sq m (400,000sq ft) and, once the building is completed in April 2010, it will enable the company next summer to consolidate staff from several London offices and take advantage of the potential operational savings.

CWG was responsible for the shell and core phase, but KPMG has taken responsibility for its own fit-out. However, in order to meet the environmental aspirations of the project, KPMG's design team became involved before the fit-out began.

'It was important to have input at the base build phase to ensure we would have enough points to achieve the required BREEAM rating,' says AECOM project manager Jas Dhaliwal. 'To that end, the centralised online portal created for the project ensured we had access to the information we needed. We then used dynamic thermal modelling to calculate the total carbon emissions.'

Another key requirement for KPMG was that

the building should have an open and transparent feel, necessitating the use of a glazed façade, with inevitable implications for solar heat gains. The design team investigated the possibility of using an active façade to mitigate these effects but this proved to be uneconomical. However, on the 14th floor, where there is a double height space, a ventilated façade with supply air at the bottom and extract at the top has been installed. This provides an unobstructed outward view while ensuring that no heat or cold will be radiated into the space from the glazing.

As would be expected in almost any project of significant size these days, the use of renewable energy sources was also investigated but none of these offered acceptable payback periods. Instead, the building services team carried out a thorough analysis of every aspect of the services to see where the required energy savings could be achieved.

Active chilled beams

In the office spaces, for instance, the combination of internal and solar heat gains dictated the use of mechanical cooling. 'Whilst passive chilled beams would have provided the lowest energy solution they would not have delivered effective control of comfort conditions and flexibility of use, so an active chilled beam system was selected,' Dhaliwal explains.

'Here, the chilled beams are driven by air from the central ventilation system, rather than relying on convection currents, thus increasing the cooling capacity of the beams. While this arrangement increases energy use through the fan power consumption, this was found to be a more efficient solution than using fan coil units or variable air volume.'

There are also plans to experiment with allowing the internal temperatures to drift upwards by around 1°C to evaluate the effects on occupant comfort. If no discomfort is reported, there is potential to achieve even >

Project team

15 Canada Square, London

Project manager
Turner & Townsend

Quantity surveyor
EC Harris

Architect
Swanke Hayden Connell Architects

M&E engineer
AECOM

Management contractor
ISG

Mechanical contractor
Skanska Rashleigh Weatherfoil

Electrical contractor
Phoenix Electrical Company

Ductwork contractor
Imperial Ductwork Services

BMS contractor
DMS

Commissioning manager
Baynard Associates



Above and right: The tri-generation system comprises a combined heat and power engine linked to an absorption chiller. Facing page: Active chilled beams are driven by air from the ventilation system.



> higher energy savings – perhaps as much as eight per cent. Outside air, tempered in the rooftop plant room air-handling units, is ducted onto the active chilled beam system, and each beam also has its own fresh air correction to localise the control. Heat is recovered from extract air using thermal wheels in the air handling plant. Chilled water for the system is supplied either from water-cooled chillers served by a cooling tower on the roof of the building, or from an absorption chiller that forms part of the tri-generation system. Consideration was also given to using water from the local dock as a cooling source but this was found to be non-viable, as the future development of the adjacent dock could lead to the ground-source heat pump system becoming redundant sometime in the future.

Tri-generation

The tri-generation system comprises a 1000kVA gas-fired combined heat and power (CHP) engine linked to an absorption chiller. While tri-generation is now being heavily promoted by the Greater London Authority as part of its 'London Plan' for reducing emissions, the

building had already been granted planning approval and did not have to comply with this. Consequently, tri-generation was selected solely for its positive contribution to improving energy efficiency and reducing emissions.

'The savings from the building's tri-generation system are significant, and therefore the CO₂ emissions are reduced to less than 35 CO₂kg/m sq,' Dhaliwal says. 'The CHP is driven by the building's electrical load when the building's load is drawing around 60 per cent of the CHP load for a sustained period of time.'

'The hot water from the engine is then directed either to heat exchangers to supply space heating and domestic hot water (DHW), or to the absorption chiller, depending on requirements. When there is a requirement for cooling, the absorption chiller is configured as the lead chiller and supplemented by the water-cooled chillers if necessary, or at times when it would be uneconomic to run the CHP. Similarly, gas-fired boilers are used to either provide space heating and DHW when the CHP is off, or to supplement the heat generated by the CHP as and when required.'



Jas Dhaliwal, left, and colleagues at AECOM, the M&E contractor on the project.



Energy management

An addressable building lighting control system with daylight linking, emergency monitoring and ballast error feedback will be provided. The lighting system presence detectors are linked to the environmental control system of the building, which enables the temperature set points to be relaxed when no occupancy is detected in the particular zone.

Presence detectors are also provided within the toilet and changing facilities to enable the water supply to be shut off when no presence is detected in the area.

In addition to these 'headline' energy-saving features, other design elements that contribute to the overall energy performance include efficient lighting (mostly T5 fluorescent) linked to daylight and occupancy controls, and variable speed pumping of chilled and hot water.

Zoning and measuring

In order to provide accurate measurement of energy consumption, each floor has separate metering of chilled water, low temperature hot water, lighting and small power – as well as water used in toilets. 'This arrangement provides a flexible building in enabling close monitoring of the effects of any changes within the spaces,' Dhaliwal notes.

Grey water recycling

While not impinging directly on energy consumption, the inclusion of grey water recycling was an important element of KPMG's commitment to sustainability and is expected to reduce water consumption by at least 30 per cent. Says Dhaliwal: 'Water from wash basins and the cooling tower will be stored in a recycling tank in the basement and used for flushing urinals and WCs.'

'This arrangement is more efficient than just using water from wash basins, as blowing down water from the cooling towers gives us a 55 per cent grey water reclaim potential. The situation will be monitored through the meters on each floor.'

Other sustainability features include 200 cycle

Key facts

- HVAC and lighting <50 per cent of the carbon emissions of the Part L notional building;
- BREEAM Excellent with a score of 72.93 per cent
- Tri-generation system;
- CO₂ emissions <35 CO₂kg/sq m;
- 55 per cent grey water reclaim by using blow-down from cooling towers;
- 200 cycle spaces;
- 350sq m sedum roof;
- Variable speed pumping;
- Evaporative humidifiers;
- Heat-recovery thermal wheels in main air handling units; and
- Daylight control.

Plant specification

Heating

- 1 x tri-generation 800kW heat exchanger;
- 4 x 890kW high-efficiency, low-NO_x boilers;
- Boiler flow/return temperatures = 80°C/60°C; and
- Chilled beam flow/return temperatures = 45°C/38°C.

Cooling

- 1 x 620kW absorption chiller;
- 3 x 2334kW water-cooled centrifugal chillers;
- 1 x 1167kW water-cooled screw chiller;
- Chiller flow/return temperatures = 6°C/12°C; and
- Elevated flow/return circuit temperatures for chilled beams = 14°C/16.5°C.

Ventilation

Four main air handling units, each providing around 17cu m/s of outside air. Each air handling unit consists of heater battery, cooling coil, thermal wheel, filters, evaporative humidifiers and supply and extract fans.

Metering

Energy meters for measuring electrical, heating and cooling consumption are provided at each floor.

Power

Automatic Staged Power Factor Correction to 0.95 inductive.

spaces with lockers, changing facilities and showers as part of KPMG's Green Travel plan, and a 350sq m sedum roof.

With its attention to detail, this project has not only exceeded the requirements of the current Building Regulations, it also looks set to more than satisfy the anticipated 2010 regulations, according to KPMG.

'We were aware that we were setting a challenging design task to everyone involved in the design team and we have been very pleased with the results,' says Young. 'The teamwork between the different disciplines has been very good and made a positive contribution to the success of the project.' ●

■ The teamwork between the different disciplines has made a positive contribution to the success of the project ■
– Jas Dhaliwal



Smarter

With the demand for high-tech energy meters expected to soar, what options are available for equipment specifiers? Ewen Rose talks to the experts

With the UK government pledging to put a smart meter in every home by 2020, energy consumption is about to become more of an exact science. These meters have been prevalent in a number of European countries for years, while Britain's own energy suppliers have spotted the security and commercial benefit to them in having direct access to customer consumption. But, whatever the motivation, the fact is that we will soon have the ability to measure and monitor energy consumption far more effectively.

Smart meters will, thanks to their two-way flow of information via the internet, tell users more about their energy consumption, but will also give energy suppliers direct access to real time information about their customers' energy usage patterns. Information is power, but the key is what is to be done with that information.

Energy suppliers are taking on the formidable task of fitting smart meters throughout the building stock. When the country moved over to natural gas from town gas in the late 1960s and early 1970s, engineers had to visit 13 million homes. Fitting smart meters will require visits to 25 million.

Yet the task in the commercial field is arguably even more challenging. To have any hope of targeting energy savings in commercial buildings, particularly those with multiple tenants, the owner needs to have a clear idea of where the bulk of his increasingly expensive



up

energy is going. According to general industry practice, this means sub-metering for services such as boilers and combined heat and power units above 50kW, chillers larger than 20kW, and fans and pumps where overall power input is 10kW and above.

Tenanted areas larger than 500sq m and heating/cooling services for tenanted areas larger than 2,500sq m should also be measured separately so that engineers can get a fix on where energy overloads are occurring, practitioners say.

There is nothing revolutionary about this. Gas meters were fitted in London in 1851 to measure how much gas was being consumed by street lighting. We can only speculate about what was done with that information once it had been gathered, but presumably it encouraged city managers to turn the lights off more promptly.

However, energy conservation is still struggling to

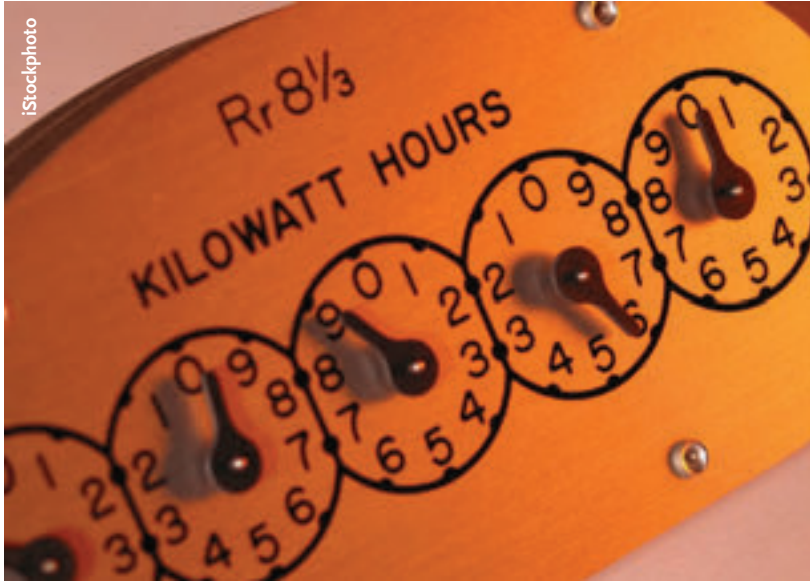
get established. Until relatively recently there was little incentive for small energy users to invest in energy metering. Climate change was a remote issue, the cost of power was low and utilities were estimating bills.

Things have changed. Energy prices are a boardroom issue, and government initiatives such as the Carbon Reduction Commitment Energy Efficiency Scheme (CRC) and the Climate Change Levy have given energy efficiency a substantial financial value.

One tonne of carbon emissions now officially costs £12 under the CRC cap and trade scheme – at least until 2013, after which the price will no longer be fixed and will be substantially (possibly three or four times) higher.

This creates a huge incentive to measure and monitor energy use for the 5,000 users on half-hourly meters, consuming more than £500,000 worth of energy a year, who are to be included in the CRC. But >

“ A smart meter and accessories can be retrofitted onto your system and will pay for itself in about three years ” – Kris Szajdzicki



Publication

CIBSE updates metering guide

Meters that are selected, installed and commissioned correctly will provide the information needed for the effective monitoring and targeting that is an essential part of good energy management.

TM39 *Building energy metering* provides best practice guidance for those responsible for the design, installation, commissioning, operation and maintenance of building services energy metering systems.

This new edition provides a more general approach to energy metering for both new and existing buildings, allowing designers and facilities managers to develop a metering strategy that is tailored to meet the particular requirements of a specific project. A step-by-step method is provided to assist in selecting appropriate ways of metering energy use.

The document covers compliance with relevant building regulations, meeting statutory requirements for Display Energy Certificates, and also takes a look at future legislation such as the Carbon Reduction Commitment Energy Efficiency Scheme and changes to the Energy Performance of Buildings Directive.

TM39 is essential reading for designers, owner/occupiers, landlords (and the letting agents who act on their behalf), tenants, facilities managers, and anyone else who can benefit from the energy data that meters and submeters can provide.

For more information, or to buy this publication, visit www.cibse.org/publications or call 020 8772 3618.

> it also makes commercial sense for far smaller energy consumers too, according to metering specialists.

'The price of energy meters has come down by 7,000 per cent in 25 years,' says Kris Szajdzicki, chairman of Bradford-based ND Meter Ltd. 'Back then, it was not worth doing anything about your energy unless you were consuming more than £60,000 worth per annum.

The cost was too high. For example, a BMS would cost about £10,000 including kit, installation and training, and the energy saving was about 10 per cent a year.

'Now if you spend more than £2,500 a year on energy you can do something about it for as little as £600. That will buy you a smart meter with web interface, real-time graphs and 12 months' consumption history so you can measure and compare usage – all this can be retrofitted onto your system and will pay for itself in about three years.'

Building and facilities managers can have a meter complete with logger and an internet interface, which uses a standard browser allowing them to access their information almost anywhere, all in a single box complete with the necessary software and a link to the building's management system – if there is one. Installing an alarm that alerts you when your energy loads are excessive, will demonstrate reasonable provision in line with the guidance in Part L Approved Documents ADL2A and B.

Demand for meters will continue to rise as more buildings and building types – without in-house experts – are required to provide energy information and meet legislative targets. This means the technology needs to be simple to use and be read automatically.

Also, more of the information will need to be available remotely to third party experts, who can analyse it and advise the building managers on remedial action.

'It is an absolute scandal that in so many of our buildings we have absolutely no idea how much energy is being consumed,' says energy consultant Mike

Malina of Energy Solutions Associates. 'The first rule of energy management is: measure, analyse, act.'

With feed-in tariffs for micro-generators due to come into effect next April, smart meters should be set up to allow the two-way flow of electricity to and from the grid. However, the correct type of four quadrant meters will be required to make this possible, and there is a good chance that utilities will charge extra for this facility.

Jim O'Neil, chairman of M&E Sustainability – the initiative led by the Heating and Ventilating Contractors' Association and the Electrical Contractors' Association to support contractors' efforts to deliver more sustainable projects – says it is important that the role of meters is linked to overall building services strategies.

'A large proportion of utility bills are estimated so we have a very poor grasp on actual consumption,' says O'Neil. 'The roll-out of smart meters is a huge opportunity for the sector – this is "bread and butter" work for competent firms. They can also install the improved heating and lighting controls that allow building users to do something about the energy consumption information they will receive from their smart meter.' ●

■ The roll-out of smart meters is a huge opportunity for the sector and is 'bread and butter' work for competent firms ■
– Jim O'Neil



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Winds of change

The performance of air-con systems continues to improve, thanks to technical innovation and rising efficiency, writes **Ian Vallely**

The efficiency of air conditioning systems has improved dramatically over the past two decades and this has significantly reduced their running costs, energy consumption and impact on the environment. Figures from Daikin UK show that, in 1990, a 28kW system running on R22 refrigerant would have had an energy efficiency ratio (EER) of 2.46, whereas a similarly-sized system today can operate at an EER of 3.74 – which equates to around 30 per cent less fuel use. (Supply of virgin R22, of course, ceases on December 31 under refrigerant phase-out this year).

This example is for a variable refrigerant volume (VRV) system. VRV is Daikin's proprietary version of the generic variable refrigerant flow (VRF) system produced by other air conditioning manufacturers. The principle of VRV and VRF is broadly similar in that they both involve the volume or flow rate of refrigerant being matched to the required heating or cooling loads, saving energy and enabling more accurate control.

Graham Wright, product sales manager at Sanyo Air Conditioners, also points to VRF as a major area of technological innovation. 'It has been subject to year-on-year incremental improvements that, over time, have transformed performance out of all recognition,' he says.

'The result today is incredibly sophisticated systems and associated controls that are light years ahead of the first systems – dramatically cutting emissions and improving comfort for building occupants.'

Philip Ord, product marketing manager at Mitsubishi Electric Air Conditioning, agrees, adding that modern VRF systems can offer simultaneous heating and cooling with full heat recovery and the ability to link to other equipment such as air curtains and water heaters.

'VRF air conditioning is now a serious and viable alternative to traditional carbon-based heating and water-cooled chiller systems,' he says. 'The controls have advanced so far that they can also control and



monitor other building systems such as alarms, lighting, etc, to increase the potential for energy saving further.'

Mitsubishi Electric says it has gathered extensive test data which shows that a VRF ground source heat pump system can outperform a traditional boiler/chiller system by more than 300 per cent for heating and cooling.

'What the tests also prove beyond doubt is that the air source heat pump VRF system is much more efficient than traditional methods,' says Ord. 'Add to this further improvements in design and controls and new products such as VRF water heating systems or air curtains, and it is clear that, if people really want to make savings, they should look at a VRF system.'



For Daikin product executive Simon Keel, the largest contributor to energy efficiency gains in air conditioning has been direct expansion inverter heat pumps and especially those in multi-split VRV systems: 'Being direct, there is no need for extra pump or fan power to be used to circulate the heating or cooling around a building. The hundreds of thousands of such systems operating throughout the world have proved the point.'

However, he believes that the next 20 years could see the decision-making landscape change, resulting in a shift of emphasis in the air-con sector: 'Chilled beams that only started to become popular five or so years ago have replaced variable air volume systems in the majority of cases. These will be operated in

association with a chiller and a boiler to give heating and cooling.'

Mixed mode

Unsurprisingly, John Staunton of chilled beam supplier SAS agrees that this technology is in the ascendant. He says: 'The British Council for Offices' updated *Guide to Specification* has introduced a design target for mixed mode and naturally ventilated offices of not more than 25C for more than five per cent of the occupied hours, and 28C for not more than one per cent.

'Many in the industry see the likely consequence of this being the next generation of office buildings adopting a mixed-mode approach to cooling and ventilation, with probably greater use of free-cooling >

A rooftop cooling unit. Carrier's Andrew Keogh says better system design and deploying other strategies can lead to improvements.

> systems. The demand for energy efficient buildings, prompted by tougher requirements in Part L of the Building Regulations, means that chilled ceilings and beams are increasingly being given higher priority by clients and consultants.'

Keel believes that chiller technology has also started to change with the introduction of new compressors, a point with which Carrier Air Conditioning's engineering manager Andrew Keogh concurs – up to a point: 'Developments in compressor technology can bring improvements, but more can be achieved by better system design and the incorporation of other system strategies [such as free cooling, heat reclaim and heat pumps].'

For Ted Berry, managing director of Samsung distributor and CRM specialist Gallant Air Conditioning, the long-term future of air conditioning will not be about pumping refrigerant around buildings. He says: 'We have to get out of our silos.'

The successful firms in the post-recession period will provide a total service approach including non-technical aspects of a project such as access to finance and help with planning applications, etc.'

Berry envisages a future where the traditional labels no longer apply and specialist suppliers work in partnership with consulting engineers to deliver the particular skills required on a project-by-project basis. This would include buying in expertise in areas like thermal modelling for firms who may not be able to afford to permanently maintain an in-house resource.

He adds: 'Suppliers must work more closely with specifiers to come up with a complete technical solution rather than just focusing on getting the best price for a particular product. Price will always be an issue, but a properly integrated building services solution including lighting, heating and ventilation is really what we all should be aiming for.'

“ The next generation of office buildings is likely to adopt a mixed-mode approach ” – John Staunton

Case study Learning centre is inspired by VRF



The first UK installation of Sanyo's gas-powered VRF air conditioning system, which generates its own electricity, is taking place at Suffolk One, a centre of learning in Ipswich.

The £65m building is designed to provide an inspirational learning environment and will accommodate 2,000 16 to 19 year-old students when it opens in September 2010.

The £11m M&E installation is being managed by Inviron. All air conditioning equipment for the project, with a combined cooling capacity of 1.2MW, was supplied by distributor ESS and is being installed by Adcock Refrigeration and Air

Conditioning. The building requires 19 GHP VRF air conditioning systems and 16 split systems. The units are mounted primarily on the roof, in groups serving five 'clusters' which connect and surround the core of the building.

The building uses 310 fan coils, mainly ducted units for concealed mounting in ceiling voids. These are augmented by a small number of ceiling cassettes. All equipment operates on R410A refrigerant. The VRF systems include both two- and three-pipe technology, the latter used to harness waste heat generated within glass-clad parts of the building and transfer it to areas requiring heating.



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“ You cannot have multiple specialists dropping their chosen solution into a project anymore ”
 – Ted Berry



Above: Air curtains can link to other systems. Below: Daikin produces a proprietary variable refrigerant volume system.

> **Controls**

Ord points to the area of control as offering by far the greatest potential for carbon reduction, but this does not need to be sophisticated. ‘A simple adjustment of on-off times, a reduction of set points, and putting in place systems that automatically switch equipment off when necessary can really make a difference,’ he says.

Maintaining tight control is also important to Wright: ‘The key to carbon reductions is to use building management system controls to ensure that the system is set up to switch off when the building is unoccupied, and changing set points to suit different

loads and time schedules during an occupancy period. This is straightforward, but I am constantly amazed by end-users who have just one on-off time set for a whole system, where they could have up to 50 time-temperature changes set up on units in a zone.

‘Where such control systems are set up correctly, we estimate that the running cost savings can be up to 20 per cent.’

However, the critical aspect for Berry is how systems integrate, both with each other and the fabric of buildings, and this, he says, means that controls are the key element in every project.

He believes we still tend to work in an outdated way, calculating heating, cooling and lighting loads separately, but – by looking at a building holistically, it is possible to come up with a more accurate picture of what the building actually needs and so deliver far more appropriate and energy efficient solutions, he says.

‘You cannot have multiple specialists dropping their chosen solution into a project any more,’ he adds. ‘It doesn’t work.’

‘To be sustainable, you have to take a holistic approach and put commissioning of the complete building at the heart of everything you do. The important thing is not the technology, but how you put the solution together.’

Carrier is finding that designers are, indeed, taking a more holistic view in order to meet current and expected energy legislation. Says Keogh: ‘An example is combined heat and power in conjunction with absorption chillers.’

This willingness of enlightened designers to integrate every element of a project also implies an openness to consider renewable technologies, a point confirmed by Keel. ‘By using renewable solar heated air or the ground as a source of energy heating, a building can be made to be sustainable.

‘Fossil fuel burners push out tons of CO₂ which can easily be saved with the use of heat pumps. They are relatively easy to install and operate. Part of their success lies with modern electronic controls, coupled with the ability to monitor their service remotely. In some cases, a service visit can even be arranged before the user knows there is a fault.’ ●



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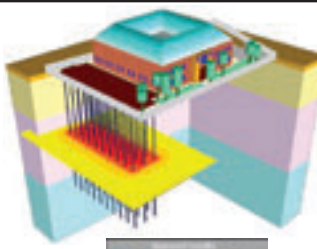

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New gateway to Royal Botanic Garden, Edinburgh

A new £15.7m biodiversity and information centre has opened at Edinburgh's historic Royal Botanic Garden, which dates from 1670, and today attracts more than 660,000 visitors annually.

The brief was to incorporate energy saving and renewable energy solutions to make the centre both cheap to run and an excellent example of sustainability and design.

Consultants Max Fordham and Emtec Building Services chose Grundfos Pumps, whose integrated, energy-efficient pump solution comprised a range of energy efficient UPS circulators and TPED in-line pumps, along with two Hydro Multi-E booster sets and an IMpress pressurisation unit.

The new facility offers a wide range of experiences, including: a biodiversity garden; participation zones; real life science studio; education room; dynamic exhibition areas; shop and restaurant.

● For more email: ldingley@grundfos.com or tel: 01525 775347.



JS Humidifiers aids low energy data centre humidification

JS Humidifiers has supplied a low energy JetSpray humidifier to the award winning Fujitsu data centre in North London.

Having employed many energy saving and IT optimisation strategies, Fujitsu has conserved the equivalent annual energy use of 6,000 homes. One strategy provided electrostatic control by using recovered data hall heat to



humidify incoming fresh air – evaporating JS Humidifiers' low energy cold water JetSpray – instead of using energy-hungry steam humidifiers.

● For more tel: 01903 850200.

Kentec in a league of its own!



Kentec is defending two more of England's top soccer stadiums against fire protection systems

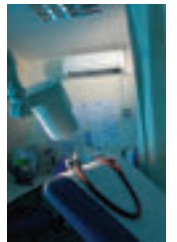
based on Kentec Syncro fire control panels. At Aston Villa's ground, a networked system of seven Kentec 4 Loop Syncro Control Panels use Apollo's open protocol fire data communications, while at West Bromwich Albion's Hawthorns stadium, the system is supported by Apollo's Protocol, linked to more than 700 Apollo XP95 devices.

● For more visit: www.kentec.co.uk email: robine@kentec.co.uk or tel: +44(0)1322 222121.

Mitsubishi heavy cools 'fever' at busy medical centre

When medical centre Chatfield Health Care found its four-storey premises a bit 'feverish' in summer, it looked to Mitsubishi Heavy Industries Europe (MHIE) for high-efficiency air conditioning systems. With outdoor siting problems to solve, solutions provider Aircon Worldwide designed, specified and installed 66.6kW of compact equipment from MHIE's KX and split ranges, sourced through distributor FM Air Conditioning.

● For more visit: www.mitsubishiaircon.co.uk



New WRAS-approved ball valve from Hattersley

Hattersley has launched a new range of WRAS-approved DZR brass ball valves in six compression sizes, from 15 to 54mm, and eight threaded sizes from 0.25 to 2.0 inches. Extra seals reduce the risk of installation damage, a metal-to-metal primary seal on the body seat retainer joint provides greater strength and sealing capabilities, and an O ring seal in the threaded versions' main joint gives additional leakage protection.



● For more visit: www.hattersley.com email: SShand-Brown@crane-ltd.co.uk or tel: 01473 277434.

Timoleon on combining floor heating with acoustic structures

Timoleon's new TX100 publication guides architects and builders on combining underfloor heating with floors and walls needing predictable noise transmission levels. The first guide to offer a complete spectrum of systems matched to robust standard details, it explains how to integrate underfloor heating and cooling systems into all types of acoustic constructions to enhance the environment and improve energy efficiency.

● For more email: projects@timoleon.ltd.uk or tel: 01392 363605.



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● For more visit: www.aircraftairhandling.com

HCP radiant heating recognised by CPA for design innovation

HCP, a division of SAS International, has been recognised by the Construction Products Association for health, safety and security design innovation in radiant heating panel manufacture.

Anti-ligature panels are ideal for use in secure facilities, such as mental health units and prisons, and contribute to a safer and more secure environment for both patients

and inmates by reducing the chances of accidental burning and the opportunities for self-harm.

● For more information visit: www.hcp-sasint.co.uk or tel: 01424 712195.



Off-site manufacture adds value



When specifying the building services for Walsall College's new Business and Learning Campus, Balfour Kilpatrick identified that off-site manufacture of plant rooms would offer value engineering benefits. HVAC

specialist Armstrong constructed the two plant rooms at their factory in Halesowen. This meant that work on the building services could take place concurrently with other on-site work, saving several weeks in time and providing significant health and safety advantages.

● For more visit: www.armstrongintegratedsystems.com email: salesuk@armlink.com or tel: 0121 550 5333.

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www.smartenergy.co.uk

02 Dec 2009 The Role of CFD in Building and System Design

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CIBSE Building Simulation Group focuses on CFD software in practice. Tel: 020 8675 5211 email: williams@cibse.org

03 Dec 2009 Achieving Excellence in Construction

London
Promoting best practice procurement by OGC and NEC.
www.ogc.gov.uk

03 Dec 2009 National Housing Federation, London Development Conference: focusing on the future

London
How to keep developing in the recession and build eco-homes.
www.homesandcommunities.co.uk

03 Dec 2009 Building services for low carbon supermarkets

London
How Tesco developed its first low carbon store. Tim Dwyer, tel: 020 7815 7638 email: timdwyer@lsbu.ac.uk

08 Dec 2009 Carbon capture and storage

London
Case studies, updates and a demonstration.
www.energyinst.org.uk

10 Dec 2009 Sustainability engineering in healthcare

High Wycombe
CIBSE Healthcare group discusses the latest thinking and drivers behind HTM 07. Richard Knight, tel: 07794 914211.

11 Dec 2009 Passivhaus Schools: the route to low-energy schools in the UK?

London
Learn more about Passivhaus.
www.aecb.net

17 Dec 2009 BWEA Connect

London
A networking event for renewables in the UK, and Christmas reception.
www.bwea.com

13 Jan 2010 The Great Carbon Debate

London
Two speakers debate their interpretation of the 'real' carbon impact of building systems design. Tim Dwyer, tel: 020 7815 7638 email: timdwyer@lsbu.ac.uk

13-15 Jan 2010 Safer Schools, Safer Communities

London
How to eliminate the social causes of crime and poor behaviour. www.issc2010.com

10 Feb 2010 Lifts Group AGM and evening seminar (tbc)

London
Steve Hobson, tel: 01732 458222 email: steve.hobson@geraldhoney.co.uk

10-11 Feb 2010 Manchester HEVAR 2010

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SOCIETY OF LIGHT AND LIGHTING

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15 Dec 2009 Festive lighting: friend or foe?

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A joint meeting with the Institution of Lighting Engineers. Tel: 020 8772 3622 email: lpeck@cibse.org

19 Jan 2010 LG5: lighting in education

London
Speaker Iain Macrae discusses the issue. Tel: 020 8772 3622 email: lpeck@cibse.org

03 Feb 2010 Young Lighter of the Year 03 February

London
Rewarding young talent. Tel: 020 8772 3622 email: lpeck@cibse.org

CIBSE/OTHER TRAINING

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Northern Ireland
Expert advice from the Carbon Trust. www.carbontrust.co.uk

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Expert advice and information. www.bre.co.uk/inetevents

21 Jan 2010 Code for Sustainable Homes

Nottingham
Expert advice and information. www.bre.co.uk/inetevents

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14 Dec 2009 Fans in the 21st Century, Parts L, F and all that London



Bill Bordass, one of the conference speakers.

Passivhaus Schools

Passivhaus Schools: the route to low energy schools in the UK is a one-day conference examining the benefits of this build method.

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The conference is being held at the Royal Institute of British Architects in London on 11 December. Visit www.aecb.net for more information.

26 Jan 2010 Building drainage explained

London

FIRE SAFETY

01 Dec 2009 Detailed technical design of fire alarm systems London

03 Dec 2009 Fire resistance of walls, floors, services and other openings London

14 Jan 2010 Part B (fire safety) of the Building Regulations London

21 Jan 2010 Fire sprinkler systems: design to BS EN 12845 London

PROJECT MANAGEMENT AND BUSINESS SKILLS

01 Dec 2009 Preparing FM and maintenance contracts London

02 Dec 2009 Running projects effectively London

25 Jan 2010 Energy Strategy Reports London – NEW COURSE

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19 Jan 2010 Introduction to 11kV distribution and protection London

25-27 Jan 2010 Electrical services explained

Birmingham

BUILDING REGULATIONS

20 Jan 2010 Building Regulations Part G (2009) explained Birmingham – NEW COURSE

BUSINESS SKILLS

01 Dec 2009 Preparing FM and maintenance contracts London

02 Dec 2009 Running projects effectively London

LIGHTING

08 Dec 2009 Roadway lighting explained (two-day course) London

20 Jan 2010 How to specify lighting: office lighting London

21 Jan 2010 Using the Society of Light and Lighting's Code for Lighting 2009 London

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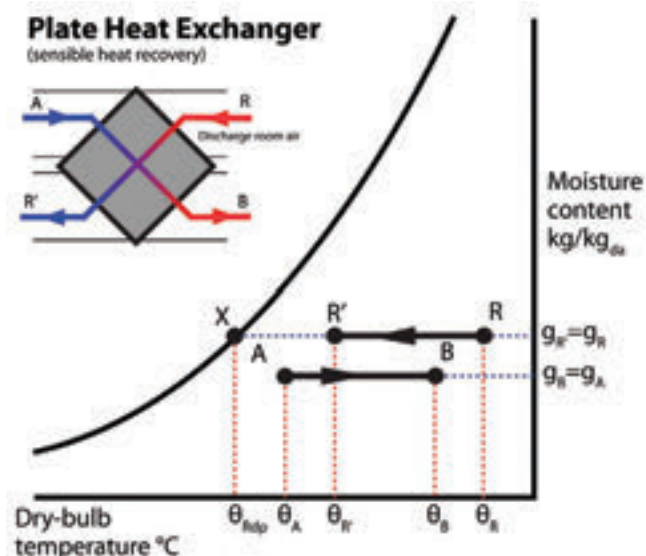
The psychrometrics of HVAC sub-systems

The CPD articles in the April, August and October editions have considered using the psychrometric chart to examine the main properties of moist air, how values may be calculated in the absence of a chart, and the principal processes that may be combined to develop system psychrometry. This article completes the set of processes that are likely to be used in commercial HVAC and develops some combined psychrometric sub-systems. Symbols are defined in the box at the end of the article – you may also find it useful to be able to refer to those earlier articles (all are available online at www.cibsejournal.com)

Heat recovery processes

When considering heat recovery components in HVAC systems they will exchange either sensible heat, or both sensible and latent heat, from typically the discharge room air into the air being introduced from outdoors. An example of a sensible heat-recovery process is shown in Figure 1. This is the psychrometric process that would characterise **sensible only** heat recovery in a plate heat exchanger, a (regenerative) thermal wheel or a run-around coil. The process is similar to that of a basic sensible heating or cooling process – depending on the temperature of the opposing airstream (and this air would be typically the air that is being extracted from the conditioned space). Considering Figure 1, if the temperature of

Figure 1 – Psychrometry of Plate Heat Exchanger



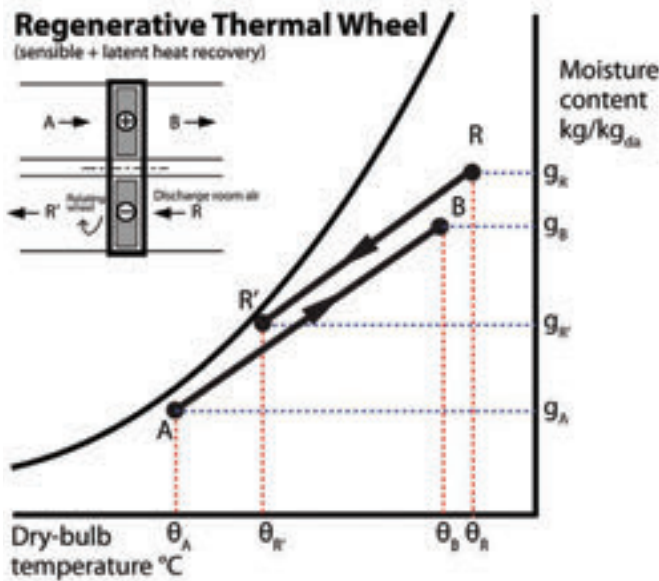


Figure 2 - Psychrometry of Regenerative Thermal Wheel

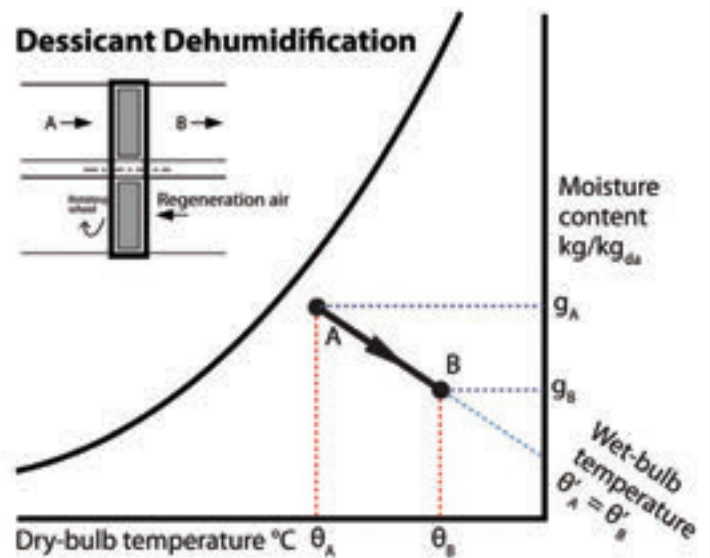


Figure 3 - Psychrometry of Desiccant Dehumidification

the incoming air, A, is below the dew point temperature, of the extracted air, θ_x , there may be some condensation in the airstream that is coming from the occupied space so providing increased heat exchange but, in the case of a simple plate heat exchanger, no transfer of water vapour.

An example of a combined sensible and latent heat exchange (ie including an exchange of water vapour) is shown in Figure 2. This process could be associated with a hygroscopic thermal wheel.

Referring to Figure 2, the practical effectiveness, ϵ , of the heat-recovery devices may be described in a number of ways. In terms of sensible heat exchange $\epsilon_s = \dot{m}_A(\theta_B - \theta_A) / \dot{m}_R(\theta_R - \theta_A)$, and for latent heat exchange, $\epsilon_L = \dot{m}_A(g_B - g_A) / \dot{m}_R(g_R - g_A)$, where the values of ϵ_s and ϵ_L are not necessarily equal for a device that has both sensible and latent heat exchange.

In terms of total heat exchange the enthalpies of the air streams may be used to give $\epsilon_T = \dot{m}_A(h_B - h_A) / \dot{m}_R(h_R - h_A)$.

Desiccant dehumidification

Theoretically the use of absorbent or chemical dehumidification to remove water vapour from an airstream is simply the reverse of the adiabatic humidification process and is shown in Figure 3. In HVAC this would typically be undertaken by a slowly rotating (1 to 10 revolutions per minute) framework with a matrix packing coated with absorbent on a wheel. The actual performance will be determined by the effectiveness of the regeneration of the absorbent – the heating process that removes the moisture from the absorbent



Many are uncertain as to how fans in an air handling system are represented on a psychrometric chart

so that it can then be reused to absorb water vapour from the incoming air.

Tempered spray

The use of sprays and sprayed coils in comfort air conditioning has lost favour for many due to concerns for the need for onerous maintenance requirements to maintain effective and healthy operation. However, when there is a guaranteed appropriate operation and maintenance routine, these types of humidification devices are still employed – particularly in industrial and legacy systems. Adiabatic humidification (as would be typical of an ultrasonic humidifier) was discussed in the article in October. If, however, the water is heated or cooled as it is sprayed into the air stream it will produce the processes as shown in Figure 4. If the spray

water is made warmer than that shown in the figure, humidification may occur isothermally (similar to the process for a steam humidifier, a vertical process line), and if the spray is made warmer still, both humidification and heating can be achieved at the same time.

For the cooler water the traditional method of providing low-temperature water was to spray the water onto an active cooling coil.

Face and bypass

A ‘process’ that appears to be somewhat under-utilised in comfort HVAC is face and bypass. This is not really a single process but a combination (most frequently) of a cooling and dehumidifying process with a mixing process where some of the air passes around the cooling coil and then mixes back in with the air that has been cooled and

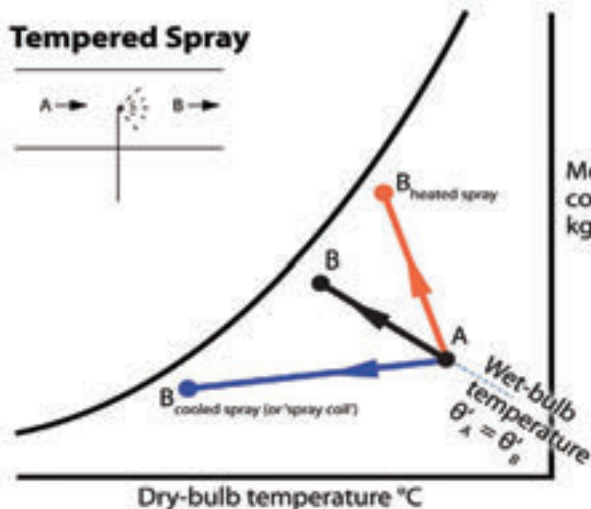


Figure 4 - Tempered Spray

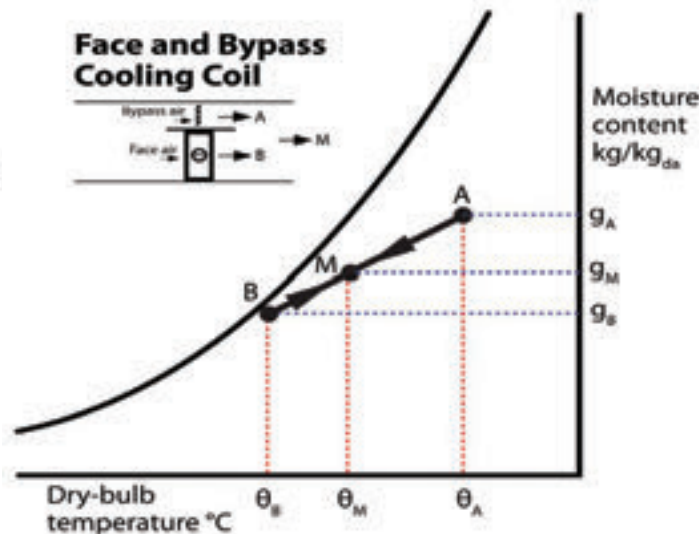


Figure 5 - Face and Bypass of a Cooling Coil

dehumidified. If applied appropriately, face and bypass can usefully reduce the energy used in 'reheat' processes commonly applied to provide close control of supply temperature and humidity.

This process is shown in Figure 5. For a bypassed cooling coil the position of the mixed point M will be determined by the proportions of the air that has passed through the coil, B, to the air that has simply bypassed the coil A.

The room process calculations

The conditioned space is itself represented as a process on the psychrometric chart and has a dedicated section on the standard CIBSE Psychrometric Chart to assist in determining the gradient of the 'room ratio line', RRL. The value of this sensible/total heat ratio is determined from

$$\frac{\text{Room Sensible Load}}{\text{Room Sensible Load} + \text{Room Latent Load}}$$

where the loads (normally in watts) have been previously obtained from a load calculation undertaken by hand (eg the CIBSE Admittance Method) or by using computer modelling software. It is important that these loads are truly **room** loads – these are sometimes confused with central **plant** loads that include the fresh air load that, if supplied from a central plant, is **not** a room load. (This confusion commonly arises from a misunderstanding of the output of computer generated load calculations).

So, for example, if a room sensible heating load was 6kW and the room latent load was 3.23kW the room sensible/total heat ratio would be

$$6 / (6 + 3.23) = 0.65$$

The slope of the RRL may then be determined from the 'protractor' printed on the chart

and shown in Figure 6. In comfort air conditioning, the line will be in the upper quadrant of the protractor when there is a room heating load, and in the lower quadrant when there is a room cooling load. The room ratio line is used to indicate a set of possible room conditions when the supply air condition is known, or conversely a set of suitable supply air conditions when the design room condition has been plotted. The actual length of the line is determined by the actual room load and the supply air mass flow rate – this will be fully applied in a subsequent article.

Filters and fans

There is often uncertainty as to how filters and fans in an air handling system are represented on a psychrometric chart. Practically a filter would not affect the heat content in the air – it would of course have a pressure drop across it and so consume air power. So the filter is not normally included in a psychrometric plot. The fan will sensibly heat the air by about 0.1K for each 100Pa of total fan pressure (WP Jones, 2001, *Air Conditioning Engineering*, 5th Edition) and so can be shown on a psychrometric chart as a simple, sensible heating process.

All the psychrometric processes that have been described in this short series of articles may be combined to determine the component requirements for an air conditioning system, to determine its control strategy and to predict its operation. By linking in data reflecting historic outdoor air conditions the psychrometric analysis can predict comparative energy consumptions for different systems. A future article will develop these combined systems.

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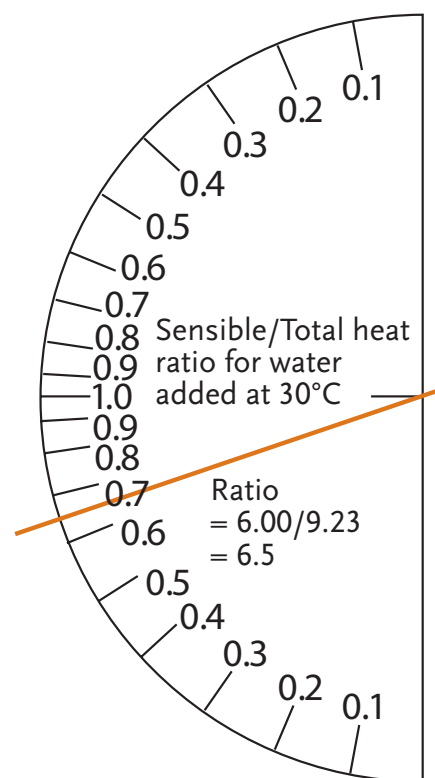


Figure 6 - Sensible/Total Heat Ratio

Further reading

Air Conditioning Engineering, Jones WP, Butterworth 2001, Chapter six
ASHRAE Fundamentals 2009, Chapter one

Symbols

- Δ = difference
- g = moisture content $\text{kg}\cdot\text{kg}^{-1}_{\text{da}}$
- h = enthalpy $\text{kJ}\cdot\text{kg}^{-1}$
- \dot{m} = mass flowrate, kg/s
- P = power watts
- θ = dry-bulb temperature deg C
- θ' = wet-bulb temperature deg C (normally sling)

Module 11

December 2009

1. Referring to Figure 2 if both air streams have an equal mass flow rate what is the effectiveness if $h_A = 30 \text{ kJ/kg}$, $h_B = 60 \text{ kJ/kg}$, $h_R = 70 \text{ kJ/kg}$ and $h_{R'} = 45 \text{ kJ/kg}$

- A 0.25 D 1.00
 B 0.50 E 1.25
 C 0.75

2. What condition might provide dehumidification of an air stream by spraying water into the air?

- A Spray water is at a lower temperature than the air dew point temperature
 B Spray is heated above the air dry bulb temperature
 C Spray temperature is above the air dew point temperature
 D Spray has a higher temperature than the wet bulb temperature the air
 E The spray is sprayed on to the heating coil

3. A face and bypass arrangement has 0.5 kg/s air leaving the coil at 6°C and 1 kg/s air at 9°C bypassing the coil. What is the resulting mixed air temperature?

- A 5°C D 8°C
 B 6°C E 9°C
 C 7°C

4. If a room sensible cooling load is 4.00 kW and the latent room load is 2.67 kW where would the RRL be plotted on the psychrometric protractor.

- A Bottom quadrant, 0.60
 B Bottom quadrant, 0.67
 C Top quadrant, 0.60
 D Bottom quadrant, 0.67
 E It can't be plotted

5. If a fan produces a total fan pressure of 0.5 kPa what would be the approximate rise in air dry bulb temperature as it passes through the fan.

- A Less than 0.05 K
 B 0.05 K
 C 0.15 K
 D 0.50 K
 E 1.50 K

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An opportunity has arisen within the Estates Directorate for a highly motivated and enthusiastic person to undertake the role of Head of Building Services. You will report directly to the Director of Estates and be responsible for providing strategic direction to the University's development, management and maintenance of building services throughout the functional estate. You will also play a key role in developing energy security, management and sustainability strategies over the coming years. This role involves long-term planning and foresight and includes monitoring of current and future European and UK legislation. You will be expected to carry out research into current and emerging technologies and management options and for implementing any promising initiatives for use in this University.

You will have considerable experience and a firm commitment to maintaining high standards of building services engineering throughout a large functional estate. Knowledge and experience of non-conventional means of energy provision and the principles of energy efficient building design is highly desirable. You will have a good first degree (or equivalent) in a Building Services Engineering discipline, be registered as a Chartered Engineer and a corporate member of CIBSE or other appropriate professional body.

For details of the post and an application form please contact the Personnel Assistant, OU Estates Directorate, The Malthouse, Tidmarsh Lane, Oxford OX1 1NQ. Tel (01865) 278750. Fax: (01865) 278792. E-mail: reception@oued.ox.ac.uk.

The closing date for applications is noon on 18 December 2009. Any offer of employment will be subject to satisfactory security vetting.

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Keeping on track

Atkins' Saphina Sharif reveals how her desire to help shape the way society lives led her into the world of civil engineering

Saphina Sharif first recognised the important role civil engineers play in shaping the way we live while in sixth form during an Engineering Education Scheme.

'I knew then that I wanted to pursue a career in civil engineering,' says Sharif. 'The more I looked into it the more I realised the influence they can have in raising the bar on delivering sustainable urban regeneration.'

Since achieving an MEng (Hons) in Civil Engineering with Spanish, the 33-year-old has held a variety of roles, including site supervisor, assistant contracts administrator and project engineer. Now she is the deputy project manager for the enabling works construction project on the Olympic Park site in London, for engineering consultancy Atkins.

'It's a huge project, over a 246 hectare site,' says Sharif. 'I'm responsible for ensuring the two main contractors who carry out the works do it in accordance with the construction drawings and specifications, ensuring that they have the necessary information and instructions they need. I have a team of supervisors and technical specialists to help me to achieve this, so basically you could say I'm a problem solver who bosses people around!'

Enabling works means getting the ground ready to be built on. In this particular instance, much work needed to be carried out because of the site's long history of industrial use, including demolition work, site clearance, earthworks removal and soil washing. This can see Sharif start work anytime between 8am and 9am and leave as late as 7pm, as the nature of her role sees her both on site and office based in equal measure.

'Most of my job is focused on finding solutions so I feel a real sense of achievement when I've successfully resolved a problem or helped steer a decision-making process. I also love the multi-discipline team aspect of my job – even after being on my current



“You could say I’m a problem solver who bosses people around!”

project for three years I learn something new every day.'

Much of her time is spent chairing meetings to agree project commitments, actions and individual responsibilities, as well as preparing or reviewing and authorising documentation and instructions.

'My days are pretty varied – given the fast-paced nature of site works, and particularly this project, there are always new issues cropping up that need resolving. Effective communication is essential to ensure the smooth running of the project so it's central to what I do.'

Throughout this process there are a number of different parties that Sharif deals with, including the client, the delivery partner, and the designer. Now communication has been made a little easier by Atkins introducing a project office where all the key project parties, such as the project management team and cost consultants, sit together to enable problems to be dealt with quickly.

In the future, Sharif hopes to take the lessons learnt from the Olympics site to other projects.

Email your latest people appointments and role profiles to cbailey@cibsejournal.com

Movers & Shakers

Andrea Voigt has been announced as the new director general of the European manufacturers' association EPEE (European Partnership for Energy and the Environment). She has 15 years experience in the industry and intends to continue fighting for the industry's interests in her new role.



Vivien Fairlamb has rejoined AECOM's sustainable development group in London

after a two year secondment with AECOM Design in Orange, California. Fairlamb is a LEED Accredited Professional (AP) and will be working with AECOM's other LEED APs in Europe to help support, develop and promote this area of work.



Q Design Consultants Ltd recently appointed **Paul Glendinning** as its operations

director to strengthen its position in the UK engineering services market. Paul Glendinning has extensive experience in the industry and in his new role he will be responsible for developing the business in both its Maidenhead and London offices.

Scott Strawbridge, executive vice president of the Mechanical Contractors' Association (MCA) of Northern California, has become only the fifth person in the Heating and Ventilating Contractors' Association's (HVCA) history to receive its Distinguished Service Award, the highest honour which the association can bestow on an individual. The award was for his contributions to the industry over the last 18 years.



Paul Wenden, Fläkt Woods' engineering and product management director, has been

appointed President of FETA, the Federation of Environmental Trade Associations. He is also president of HEVAC, the Heating,

Ventilating and Air Conditioning Manufacturers Association.

Bill Bolsover, chief executive (CE) of Aggregate Industries, John Frankiewicz, CE of Willmott Dixon, and Daniel Labbad, CE of Lend Lease Europe, have all joined the UK Green Building Council's (UK-GBC) board. All are founder members of the UK-GBC and all have actively participated in its task groups.



Chris Newton has been announced as the acting chief executive of engineering consultancy NG

Bailey. Newton will step up from his position as chief financial officer, which he has held since 2004, to perform the role.



Ridge and Partners LLP, the multidiscipline property and construction consultancy, has

appointed **Daren Keep** as a partner. Keep will contribute to Ridge's mechanical and electrical engineering capability.

Andrew Cripps is the new regional director in the sustainable development group at multi-disciplinary consultancy AECOM. Cripps will be responsible for a wide range of research and development, particularly concerning alternative technologies, and will be especially focused on developing relationships with the government and public sector. Cripps previously led the sustainability and alternative technologies group at Buro Happold.



Ian Ellis has been elected president of the Building Controls Industry Association (BCIA). Ellis, who

is marketing manager for Siemens Building Technologies, takes over from Doug Robins. Steve Harrison, a controls systems manager (Europe) for Johnson Controls, is the new vice-president.



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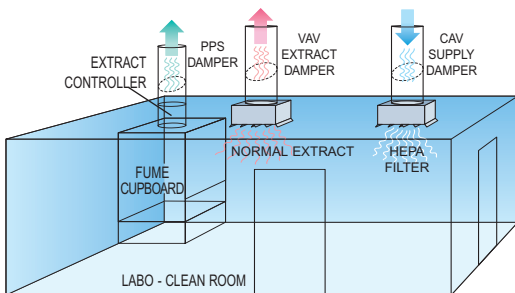


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