CIBSE JOURNAL

The official magazine of the Chartered Institution of Building Services Engineers

October 2014

WITH THIS ISSUE *Hotel & Leisure Special*

TREE OF KNOWLEDGE
Bill Bordass reveals all in Woodland Trust post-occupancy study

A KING'S RANSOM
How PFI partners saved £1.2m per annum at London university

BREAKING NEW GROUND

HEAT NETWORK CODE OF PRACTICE SET TO TRANSFORM INDUSTRY

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Continuing thread

'A problem addressed is not necessarily a problem solved.' These are the sobering words of Bill Bordass, who, in this month's *Journal*, conducts an in-depth post occupancy evaluation of the Woodland Trust's prominent new Grantham HQ.

A veteran of numerous campaigns against poor performing buildings, Bordass was pointing out that buildings will continue to fail if they are not monitored properly for feedback. To maintain the 'Golden Thread' from design intent to reality, Bordass says teams must accept that fine tuning will be necessary for a building to work, and that an appropriate contingency budget should be set aside.

By most standards the Woodland Trust HQ performs very well, with gas and electricity consumption in line with the design predictions. But there are issues that were unforeseen, such as greater-than-expected energy use in the server room, and occupants opening windows less frequently than expected, impacting the natural ventilation strategy. Nearly all the glitches could be overcome – for instance by repositioning wrongly sited sensors – but they would not all have been identified without soft landings.

Elsewhere in the *Journal* there are examples of good engineering being applied to projects to save energy at the design and operation stage. In our 'Hotel and leisure special' Grontmij explains how it worked with architect Bennett's Associates to create a passive-first design that is intended to save Camden Council £500,000 a year in energy bills, enabling the local authority to build a new public pool opposite St Pancras International Station.

> After reviewing life-cycle needs, the team identified 150 opportunities to cut energy

Meanwhile, the review of a 25-year-old PFI contract gave Bouygues and King's College London the opportunity to address the FM service within the contract (page 34). After reviewing the life-cycle of the property, the team identified 150 opportunities to cut energy. A mix of process improvements, energy savings measures, and more specialist engineers helped the PFI achieve an astonishing £1.1m savings per annum – exceeding the target by £300,000.

The draft consultation for the new Code of Practice for Heat Networks was published last month. It's a very detailed document covering feasibility, design, installation and operation, and should give funders the assurance they need to invest in the technology. What's more, there is a proposal for a training and accreditation scheme that could be in place in the new year, when the final version of the code is published (page 43).

Alex Smith, editor
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Local authorities face new procurement rules

Industry groups have welcomed new best-practice guidelines for local authority contracts, which aim to improve and 'modernise' project procurement.

The Local Government Association has advised that: the timescale to pay sub-contractors – for anyone providing services to local authorities – will not exceed their own payment terms; e-invoices will be used to modernise council payment systems; and they will engage with suppliers through a single, simplified pre-qualification questionnaire – PAS 91 for construction projects – to cut the red-tape burden on SMEs.

Several contractor bodies have said they will press for support of these measures by legislation in the next parliament, and for PAS 91 to become a British Standard for procurement.

PASSIVHAUS PROJECT COMPLETED IN CHINA

An apartment hotel, west of Shanghai, in China, has been completed to the Passivhaus standard. The five-storey building – on a research campus in Changxing, Zhejiang province – delivers an estimated 95% energy saving compared with typical Chinese construction standards, according to the owner. The project design had to be specially adapted to the hot and humid climate of the Yangtze River Delta region.

The 'Passivhaus Bruck' building was commissioned by the Chinese Landsea Group, and designed by Peter Ruge Architekten, and contains 46 residential units, including four model apartments, each with three rooms. Chinese families have been invited to live there for a short time, to experience the conditions.

Sun shading, a well-insulated building envelope, passive ventilation, and triple-glazing of the floor-to-ceiling windows are claimed to provide comfortable internal temperatures all year round.

'No' vote secures £7.8bn projects

YUI / SHUTTERSTOCK

Vote to stay in the union allays investor fears

More than £7bn of planned construction works have been secured by last month's 'no' vote in the Scottish independence referendum.

Construction market information provider Barbour ABI calculated that £38bn of construction projects are planned across Scotland. However, around one fifth of the projects are backed by investors based outside the country – which left an estimated £7.8bn hanging in the balance ahead of the vote.

A large proportion of the planned projects involve renewables supported by UK-wide subsidies, so these were thought to be at particular risk, according to Barbour's report, *Scottish Construction: A Bright Future?*

'In the past 12 months, construction in Scotland has outperformed other areas of the UK, with it having the third-highest volume of contract value, behind only London and the south east [of England],' said lead economist Michael Dall.

He added that the industry would have been in 'unchartered territory' if there had been a 'yes' vote, leading to 'prolonged and complex' negotiations between the new Edinburgh-based government and its Westminster counterpart.

Dall added that the currency question could also have had a 'direct impact' on the planned construction works.

DECC's smart meters 'a waste of money', says MP

Cost will be a burden on families, says chair of influential committee

The massive project to install smart meters in every UK home is likely to be a waste of money, according to Margaret Hodge MP, who chairs the influential parliamentary public accounts committee.

The Department for Energy and Climate Change (DECC) has instructed energy suppliers to replace 53 million meters, in homes and small businesses, with smart electricity and gas meters by 2020. The estimated cost of £10.9bn will be paid by consumers through their energy bills.

This works out at around £215 per meter, and Hodge's committee is concerned that this is an additional cost that people and small businesses 'can ill afford' – especially as the use of smart meters is expected to cut the average annual energy bill (£1,328) by just 2%.

Even this saving depends on consumers becoming more 'energy savvy', and changing their behaviour

AFP / GETTY IMAGES

as a result of the additional information provided by the meter.

Hodge's committee said DECC was also depending 'heavily' on assumed competition in the energy industry to control costs and deliver benefits. 'Relying on market forces to keep costs down may not be enough, on its own, to protect consumers,' she said. 'Energy suppliers are concerned that it may cost more to persuade reluctant customers to accept the new meters.'

It added that DECC should require suppliers to provide 'a clear breakdown for consumers of the cost of smart meters, their operational cost savings from stopping meter readings, and whether consumers are achieving the expected reductions in energy consumption'. Hodge said that the 'lack of clarity on the impact of smart meters on vulnerable and low-income consumers is particularly concerning'.

She said DECC also needed to ensure that smart meters are fully interoperable, so customers can switch easily between suppliers, and that suppliers don't replace meters unnecessarily when customers switch.

'There is also a danger that the government gets locked into an existing technology when technologies are changing fast, leading to consumers paying for investment in a system that is already out of date,' added Hodge, in her evidence to a parliamentary select committee.

In the future, customers should be able to receive energy information on their smart phones; making the in-home display redundant.

MPs back schools engineering pledge to tackle skills gap

MPs have pledged to help tackle the engineering skills shortage by encouraging employers to work with their local schools.

All 650 MPs were invited to a parliamentary reception, hosted by the Institution of Engineering and Technology (IET), aimed at finding ways to inspire the next generation of engineers. Attendees agreed to urge employers in their constituencies to work with local schools and colleges to encourage more young people to become engineers.

They signed a pledge to encourage girls and boys to consider science, technology, engineering and maths (Stem) careers, promote the value of vocational Stem subjects, and promote Stem careers with parents. According to the IET, 53% of employers believe they need to get more involved with the education sector to help change the perception of engineering careers among young people.

UK skills minister Nick Boles told the reception that a guaranteed supply of skilled workers was 'essential if UK engineering is to compete on the world stage'. He added that the engineering sector needed 'to draw on as wide a talent pool as possible'.

Boles explained that the government had launched a £30 m fund 'to increase the supply of engineers, to encourage more women into the sector, and to address engineering skills shortages in smaller companies'.

The UK will need to recruit 87,000 new engineers each year for the next decade, said IET chief executive, Nigel Fine. 'So there is a critical need to promote engineering to young people as an appealing career choice.'

In brief

WMO ISSUES WARNING AS CO_2 LEVELS HIT RECORD HIGH

Greenhouse gases in the atmosphere reached record levels in 2013, with CO_2 concentrations rising at their fastest rate since 1984, according to the World Meteorological Organisation (WMO).

The body's most recent research shows that CO_2 in the atmosphere reached 396 parts per million (ppm) in 2013 – up 3ppm on the previous year – prompting WMO secretary general, Michel Jarraud, to warn: 'We are running out of time.'

However, scientists remain unsure about the consequences of this increase because global average temperatures have not risen in line with the concentrations. However, the WMO said there had been a 34% increase in the warming impact on the climate between 1990 and 2013, because of the long-term presence of CO_2 and other gases in the atmosphere.

M&S SEALS BIOGAS DEAL

Marks & Spencer has agreed to buy 35,000 MW/hours of biomethane certificates, in a bid to reduce its carbon footprint by 6,400 tonnes.

The biomethane gas will be supplied by Future Biogas, and is said to be 50% more carbon efficient than natural gas. It will be produced at the Vulcan Anaerobic Digestion (AD) plant, near Doncaster, using break crops – non-commercial crops used for soil regeneration – from farms across Yorkshire and the north east of England.

US FIRMS URGED TO FOCUS ON AIR LEAKAGE 'WEAK LINK'

US engineers are being challenged to improve building envelope performance – including meeting proposed new air-leakage tests – as part of the widely adopted ASHRAE/IES energy standard 90.1.

There are 14 proposed addenda to ANSI/ASHRAE/IES Standard 90.1-2013: Energy Standard for Buildings Except Low-Rise Residential Buildings, currently open for public comment. The changes can be reviewed here **www.ashrae.org/publicreviews**

European ministers urged to raise the bar for reduction in member states' energy use

International Energy Agency seeks a more ambitious target

Energy efficiency is the world's 'hidden fuel', and has the potential to stimulate massive economic growth, according to a new report from the International Energy Agency (IEA), released ahead of a crucial European Commission (EC) vote on energy-saving targets.

The publication of *Capturing the multiple benefits of efficient energy* was timed to increase pressure on the European Council of Ministers, which will agree its 2030 energy-saving target in the next few weeks.

The EC's proposal of a 30% cut in energy use by member states, by 2030, has been attacked for lacking ambition, with campaigners proposing a 40% target instead.

The IEA study seeks to support efforts to secure a greater proposed reduction by refuting the widely held position that it is impossible to quantify the economic benefits of energy efficiency. It claims the payback period for measures drops from 4.2 to 1.9 years if their impact on productivity – and operational benefits – are included in 'internal rate of return' calculations.

The IEA estimates that economically viable, energy-efficiency investments could boost global economic output by $18tn by 2035. However, it says two-thirds of the potential benefits could remain unrealised because energy efficiency is 'routinely and significantly undervalued'.

JORG HACKEMANN / SHUTTERSTOCK

Retailers see natural refrigerants as 'future-proof' investment

Almost two-thirds of supermarkets surveyed in northern and western European countries use natural refrigerants in their cooling systems, claims a report by Carrier Commercial Refrigeration, Europe.

Researchers said the trend was being driven by industry-wide sustainability policies 'that are outpacing EU legislation.'

The study – of mostly large food retailers in Germany, France, Denmark, Norway and the UK – found that 65% of respondents were using natural refrigerant-charged cooling technology. One of the key drivers behind the switch is retailers' growing awareness of the link between carbon-footprint reduction and business success.

'Retailers increasingly recognise that natural refrigerants represent a future-proof investment in terms of legislative compliance,' said Thierry Jomard, president, Carrier Commercial Refrigeration, Europe.

More than 40% of the average supermarket's total energy consumption is from refrigeration.

'A challenge for the future,' the researchers said, 'will be to make the technology readily accessible to smaller convenience stores and retailers in southern Europe, where warmer temperatures reduce the effectiveness of CO2 systems.'

Recruits need broader view of supply chain

Industry training needs to be broader so that apprentices and students understand the entire construction supply chain, Andy Sneyd, president of the Building & Engineering Services Association (B&ES), told the annual President's Luncheon.

Sneyd said the industry had to do more than just recruit the 'best and brightest'. A broader training approach would 'spread the word that construction can offer a stimulating working environment, profound job satisfaction, and the opportunity to think and act innovatively,' he added.

Construction has been identified by the government as a 'key enabler' in the stimulation of the wider economy, Sneyd pointed out, which means 'how it is led, organised and managed is crucial to every man, woman and child in the country'.

'There is more to the design, construction, and commissioning of buildings than just the technological aspects,' he added. 'Key to our ability to address today's challenges is the existence of a well-trained, well-managed and well-motivated team, at every level of the workforce.'

Update for hospital boilers in £12m partnership deal

St George's NHS Trust and British Gas have signed a £12 m energy-performance contract to update the hospital's ageing infrastructure.

The long-term partnership will guarantee energy cost savings of £1.1 m per year, and a carbon saving of 22%.

The project includes replacing the 35-year-old steam boilers, and the combined heat and power plant. Other planned energy-conservation measures – which have a predicted payback of less than 10 years – include insulating the steam pipeline distribution, replacing chillers, and optimising the building management system.

'The majority of the site's energy plant, engineering, and utilities infrastructure is at the end of its useful life. It is inefficient, unreliable, and prone to failure,' said Rathan Nagendra, energy, sustainability and compliance manager at St George's Trust.

He said other drivers for the project were the hospital's increasing utility bills – currently around £6m per year – and a need to reduce carbon emissions by 34% by 2020, on a 2007/08 baseline.

The project – backed by the London Energy Efficiency Fund – is forecast to achieve a carbon reduction equivalent of £1,907 per tonne of CO_2, based on a saving of 6,300 tonnes. British Gas will make up any shortfall, in the event that energy conservation measures implemented are below the contracted level.

CIBSE backs guide to planting trees in the built environment

Designers should use trees as engineering tools, says George Adams

A new guide to urban planting has been launched, to encourage engineers to incorporate trees into 21 st-century streets and civic spaces.

CIBSE has partnered with the Trees and Design Action Group (TDAG) to provide expert guidance for the report, *Trees in Hard Landscapes: A Guide for Delivery*. The document looks at the practical challenges – and solutions – for integrating trees into the built environment, and is aimed at highway engineers, public-realm professionals, and tree specialists.

CIBSE immediate past president, George Adams, said he approached TDAG about collaborating on the guide, which is referred to by the Greater London Authority in its Replacement London Plan. This asks boroughs to take into account the work of TDAG when considering planning applications.

'It is fundamental that engineers collaborate with other professions to reduce carbon emissions,' said Adams. 'Planting is an integral part of the process of protecting the urban environment from climate change. Industry must come up with more initiatives and look at holistic solutions. It's not just tinkering to achieve 10-20% savings from the building services.'


Bonn Square, Oxford

Photo credit: Michael Murray

Adams also urged engineers to consider how water could be used in their designs. 'We have to think about how we are going to store water to offset the low amount of precipitation in the summer.'

As well as CIBSE, TDAG also worked with the Institution of Civil Engineers, the Chartered Institution of Highways & Transportation, and the Institute of Chartered Foresters on the report, which can be downloaded from **www.tdag.org.uk**

Green Deal must be more appealing, say MPs

A group of influential MPs has branded the Green Deal a 'disappointing failure in its first 18 months.'

In its second watching brief on the scheme, the Energy and Climate Change Committee said that – rather than facilitating access to energy-efficiency measures, and creating momentum in the market – the Green Deal has 'caused frustration and confusion for consumers and businesses in the supply chain'.

Noting that only 4,000 Green Deal plans have been initiated (not completed), it concluded that: 'Unless the package is made more attractive to a wider group of consumers, Green Deal finance is likely to remain unappealing to many.' The report added: 'A combination of financial, communication and behavioural barriers has meant that the policy has been slow to attract customers.'

CIBSE NEWS

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Fitzgerald and Simpson made Academy fellows

Past CIBSE president Mike Simpson FCIBSE FSLL and CIBSE fellow Shaun Fitzgerald are among the new Fellows joining the Royal Academy of Engineering.

The 59 elected Fellows join the Academy from diverse backgrounds, including engineering and manufacturing companies and academic institutions. New Fellows have been invited to join the Fellowship in recognition of their outstanding and continuing contributions to engineering.

Biomass guide to launch at Wood Conference

The National Wood Fuel Conference will be held at Denbies Vineyard, Dorking, Surrey, on Friday 17 October.

Key speakers will present on: the broadleaved production forecast; CIBSE best practice guidance for biomass systems and the sustainability criteria; and the wider view of wood fuel.

CIBSE AM15: Biomass Heating will also be launched at the event, which has been organised by Matthew Woodcock, of the Forestry Commission, and Carrie White, of Surrey Hills Enterprises. David Palmer, of The Campbell Palmer Partnership, will speak at the conference. For more information, visit **www.surreyhillswoodland.co.uk/wood-fuel-conference/**

YEN national ball

The Young Engineers Network (YEN) National Ball will be held on 25 October, in Bristol.

The Hollywood-themed black tie ball will start with a drinks reception, followed by a three-course dinner, and after dinner entertainment.

Visit **www.cibse.org/yen** for more.

Master-ing light and lighting

Philips' luminous ceiling LEDs produce light output that is comparable with light from a clear sky

- **The Society of Light and Lighting launches its 2014-15 Masterclass series**

This year's Masterclass series will focus on the relationship between light and health.

Each seminar will include a presentation from a 'master' from the sponsoring companies: Helvar, Philips, Trilux, and Thorn. For the first time, the event will also include a 'Lighter's question time', to generate discussion and audience participation.

Dan Wills MSLL, of Helvar, will discuss: the role of lighting controls in our daily lives; the importance of user interfaces – and the incorporation of individual requirement – for ease of use; intelligent networks and the human benefits of smart lighting; and standardisation and metrics, linking control philosophy with scientific study.

Darren Smith, representing Philips, will look at how digital technology can be taken to the next level, focusing on the possibilities that can come from human control and interaction to maximise performance. He will talk about connectivity at home, in the office, within retail environments, and outdoors.

Helen Loomes, from Trilux, will recap on the importance of light in relation to wellbeing, and the effect it has on circadian rhythms. She will discuss examples of lighting designed to mimic daylight, and how these results are being analysed. She will focus on incorporating human-centric lighting for environments where people spend a prolonged amount of time – but, primarily, within health and education.

Finally, Kevin Stubbs, from Thorn, will discuss areas of lighting that can affect us, and ways in which these can be improved. He will look at the simple technology currently available to help us, and demonstrate how these elements have been used in practice.

The dates for the Masterclass series are:

- 23 October 2014, Birmingham
- 27 November 2014, Dublin
- 29 January 2015, Newcastle
- 26 February 2015, Leeds
- 30 March 2015, Edinburgh
- 30 April 2015, Bristol
- 14 May 2015, London

For details, and to book your place, visit **www.cibse.org/sll**

Help to upgrade your membership

CIBSE is holding a number of membership briefing events across the UK over the next few months.

The briefings will offer advice and support to members who are considering upgrading their membership, and help guide them through the requirements to reach their goal.

If you are considering upgrading your membership, or want to know what's involved, come and speak to the CIBSE membership team at one of these events:

- 20 October, 6-8pm, Truckles, Bury Place, London
- 28 October, 1.15-2.15pm, and 29 October, 8.30-9.30am, Leadership in Building Performance Conference & Exhibition, QE11 Conference Centre, London
- 6 November, 6-8pm, CIBSE YEN membership and registration briefing session, Aecom, Cardiff
- 20 November, 5.30-7.30pm, CIBSE, London
- 26 November, 6-8pm, Birmingham Chamber of Commerce
- 4 December, 6-7.30pm, BDP, Manchester

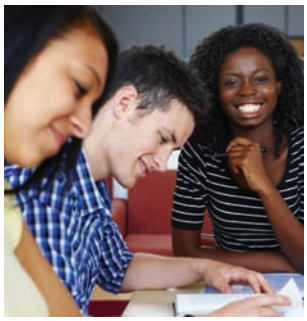
For more information, visit **www.cibse.org/briefings**, and to book your place,email **membership@cibse.org**

Graduates should go for next rung on CIBSE ladder

Young engineers urged to take the 'next logical step'

Did you finish your course in 2014? If you have completed a bachelor's degree in an engineering, science or technology subject – or a MEng – you may consider applying for CIBSE Graduate membership.

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



membership is the next logical step in your professional development. To find out what you need to do to reach your goal, visit **www.cibse.org/applicanthelp**

Our help pages include real-life examples of engineering practice reports, interview presentations, technical reports, and case studies from successful applicants.

We also run regular briefing sessions outlining the process and requirements to apply for a professional grade of membership in future. For details, visit **www.cibse.org/briefings**

For more details about CIBSE's Graduate membership – and to download an application form – visit **www.cibse.org/graduate** For further information, contact **membership@cibse.org**

Wanted: Chair to champion building services careers

The CIBSE careers panel monitors the institution's career development strategy, and makes recommendations for developing and implementing this strategy within the context of CIBSE's overall strategic plan.

It works in partnership with external construction and engineering careers organisations and other professional bodies.

The panel is made up of around 10 people – both CIBSE members and representatives from other engineering and construction careers-promotion bodies.

It meets up to three times a year, in Balham, London, and undertakes ad hoc activities at other times.

To be considered for the role of chair, you will need to be a corporate member of CIBSE, with an interest in – and experience of – promoting building services engineering as a career.

The appointment, which will be approved by CIBSE's education, training and membership committee, will be for an initial three-year term. This is a voluntary position, and no salary or fee will be paid. Reasonable travel expenses will be paid to cover attendance at panel meetings.

To be considered, email your CV – and why you want to take up this position – to **cclements@cibse.org** by Friday 7 November.

Consultation launched on heat network code of practice

CIBSE and the Combined Heat and Power Association (CHPA) are seeking industry feedback on the draft of a new publication, *Heat Networks: Code of Practice for the UK*.

With recent research outlining the potential for heat networks to supply up to 14% of heat needs by 2030, it is an opportune time to develop and implement minimum standards for district heating. These will help to enhance the quality of heat networks where necessary, and reduce costs by helping to standardise procurement.

This is the first code of practice to be published by CIBSE and the CHPA. It seeks to provide clear and measurable outputs that will ensure the heat network operates effectively, and meets client and customer expectations.

It is hoped that the code will create a foundation for the CIBSE/CHPA partnership to provide specialist training, accreditation, and registration in the sector.

To read the draft publication, and to provide feedback, visit **www.cibse.org/HeatNetworksConsultation** The consultation closes on 9 October. See our Heat Works feature on page 43.

New members, fellows and associates

FELLOWS

Brown, Peter Alan
Epsom, UK

Crooks, Daniel Alan
Plymouth, UK

Jack, Lynne Barbara
Bathgate, UK

Keightley, Adam Daniel
Nottingham, UK

Lee, Man Kwong
Kowloon, Hong Kong

Lee, Chi Wa
NT, Hong Kong

Pang, Kwong Choi
Kowloon, Hong Kong

Phoenix, Thomas
Greensboro, USA

Powers, Michael Kenneth
Birmingham, UK

Tse, Tsz Yan
Pok Fu Lam, Hong Kong

Yuen, Hong Wa
NT, Hong Kong

MEMBER

Chan, Chi Ho
Shatin, Hong Kong

Chatys, Filip Wojciech
Bristol, UK

Chu, Man Tat
Tai Po, Hong Kong

Davda, Ashwin
Luton, UK

Devlin, Declan Joseph
Abu Dhabi, UAE

Fallows, Terry
Leatherhead, UK

Fan, Chi Man
Kowloon,Hong Kong

Ha, Hau Sze
Shatin, Hong Kong

Ho, Ho Ming
Tai Po, NT, Hong Kong

Hutchins, Guy
Bury St Edmunds, UK

Kargakis, Christodoulos
Swansea, UK

Kelly, Philip Malcolm
Oxford, UK

Kinasiewicz, Bartlomiej Jacek
London, UK

Lai, Chun Wai
Ngau Tau Kok, Hong Kong

Law, Hon Man
NT, Hong Kong

Leung, Cheuk Lik
Tseung Kwan O, Hong Kong

Lo, Chi Chiu
Lam Tim, Hong Kong

Ng, Hon Fung
Shatin, Hong Kong

Ng, Wai Ki
Ap Lei Chau, Hong Kong

Poon, Wing Keung
Tsuen Wan, Hong Kong

Sidhom, Janine Michelle
Sydney, Australia

Smith, Colin
Glasgow, UK

Tierney, James Joseph
Blackrock, Republic of Ireland

Walmsley, Paul
Rochdale, UK

Wan, Kok Wing
Los Angeles, USA

Wilson, Ryan Clinton
Sydney, Australia

Yau, Chi Lok
Tai Po, Hong Kong

ASSOCIATE

Peat, Stephen
Uxbridge, UK

Kearney, Derry
Dublin, Republic of Ireland

LICENTIATE

Fleming, Jack
Bristol, UK

Monasterski, Pawel Adam
Epsom, UK

'WHAT WILL HAVE THE BIGGEST IMPACT ON BUILDING PERFORMANCE OVER THE NEXT FIVE YEARS?'

Legislation, BIM, or energy costs? We ask seven speakers at CIBSE's first Leadership in Building Performance Conference and Exhibition what they think will have the biggest influence on the operation of buildings

Janet Beckett, MCIBSE, director at Carbon Saver UK

There is an increasing client awareness of building performance and good building services as the main contributor to that performance. It has been driven almost entirely through legislation. Part L and energy performance certificates may not always be popular, but they have certainly made clients think twice about where their money is best spent. This trend will certainly continue, providing the application of these regulations is resolute, consistent and highly proficient.

Dr Claire Das Bhaumik, FCIBSE, partner, Inkling

Energy prices and legislation, of course, but facilities management and ease of maintenance, too. There is also an increasing tendency for buildings such as schools, universities and libraries to increase their diversity of use and opening hours. Longer hours – particularly in the evenings – mean greater energy use and this also puts limitations on the unoccupied 'window' when maintenance can be carried out.

Jo Harris, manager in the sustainable construction group, BSRIA

Two things influence building performance: information about the design intent and the knowledge of the operators. If the industry can get to grips with BIM, we have the potential to enhance the information about the facilities we build and can take that greater level of information to improve the knowledge of our operators to manage building performance better.

Stephen Hodder, RIBA President

There continues to be a gap between how buildings perform in reality, and policy, design and construction practice. The challenge is to get better at measuring and learning from real building performance, and feeding the data into policy and how we design and build. Biggest impacts will be effective building handover strategies and use of post-occupancy evaluation, as well as the adoption of BIM to design and build 'intelligently' and to support facilities management throughout the building lifecycle.

Geoff Prudence, FCIBSE, chair, CIBSE Facilities Management group

One of the biggest influences on buildings will be the implementation, in practice, of drivers on use of energy through regulations and – particularly – performance monitoring and certification. But, with increasing technological change and 'workplace' developments, it will be strong technical and leadership skills that will actually deliver the changes. CIBSE has a fantastic opportunity, if it chooses to take it.

David Mason, senior sustainability manager, Skanska

As occupiers understand more about the benefits a well-performing building can bring, there will be more pressure for buildings to perform as expected. Over the next five years I believe performance guarantees, or 'performance based contract clauses', will develop as tenants demand cost certainty, and developers look to incentivise project teams. This will lead to greater

RAZHUSIN / SHUTTERSTOCK

consideration in design and construction, and more attention to building handover, monitoring and review. All good things for our industry.

Andy Ford, FCIBSE, professor of systems engineering in the built environment at London South Bank University, and CIBSE past president

Technology to allow remote mining of data, and use of sensors to enable better control of building performance. This is a rapidly evolving area, as crossover skills from technology merge with buildings service, allowing understanding of live building performance and reliable simulation of possible improvements. This is just the beginning. With Electricity Market Reform policy over the coming five years, we will see this market evolve and begin to create a new energy industry based upon energy efficiency, distributed storage and demand-side control.

And now my question for readers. We are emerging from a recession. As usual, we are now seriously short of engineers. Because this time it has been six years, there is a big hole, which just gets bigger as the baby boom generation retires. Externally, the challenge to deliver sustainable low carbon new buildings, and to decarbonise the existing stock in the tight prescribed timescale, requires many new engineers and much retraining of the existing ones. They are just not available. How do we change our industry to attract as wide a cross-section of the population as possible, to deliver this better built environment efficiently and quickly?

Book your place now

The Leadership in Building Performance Conference and Exhibition takes place on 28-29 October 2014 at QEII Conference Centre, Westminster, London.

To register, visit **www.cibse.org/conference** where you will find the list of the key conference themes, the speakers and details of the companies and organisations attending the exhbition.

CIBSE BUILDING PERFORMANCE CONFERENCE AND EXHIBITION

Feedback

The *Journal's* readers draw attention to the work of scientist Rosalind Franklin – the forgotten genius of DNA – and biomass boiler sizing

Rosalind Franklin

Credit where it's due

Great article on the Francis Crick Institute (*CIBSE Journal*, September 2014) but please don't forget the often overlooked contribution of Rosalind Franklin and her X-ray crystallography work, which provided huge insights into the structure of DNA. Without this critical work, Crick, Watson and Wilkins would not have been able to elucidate the structure.

Dr Chris Iddon, SE Controls

Size is everything

In response to Remeha Commercial's article on the sizing of biomass boilers (*CIBSE Journal*, September 2014) the advice offered in respect of a school with an 800kW peak load would result in a far-from-optimal solution. Biomass boilers should never be oversized, let alone sized to meet the peak load. In this example, if DHW calorifier charging is moved to outside the heating period, the peak load could immediately be reduced by 150kW or more. Then a biomass boiler rated at about 350kW – in combination with thermal storage – would be able to meet the winter peak load. Suggesting two biomass boilers should be installed is a very expensive solution, and results in an extremely low utilisation factor for one of the boilers, which would only be required for one to two hours a day. If these boilers operate in slumber mode when not required, the annual fuel consumption will be excessive, and the seasonal boiler efficiency low. Irrespective of whether a biomass boiler requires a buffer vessel to protect it (which Gilles boilers do not), the use of a thermal store together with the boiler can produce a much cheaper solution, operating at high seasonal efficiency and high boiler-utilisation factor. If space is not available to locate thermal storage in a plantroom, it can be installed outside, with negligible impact on heat losses. The biomass decision support tool (**www.carbontrust.com/resources/tools/biomass-decision-support-tool**) provides a quick way to get close-to-correct boiler sizing, while chapter six of *CIBSE AM15: Biomass Heating*, published this month, provides a step-by-step guide to biomass boiler sizing.

David Palmer BSc MSc CEng MIEMA, CIBSE council member

On CIBSE's LinkedIn group, readers ask if BIM is yet another device in the blame game

Ahmed Zeiter
BIM is the future, especially for mega projects with complicated trades.

Nick Hopper
Anything that can get the construction industry to work in a coherent manner, reduce design/construction time, minimise construction waste, maximise energy efficiency and life-cycle costs of buildings is a good thing.

Ian Childs
BIM will never have an appropriate level of end-user acceptance unless a simple, browser-based reader is readily, and freely, available to enable viewing by building supervisors and service providers. It is imperative that compatible protocols be specified for models.

Rob Farman CEng CBIFM MCIBSE
Describing BIM as 'a way of shifting risk onto subcontractors' is likely to become a self-fulfilling prophecy. Let's face it, some sub-contracting work is not that sound. Good air handling, for example, depends on good duct design, which needs to be installed as shown in the design drawings. Instead, the subcontractor says: 'I can't install that. Like Frank Sinatra, I'll do it my way, and produce "as built" drawings.'

Also on LinkedIn: are our sewage systems and bathrooms going down the pan?

Malcolm Wallace FCIBSE
It's a desire to have things the same as they were. The traditional kitchen at the back of the house, overlooking the yard versus the modernist view that you put the kitchen on the roadside, and have the living room overlooking the garden. It's a better layout, but took a hell of a time to be accepted.

Simon Owen
Our lifestyles change fairly quickly, yet our desire to change our buildings (home, work and leisure) lags behind.

Phil Dodd
I remember living in a house with a separate toilet and bathroom. I imagine the rooms were combined to save space, create a bigger bathroom, and save money on pipework.

Water saving is also a wealth thing. Modern houses are built with a maximum limit to water consumption of around 102 litres/person/day. I am working on a house that will be worth £45m, and the 'experience showers' can use 80l/min. We were advised to provide 500l of hot-water storage per shower, to be available any time, day or night. So we now have 3,000l of water stored at 60°C, 24/7, for a shower that may be used once a week.

CIBSE Journal welcomes readers' input, whether it be letters, opinions, news stories, events listings, humorous items, or ideas and proposals for articles.
Please send all material for possible publication to: editor@cibsejournal.com, or write to the editor, *CIBSE Journal*, CPL, 275 Newmarket Road, Cambridge, CB5 8JE, UK. We reserve the right to edit all letters.

SIMPLIFYING THE STANDARDS

Proposed changes to Building Regulations will have far-reaching implications for space standards, accessibility, and security, as well as sustainability. **Hywel Davies** explains

For the past two years, the government has been working to rationalise the technical standards and allied requirements that apply to new housing projects. As parliament headed off for the conference recess, Building Regulations minister Stephen Williams announced proposed changes to the rules covering access, security, water, and space standards.

The June edition of this column outlined anticipated changes to Building Regulations in England that were expected to flow from the Housing Standards Review (see consultation at **http://bit.ly/1pjuvdo**). Just as this edition was being prepared, the latest Building Regulations consultation package emerged from the Department for Communities and Local Government, covering essential quality, sustainability, and accessibility matters.

It includes consultation drafts of revised Approved Documents, covering water efficiency, requirement G2 and solid-waste storage, and requirement H6 (sometimes described as 'covert bin stores'). It also includes a new Approved Document Q, covering security – with an optional requirement, Q1, for 'Unauthorised Access, a Nationally Described Space Standard' – and new requirements for access for wheelchair users and others with reduced mobility. There is also a 'technical consultation' document covering the whole package, and an updated impact assessment. The consultation runs until 7 November.

MIKHAIL HOBOTON POPOV / SHUTTERSTOCK

The revised regulations cover water efficiency

> The latest estimate is that the proposed changes will deliver savings of around £114m per year

The coalition government has committed to easing the regulatory burden on housebuilders during this parliament, and one aspect of this is reducing the number of – sometimes conflicting – Building Regulations and local planning requirements. The aim is to 'consolidate essential rules into a national framework centred on the Building Regulations'.

In March, the government announced the main outcome of the Housing Standards Review, and set out how it would deliver a simplified system for setting standards in the design and construction of new homes by the end of this parliament. By cutting costs and streamlining the technical requirements for housebuilders and local authorities, the coalition hopes to stimulate new building and – at the same time – improve quality, safeguard environmental protections, and provide for disabled people. The latest estimate is that the proposed changes will deliver savings of around £114m per year.

Bringing the requirements into the Building Regulations system will create a simple, single-compliance process, reducing both bureaucracy and cost.

The proposals include 'optional requirements' that local authorities will only be able to implement once they have demonstrated a justification for such a requirement in their area – covering need and viability – through planning policy that will be subject to the normal examination process. Supplementary planning guidance alone will not be sufficient to implement the optional measures.

Once the requirement is covered by the local authority plan, it may be implemented through a condition – on a scheme-by-scheme basis – when planning permission is sought. Authorities will be expected to set out in their plan the circumstances in which they will apply the optional

requirement. In the case of appeals, the usual route will apply.

The consultation describes how the new system will be implemented, and the proposed transitional arrangements. It is intended that these proposals will be implemented during the course of 2015, when – subject to parliamentary approval – the Deregulation Bill (**bit.ly/1r9NYTq**) receives Royal Assent.

This bill contains provisions to amend both the Building Act (1984) and the Planning and Energy Act (2008), to enable the introduction of the new system of optional standards and requirements. The provisions add a new section to the Building Act, covering both the legal power to introduce optional requirements through Building Regulations, and the removal of powers in the Planning and Energy Act, relating to local authorities, requiring renewable energy provisions for housing schemes. However, this latter provision will only take effect once the zero-carbon homes standards come into force, which is currently scheduled for 2016.

The consultation does not include any proposals for changes relating to energy standards, which will also be implemented when the zero-carbon homes policy is brought into force.

This will also require the introduction of the regulatory framework for Allowable Solutions, which is a part of the Infrastructure Bill, currently awaiting its committee stage in the House of Lords before going to the House of Commons in the autumn.

None of this applies to non-domestic buildings at this stage, although it will clearly have a significant impact on mixed-use developments in the future.

CIBSE will be responding to the consultation with the help of its Homes for the Future Group. Members are invited to send their comments to **HSR@cibse.org**.

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

EMPLOYERS ARE THE BEST EDUCATORS

Firms must engage with schools so young people ask the right questions, says ***David Fitzpatrick***

I am indebted to the Institution of Engineering and Technology for two striking statistics this month: 53% of engineering employers believe they should engage with schools and colleges in order to encourage more young people to become engineers; and we will need 87,000 new engineers every year for the next decade, to maintain the UK's economic competitiveness.

Both figures are quite shocking – the second because it is such a huge number and it is hard to envisage a strategy that could make that level of recruitment and training possible, but the first is arguably the most worrying.

Regarding the 53%... does that mean 47% don't consider engaging with our education sector to be a priority? Surely the IET should have got a 100% positive response to that question?

There is no bigger challenge facing our sector. The latest 'state of trade' survey from the Building & Engineering Services Association (B&ES) shows that the recovery is well under way, but that there are bumps in the road – not least the skills shortage, which becomes increasingly acute as workloads soar.

A growing number of companies in our industry are being forced to turn away potentially lucrative contracts because they cannot resource them properly – or worse, they take them on anyway. Surely every engineering employer would want to help the flow of new engineers to ensure they have the right skills pool in the future?

However, this is not simply about numbers. We don't want thousands of new engineers – we want thousands of engineers with the right type of skills and, equally importantly, the right attitude. That is where employers are essential to the process. They know what is happening in the marketplace, and how technical and contracting processes are evolving. It is vital that they pass that knowledge on to colleges and schools, so our young people learn the right things and ask the right questions.

> The skills shortage becomes increasingly acute as workloads soar

B&ES President Andy Sneyd identified training that covers the whole supply chain, and the complete construction process, as essential for any new building services recruit. It is not enough to attract a young person and equip them with a narrow set of technical skills; we also have to make sure everyone we bring into the profession appreciates how the modern supply chain operates – and their role in it.

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BRIDGING THE GREAT DIVIDE

Adverse relationships between 'shell and core' and fit-out consultants do not typically create the conditions to optimise services for the whole building. Grontmij's **Geoffrey Palmer** says there is a better way

How do we produce great buildings, loved by their users, which are gentle on both the environment and on wallets? Is it by increased advocacy and mistrust, or could it be by collaborative methods and working? In this article, I will specifically explore the opportunities that present themselves when dealing with the great divide between 'shell and core' and fit-out consultancy in the UK building design and construction market.

I have worked in building design and construction all my life. In the UK, Europe and the Far East, I have seen all manner of different contracts and approaches and, in my mind, the greater the collaboration, the better the building and the happier the client.

So how do we drive value, not cost? How many times have you been invited to a value engineering session only to find that, in reality, it is all about cost reduction? Don't get me wrong, designing cost-effective solutions must always be in the front of our minds, but real value has to be the careful balance of all aspects of cost (both capital and recurring), occupant satisfaction (including ease of use and delight), programme and sustainability.

What we are striving to achieve in this delicate balance is difficult enough when we are working with informed end-user clients, but is made ever more difficult when we artificially divorce elements of a building's design from the occupants. This, we sometimes do in our 'shell and core' versus fit-out approach. Interestingly, in many European countries, it is the norm for the base-build designer to work with the incoming tenants and deliver the designs for their needs.

Perhaps we should first look at what we are trying to achieve:

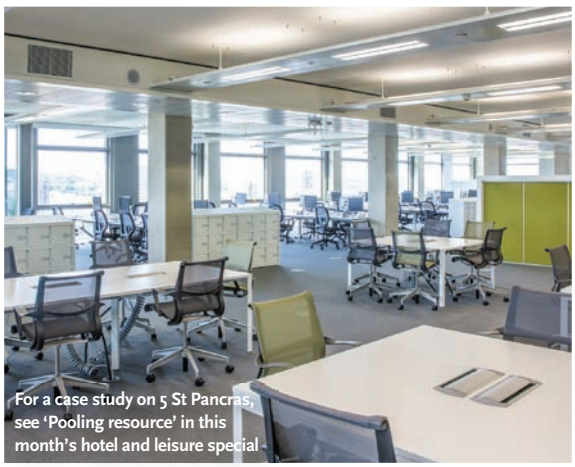
- Cost-effective procurement
- Good value buildings
- Effective workspaces
- Reduced programme
- Improved sustainability
- Maintainable, efficient projects.

It is interesting that the above list varies little between developers, end-users and tenants, but squaring the circle to develop more integrated projects requires greater trust, familiarity and a different approach to independence and competition. Here, I am not talking about small-part, floor fit-outs but rather the larger entities with bespoke elements, where detailed knowledge of the building and its approach to efficiency can bring real benefits.

Early intervention can deliver programme and cost savings, if the notional line between the core and tenants' area is ignored. For example, if we have a riser, then adjacent to the connection is a good place for an isolator valve for a branch to a floor (easily accessible, isolates whole floor, and so on). But, if the tenancy starts three metres into the building, then an isolator on that line has little merit in terms of the total system design.

If well-implemented, a collaborative approach to total building design is beneficial for all. So why is this approach such a rarity? Most serious incoming tenants have an advisory team who, obviously, are angling for the full design. Most corporates have tendering and governance systems that may preclude this approach. Probably the biggest hurdle is the distrust that is evident in the adversarial nature of our construction contracts. Will we really have finished the 'shell and core' properly before moving on to the fit-out? Can we trust the calculations for base-build performance without it being demonstrated and independently witnessed at a demise line?

> Squaring the circle to develop more integrated projects requires greater trust, familiarity and a different approach to independence and competition



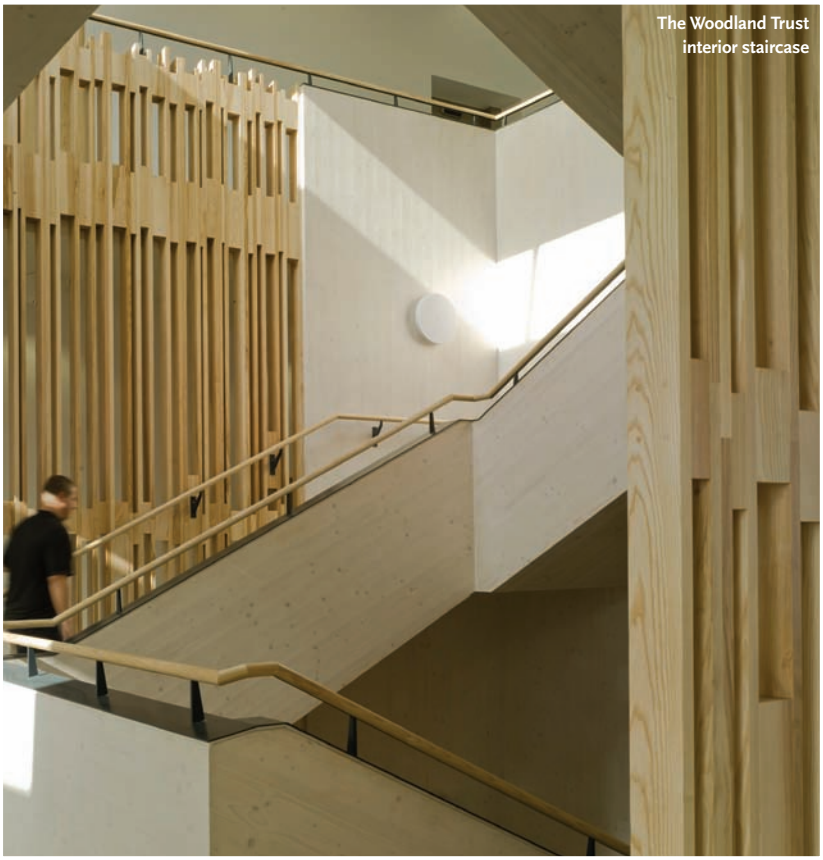
For a case study on 5 St Pancras, see 'Pooling resource' in this month's hotel and leisure special

We all know that sustainable, user-friendly buildings are born out of collaboration, and that the current 'normal' approach goes a long way to undermine this. So where is the bridge that can link these two islands of thinking? For me, it is the consultant and our professional colleagues, who joined the industry to create better buildings, and who believe that integrity, reputation and the 'long game' is the key to repeat business.

We must understand that more complex and passive buildings know no boundaries between design teams and contractors and, when acting for tenants, we should look closely at who is really best placed to undertake the fit-out designs as part of our professional responsibility to our clients. 'What, and potentially give work away to the shell and core designer?' I hear you say. But, I believe the additional value created by whole-building and system-related solutions will help us further our relationship with clients to improve the programme, cost and quality of the projects we work on. Our reputations are bigger than us sweeping commissioning or snagging issues under, the carpet or favouring one party if appointed on a joint commission.

This joined-up approach has led Grontmij to help deliver the BREEAM 'Outstanding' rating for the new HQ for Camden Council at King's Cross.

GEOFFREY PALMER is a director at Grontmij



The Woodland Trust interior staircase

TREES OF KNOWLEDGE

Experience gained from the post-occupancy evaluation of the National Trust's Heelis building have been fed into the design of The Woodland Trust's headquarters. The project team compares the in-use performance of both

By Bill Bordass, Pete Burgon, Hester Brough, and Matt Vaudin

To maintain the 'golden thread' from design intent to reality when creating the 2,727m² head office for The Woodland Trust, Max Fordham – and architect Feilden Clegg Bradley Studios – used post-occupancy findings from the Heelis building, in Swindon. The outcomes have now been studied, thanks to funding from Innovate UK – formerly the Technology Strategy Board – and its Building Performance Evaluation programme.

In 2002-04, the environmental engineer and architect formed part of a research team investigating the potential for soft landings[1], and discovered the importance of maintaining the 'golden thread' – starting with inception and briefing, then managing expectations throughout the procurement process, building on initial aftercare, post-occupancy evaluation, and closing the feedback loop.

Gathering data

At that time, Max Fordham and Feilden Clegg Bradley Studios were working together on Heelis, the National Trust's 7,605m² (gross) head office in Swindon. The project followed a strong sustainability agenda, though this was somewhat softened by the requirements of the developer, which procured the building after the scheme design had been agreed with the client.

As part of the reality checking advocated by soft landings, a matrix was developed by Feilden Clegg Bradley Studios and Max Fordham, to allow design ambitions for

The Woodland Trust's head office, in Grantham

Heelis is the National Trust's head office, in Swindon

sustainability to be reviewed at project meetings. Max Fordham was also appointed to fine-tune the operation of the mixed-mode building for two years after handover. The Heelis findings were published in *Building Services Journal*[2] in November 2007.

Feilden Clegg Bradley Studios also commissioned William Bordass Associates and Building Use Studies to undertake a post-occupancy review, similar to the Probe studies published in *Building Services Journal* from 1995-2002[3].

Learning from Heelis

A key finding from Heelis was to avoid unmanageable complications. Measures adopted at The Woodland Trust included:

- A traditional contract. The developer-led procurement at Heelis did not allow some elements to evolve as the designers would have preferred
- The steel frame of Heelis had problems with airtightness and thermal bridging. The Woodland Trust, therefore, used a solid, cross-laminated timber (CLT) structure, with external wood-fibre insulation and larch rain-screen cladding. Concrete panels (known as concrete radiators) were also bolted onto the undersides of the CLT floors, to add stiffness and thermal capacity
- Heelis was mixed-mode, with windows that open, automated night ventilation – using motorised inlet panels and the negative pressure roof outlets – and background MVHR in winter. The Woodland Trust used natural ventilation only, with manual windows at desk level and motorised ones at higher level
- Heelis had suspended and recessed ceiling-mounted fittings, with occupancy sensing and dimming. The Woodland Trust had a simpler system, with ambient lighting controlled by an area time switch – or from reception – and task lighting by occupants. Corridors, stairs, WCs, and support spaces used self-contained occupancy sensors. Meeting rooms had manual controls
- The design at Heelis optimised daylight factors (see panel, 'Atrium at Heelis', right), but took less account of the brightness of walls and ceilings. As a result, some areas could feel gloomy when desktop illuminances were sufficient. Ambient lighting at The Woodland Trust, therefore, included wall-washing (see panel, 'Woodland Trust: North Atrium', page 22)
- The catering kitchen at Heelis used considerably more energy than anticipated. The Woodland Trust decided not to have one

ATRIUM AT HEELIS

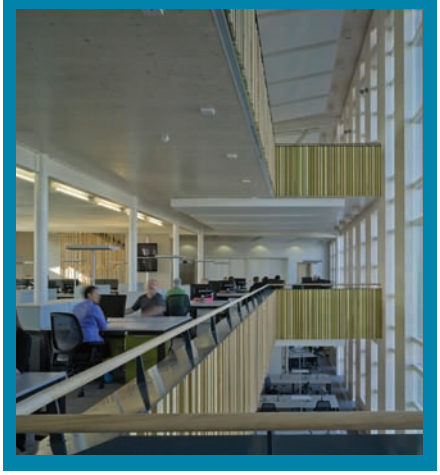
This two-storey building relies extensively on roof lights – not just in the atrium, but in the office spaces around it, where there are also openings between the first and ground floors. The roof includes automatically controlled ventilation openings designed to achieve negative pressure under all wind directions, and an 83kWp photovoltaic (PV) array. Note the external louvres to the south-facing offices to the right. Roof lights to the office areas are north-facing only, shaded by projections of the PV panels above the ridge.

The Woodland Trust has a solid, cross-laminated timber structure, with external wood-fibre insulation and larch cladding

> The 'keep it simple and do it well' approach could be taken further still, particularly by improving the usability of control systems and avoiding over-complication in the name of energy efficiency

THE WOODLAND TRUST: NORTH ATRIUM

Note the central steel columns and beams, and the concrete radiators to the left and in the background. Wall-washing lights can be seen on the west wall, with ambient lighting up the centre. The few splashes of light on the ceilings indicate that most of the task lights were off.



- The ICT system at Heelis had used more electricity than anticipated. The Woodland Trust, therefore, chose 'thin clients' in place of PCs. This – and good use of daylight – also helped to reduce unwanted heat gains into the office space
- Both server rooms combined chilled water systems with free cooling. However, value engineering at The Woodland Trust changed this from airside to waterside free cooling
- Both buildings had relatively standard heating systems, with three gas boilers, perimeter trench heating – with a compensated flow temperature – and local zoning, using two-port valves. The Woodland Trust's plant was more compact and efficient, with lightweight condensing boilers. Heelis had cast-iron boilers, with only one condensing
- At Heelis, using the heating plant to produce domestic hot water (DHW) proved inefficient in summer, so the post-occupancy evaluation suggested an independent hot water boiler. The designers did not take up this recommendation for The Woodland Trust, as it had more efficient plant, and no catering kitchen.

Occupant satisfaction

Figure 1 compares average scores for headline indicators from the BUS Methodology occupant questionnaire surveys. The satisfaction scales run from 1 (poor, on the left) to 7 (good), apart from the final question – on perceived productivity – which goes from -40% to +40%. The flashes above each of the scales represents the benchmark from the BUS reference dataset for that variable, with the 95% confidence limits. The points are coloured red if they are statistically significantly below the benchmark, green if they are above, and orange if similar. For consistency, BUS 2011 office benchmarks are used for both buildings (2004 benchmarks were originally used for Heelis).

The profiles are similar for both buildings. In detail:

- Heelis rated worse on winter temperature and summer air quality. This partly related to initial control problems. The situation was improved the following year
- The lower perceived productivity at Heelis was probably because many staff had relocated from other parts of the country. The Woodland Trust moved just 200 metres
- Noise at The Woodland Trust was the only indicator significantly worse than average. This reflects a general deterioration in noise perceptions, owing to more open planning, and higher occupation densities. Many Trust staff were also unaccustomed to open-plan offices. In addition, The Woodland Trust needed to use a space that was acoustically connected to the offices for large meetings and training sessions – activities not anticipated in the brief
- The average score for health at the Trust was linked to less window opening than anticipated, and – perhaps – some initial problems with outgassing. Ventilation control was subsequently improved.

Energy performance

Using standard Building Regulations assumptions, the predicted annual gas consumption was 37.5kWh/m^2 GIA at The Woodland Trust. The total in 2012-13 was

32.6kWh/m², with the heating component, 25.7kWh/m², almost identical to the design estimate – a very good result in this exceptionally cold year. This also compared well with the 90kWh/m² for heating and hot water at Heelis, with an additional 24kWh/m² for its catering kitchen.

Figure 2 shows annual electricity consumption – in kWh/m² –for the same period, broken down by end use. Starting at the bottom, this shows:

- The estimated breakdown for Heelis in 2006. Note the large proportion attributable to the server room and catering kitchen. Not shown is its 9kWh/m² renewable contribution from PV
- The design estimate for The Woodland Trust, using standard assumptions for Building Regulations, plus Max Fordham's estimates for the server room
- In-use performance at the Trust in 2012-13. Note the much lower consumption of the lighting and the ICT in relation to the small power allowance. However, much of this reduction reappeared in the server room and its air-conditioning
- Potential future savings using relatively low-cost measures – predominantly switching off the VoIP telephones outside office hours (plus associated savings on the switch, UPS and associated air conditioning), and improved control of the backup cooling units in the server room and the ambient lighting.

Issues in operation

Generally, The Woodland Trust building performed well, but some problems arose in use – of which server-room cooling was the most critical.

Value engineering at a relatively late stage replaced the independent airside and chilled water cooling systems with a packaged chiller, with both refrigerant and free cooling. Although the chiller was highly specified, it failed every few months, bringing down the Trust's entire ICT, thin client, and telephone systems.

The manufacturer was remote and local support proved difficult to obtain, so a basic DX backup system had to be added. The chiller's controls proved to be vulnerable to brief power interruptions, which are common in Grantham. Although the problems were eventually fixed, simple, more standard equipment would have been preferable.

Using the boiler plant for both heating and hot water also led to some energy wastage, because of interactions between the two systems. A reduction of nearly 10% in gas

Occupation satisfaction

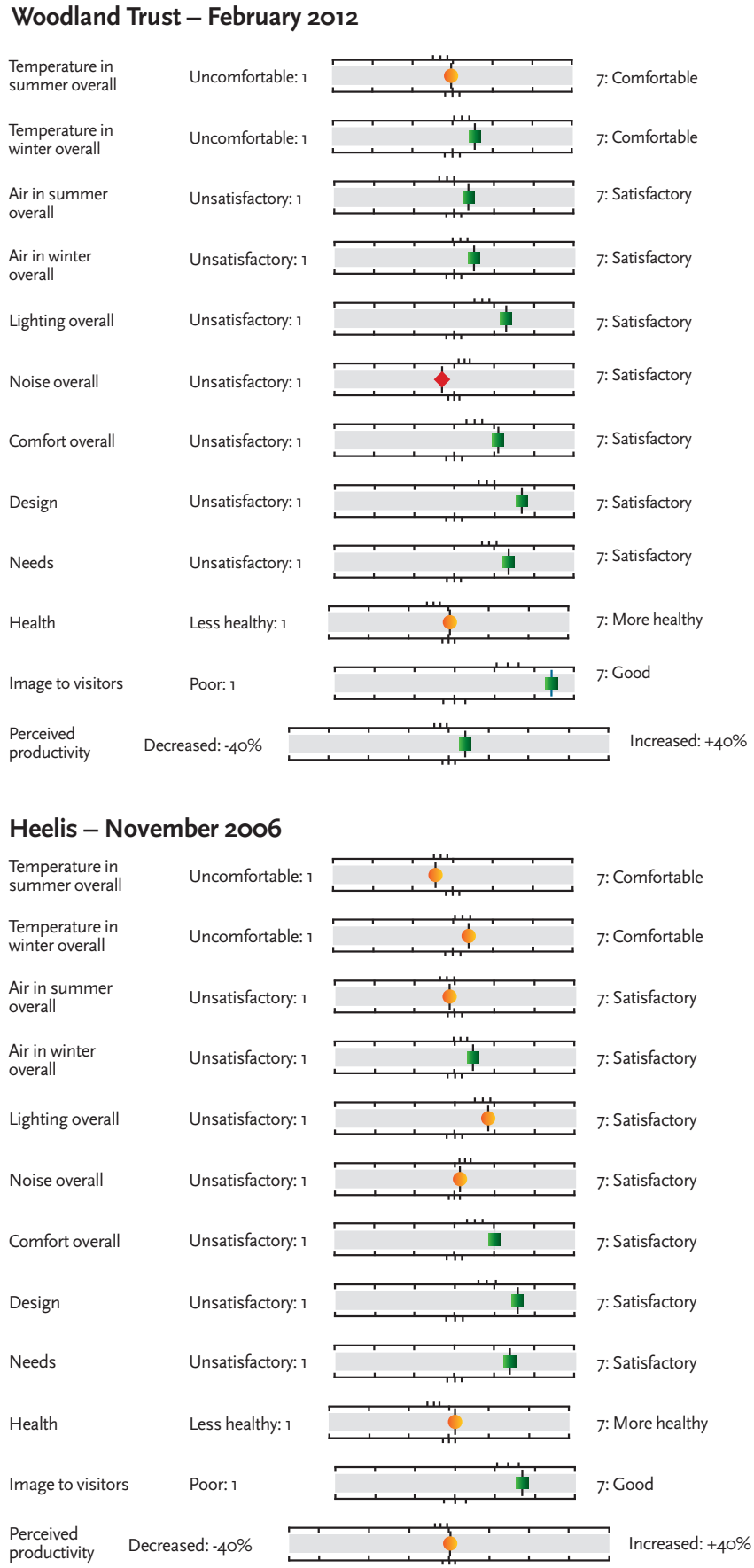


Figure 1: Comparison of average scores for headline indicators from the BUS Methodology occupant questionnaire surveys

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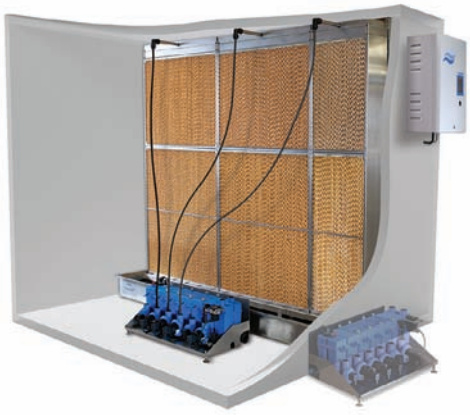

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consumption was estimated had the systems been completely separated.

The natural ventilation system initially caused problems. In winter, occupants opened windows less than expected because of draughts (the main openings are at desk level). When CO_2 levels rose above 1,200ppm, the automated system opened higher-level windows, but the minimum setting of 10% was also draughty. The BMS was eventually altered to give facilities control over minimum window opening.

In summer, night cooling was also disappointing initially, partly because of a complicated control logic and convection currents reaching the external air-temperature sensor when the sun's rays fell on the building's timber rain-screen cladding, elevating the detected temperature by as much as 8°C. The situation was improved by relocating the sensor, simplifying the logic, and allowing the facilities manager to decide whether heating or night cooling was required.

The function of the concrete radiators was explored in 2012-13, using heat-flux sensing and time-lapse infrared thermography. The average rate of heat absorption during office hours was 5W/m², rising to 10W/m² on hot days. An important finding was a need to close windows an hour before the office opened, so temperatures could equilibrate, otherwise the air and furniture could feel too cool when people arrived (see panel 'Night cooling and concrete radiators', right.)

Conclusions

The building achieved many of its design objectives: good quality at a normal cost (£1,800/m²), and good levels of occupant satisfaction – though with shortcomings in relation to noise, in particular. Initial problems with air quality and summertime temperature have been tackled, with potential for further fine-tuning.

Lower energy use than Heelis was achieved for all building-related end uses, especially heating and lighting. However, despite 'thin clients' and other efforts, the electricity used by ICT systems was higher. Future projects would benefit from the services of an ICT energy-efficiency consultant.

The 'keep it simple and do it well' approach could be taken further still, particularly by improving the usability of control systems, and avoiding over-complication in the name of energy efficiency – especially in the design of the server room cooling system. In terms of procurement, future projects should:

- Adopt soft landings and manage it firmly from the outset, with champions identified to carry it forward throughout a project
- Make better provision for follow-through after practical completion. Fine-tuning will always be necessary – this should be planned for, including a contingency budget to allow any minor alterations to be dealt with quickly and effectively
- Appreciate the need for constant feedback. With each project there are new things to learn; a problem addressed is not necessarily solved; and unintended consequences may emerge. **CJ**

Electricity consumption at Heelis and The Woodland Trust

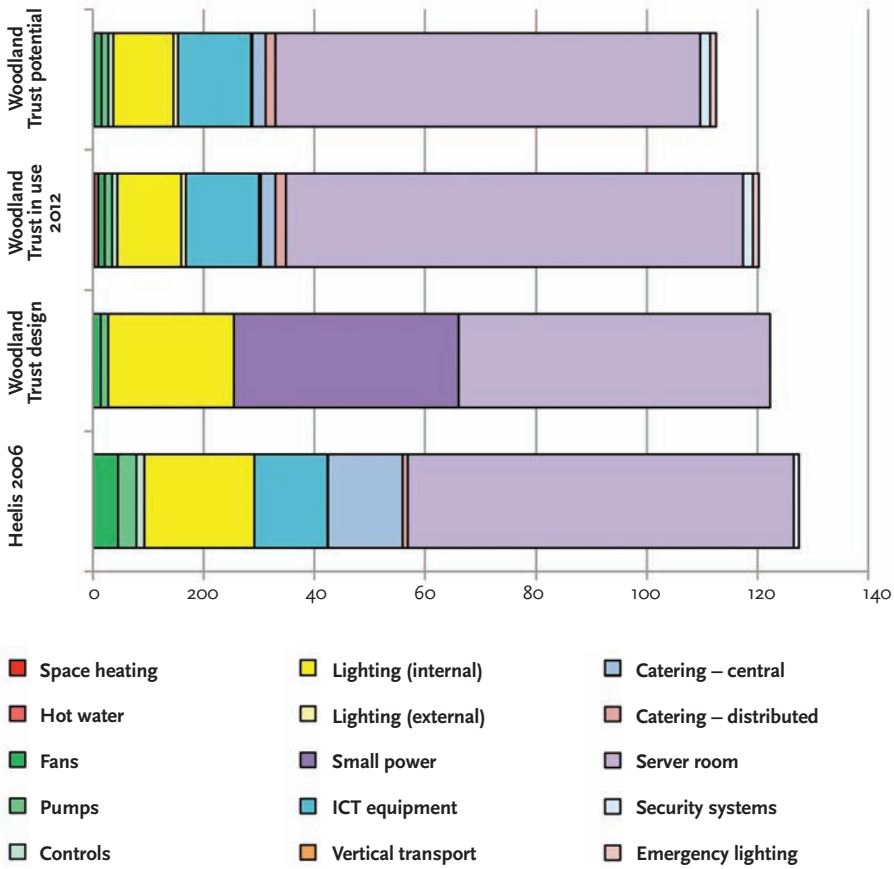

Figure 2: Annual electricity consumption kWh/m², broken down by end use

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1 The *Soft Landings Framework* published by BSRIA and UBT in 2009, drew upon this research work, subsequent case studies, and the activities of the user group hosted by BSRIA. Download it from **www.usablebuildings.co.uk**

2 G Nevill, *So, how are you doing?* Building Services, *Building Services Journal*, 32-37 (November 2007).

3 The original Probe articles can be downloaded at **www.cibse.org/knowledge/probe-post-occupancy-studies**

BILL BORDASS FCIBSE, of William Bordass Associates and the Usable Buildings Trust, **PETE BURGON** CEng MCIBSE, of Max Fordham, **HESTER BROUGH**, of Feilden Clegg Bradley Studios, and **MATT VAUDIN**, of Stonewood Design

NIGHT COOLING AND CONCRETE RADIATORS

The office at the end of a period of night cooling, showing heat retained in the concrete radiators while the rest of the office is cold. The interior, therefore, needed time to come to equilibrium before occupancy.

RETAIL THERAPY

London's iconic Harrods store won the refurbishment project category at the 2014 CIBSE Building Performance Awards, for a complex 10-year refurbishment that has delivered improved internal conditions, energy reductions, and more resilient building services. **Andrew Brister** discovers how the team produced the goods

> Systems regularly struggled to meet the demands of the store retailers, who continually seek higher lighting levels, and more extensive display-lighting schemes

Harrods has come a long way since Charles Henry Harrod established his business in 1824. Today, the brand includes Harrods Bank, Harrods Estates, Harrods Aviation and Air Harrods – but it will always be best known for its iconic store in London's upmarket area of Knightsbridge. Occupying a five-acre (20,000m^2) site – and comprising more than 90,000m^2 of selling space in 330 outlets – it is the biggest department store in Europe, and attracts visitors from across the globe.

A business that clearly doesn't rest on its laurels, it has ambitious expansion plans for the store, despite the limitations of the site, and the building's Grade II-listed status. 'The store continues to expand its retail square footage, while maintaining the existing footprint,' a Harrods engineering spokesman points out.

With more shopping space comes higher footfall, and an increasing demand on building services – so Harrods developed an ambitious refurbishment scheme to breathe new life into a store that first opened in the early 1900s.

'The rooftop HVAC [heating, ventilation and air conditioning] project is a scheme that started at a conceptual level more than 10 years ago,' says the spokesman. The plan was to replace ageing infrastructure, while also introducing additional capacity to support the future expansion plans for the business.

'The ethos was to strive towards reducing energy consumption, improve comfort levels within the store, enhance the resilience of the system, and increase the ability to respond to

Controls for the pumps, and (right) the engine room chillers

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KIEVVICTOR / SHUTTERSTOCK

Harrods' Grade II-listed status was never used as an excuse to avoid striving for the best technical solution

unplanned plant failure, without impacting other systems,' he continues.

Retail space has expanded from 925,200 ft^2 to 1,381,700 ft^2, while the building's annual electricity consumption has decreased from 49,000 MW to 41,500 MW per year. The cumulative effect is a carbon reduction of more than 4,000 tonnes of CO_2 each year.

'Considering these reductions have been achieved while increasing the overall footprint of the retail space – where you would normally expect to see an equivalent increase in the electrical consumption – this makes the project more meaningful, and worthy of recognition,' says the spokesman.

Clearly, the judges at the 2014 CIBSE Building Performance Awards thought so too, because Harrods won the Refurbishment Project (over £5 m) category.

Talking shop

Over the years, Harrods has amalgamated its buildings in Brompton Road, Hans Crescent and Basil Street, and extended upwards. Engineering solutions have slowly evolved around the store, and are now dovetailed into the fabric of the building, making large intrusive refurbishment very difficult. Plant was ageing, inefficient, and under capacity.

Harrods is designed to operate using a full fresh-air ducted system. The fresh air is delivered to the shop floors via large builders' work shafts, which traverse the store from the rooftop down to the basement levels.

The air handling units deliver tempered outside air into the shafts, which are then controlled at each floor level using variable volume dampers. The variable air volume (VAV) system acts according to room-temperature sensors by modulating the supply air volume to control the space condition. The existing rooftop equipment consisted of multiple air handling units set up in clusters. The units were served by air-cooled chillers positioned close to each cluster, with heating provided from steam coils fed from the basement boiler room.

The air handling units' fan speed was varied to maintain the shaft pressures for the VAV system feeding the various dampers. The ductwork system is extensive, and distributes throughout the store, and has become part of the fabric of the building.

While this is an effective means to condition the store, the continual expansion had challenged the system to the point where numerous operational problems were being experienced, admits Harrods. Plant was regularly failing, and was difficult to repair because equipment was often no longer supported by the original manufacturers.

There were problems on the electrical side, too. The store's electrical intake is rated at 11 MW. This was regularly being exceeded and putting a strain on the electrical infrastructure.

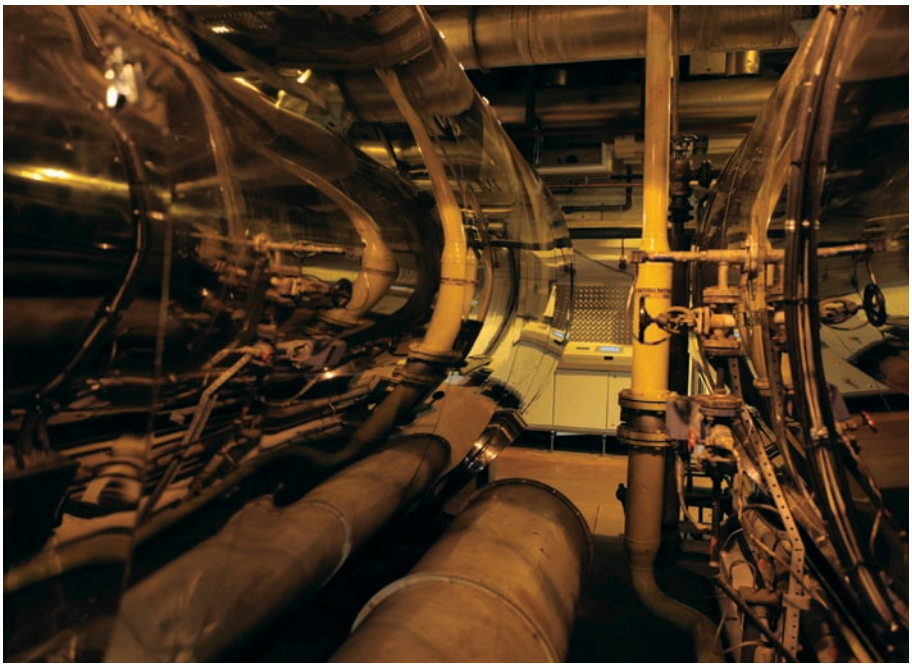
The demands of the retailers for more lighting, power and cooling were limited by the maximum intake capacity. Systems regularly struggled to meet the demands of the store retailers, who continually sought higher lighting levels and more extensive display-lighting schemes.

Because of the scale of the store, and the extent of the problems experienced, the solution could not simply be found in localised short-term fixes. 'Harrods recognised that a more holistic approach needed to be adopted to address the problems, and secure the long-term operation of the store,' says the spokesman. 'A complete overhaul of the HVAC system was required to address the internal conditions, reduce the store's energy consumption, and increase the system's cooling capacity. It was also imperative to introduce resilience, to mitigate downtime for plant maintenance or failure.'

The answer was to deliver a completely new infrastructure – but how to achieve that in a landmark, listed building, while ensuring there was no downtime to the business or disruption to the store's operation? Enter the project team of building services engineer PSK Design, architect Woods Hardwick, structural engineer WSP, and project manager, Riley Consulting.

Delivering the goods

Because of the magnitude of the undertaking – and the budgets involved – it was necessary to deliver the new infrastructure in phases.



The boilers in the main building at Harrods (above) and the store's low-voltage switch room (below)

The design would need to reflect this, without compromising the final solution.

The project team has increased AHU plant capacity by 30% by opting for a compact air handling unit that sits within the same footprint as the existing units. The units' volumes were increased, yet – by incorporating only one heating coil, one cooling coil and filler bank – the overall energy consumption of the air units has been reduced.

All the motors were selected to operate with variable speed drives to align with the pressure control regime, while reducing power consumption.

The specific fan power for each system was reduced from 3.0W/(l/s) to 1.6W/(l/s), while air volumes have increased from 500m^3/s to 670m^3/s.

When in cooling mode, shaft temperatures have been reduced from 16°C to 13°C to increase cooling capacity to the shop floors. Considering the increase in volume and the decrease in supply temperature, the store's sensible cooling capacity has gone up from 4,500kW to 7,900kW, a 75% increase.

Energy-efficient lighting has been introduced throughout the store, with stringent specifications for new retail shop fit-outs – part of the regular turnover within Harrods. 'This policy is continually policed, and has reduced the lighting loads from 5.8MW to 3.1MW,' says the spokesman. 'This involved the retrofitting of general circulation space lighting – as well as display lighting – to LED technologies, while maintaining the lighting levels and colour temperatures.'

To improve the system resilience, and join the many roof zones, a 300mm-diameter ring main was installed, where all the chillers and AHUs link together on a primary header, and can be operated as a variable volume system with two-port control. This was required to achieve the energy targets, because analysis of the number of degree days where the building is operating at its balance point showed that the plant would be operating at part loads, and, therefore, lower pump speeds.

This presented a difficult engineering challenge as the operation of a ring main requires central plant with a primary and secondary pumping solution. Traditionally, the chillers would be configured with constant-volume circulating pumps on a primary circuit, to maintain constant flow through the chillers, with variable speed secondary pumps serving the ring main. The problem with this is that it would require all the plant to be located together, to coordinate primary and secondary sides – which was not possible because of the congestion at roof level.

'The use of a primary pumping variable volume (PPVV) system was selected, because the design uses fewer pumps and less piping connections compared with traditional primary-secondary systems – and there is a reduction in the ancillary items, such as electrical supplies, controls and valves. However, the main benefit is a reduction in the power consumption, and a much-reduced plant footprint,' says Harrods.

These factors help to reduce the initial cost of the chilled water system, and the small footprint lends itself to sites that have constrained footprints, such as refurbishments. A PPVV design displaces the small, inefficient, low-head primary pumps used in primary-secondary systems. The pressure drops around the central plant – previously satisfied by the primary pumps – are, instead, fulfilled by the main distribution pumps, allowing for the selection of larger,

Existing problems

Issues with the old plant included:

- Existing air handling units were designed to deliver a lowest temperature of 16°C, which limited the opportunity for treating higher-density cooling loads. Hotspots were appearing in Harrods, where central plant capacity was unable to deal with conditions in the store
- The cluster concept meant – when central air handling or chilled water plant failed – there was no ability to back up from other areas, or share chilled water from adjacent zones
- Existing plant struggled to respond to seasonal variations in external temperatures. Typically, spring and autumn days – that started cool and warmed quickly during the day – challenged the store's plant and internal conditions.

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more-efficient pumps, with efficiencies similar to those of the secondary pumps in a primary-secondary system.

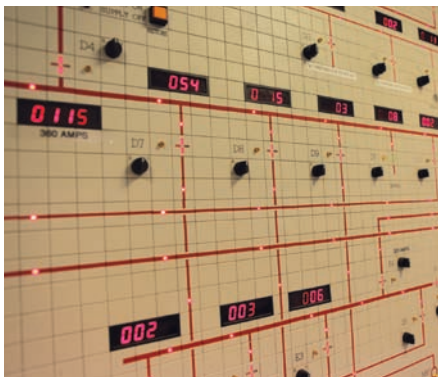
There are hurdles to achieving this solution because varying the water flow rate through the chiller evaporator poses a number of challenges, such as: maintaining the chiller flow rate between the minimum and maximum limits of the evaporator to avoid chiller lock out; and managing transient flows without compromising stable operation in multi-chiller plants, to avoid evaporator freezing. By working closely with the design team, chiller manufacturer, control valve manufacturer, and BMS controls installer, the team was able to design out these problems, and deliver a simple, robust and energy-efficient solution – all within a compact footprint.

High coefficient of performance (COP) chillers were required to deliver the increased chilled-water capacities, but reduced overall electrical consumption. To achieve the duties and COP targets, a combination of water-cooled chillers and air-cooled chillers were selected, providing a total capacity of 14.7 MW.

Operationally, this produced performance benefits, because – in the early and late season – there can be wide swings in temperatures. These are best dealt with by dynamic air-cooled machines that can be operational very quickly. The water-cooled machines were configured to provide the base load cooling during the summer months, with the air-cooled machines supporting during the peaks. The COP on the air-cooled machines is 3.7, and 6.2 for the water-cooled.

As part of the refurbishment works, the decision was made to remove the old steam system and introduce low temperature hot water (LTHW) via a plate heat exchanger. This eradicated issues with high losses, leaks and safety, and the system now operates as a weather-compensated system, delivering water between 40°C and 65°C to the AHUs.

The engine room control centre (above) and the mimic panel (below)



'The project has demonstrated strong collaborative working between the project team in the delivery of a complex refurbishment spread over a 10-year period,' says the Harrods spokesman. 'The ability to establish a strong design brief early in the process, maintain the principles through design and construction, and deliver the project with no dilution of the original vision is very rare.'

The project was completed without any downtime to the stores' operation, despite the replacement of all air handling plant and chillers during some of the coldest, wettest and warmest weather in recent history.

The difficulties of working in an iconic Grade II-listed building was never used as an excuse to avoid striving for the best technical solutions. The refurbishment has ensured that there are a few more years in this venerable old store yet. **CJ**

A LITTLE MEANS A LOT

The review of a 25-year PFI contract between King's College London and Bouygues Energies & Services identified 150 opportunities to cut operational costs. King's **Nick O'Donnell** and Bouygues' **David Carr** reveal how the initiative resulted in initial FM savings of £1.1m per annum – £300,000 more than the original target

King's College London's Franklin-Wilkins Building was one of two sites at the university included in the review

In August 1999, King's College London and Bouygues Energies & Services entered into one of the first private finance initiative (PFI) partnerships in the UK. The 25-year 'build and operate' agreement covered the refurbishment of one building, the demolition and replacement of another, and life-cycle replacement and operational facilities management (FM) at both.

By 2012 – the partnership's halfway point – the college's operating environment had changed fundamentally, due to higher energy costs, longer study days, and the rise of the sustainability agenda.

With a potential break clause approaching in August 2013, Bouygues and King's launched a review, to see how the FM service delivery could be made more efficient and effective. One of the objectives of the review was to reduce the annual FM cost within the PFI agreement by £800,000, and to review the life-cycle needs of the portfolios (see panel, 'Project aims', left).

King's has four campuses along the Thames – plus one at Denmark Hill, in south London – which, together, total 411,004m² gross.

The two sites under review were the Franklin-Wilkins Building (41,528m²) and New Hunt's House (18,885m²). The buildings comprise a mixture of scientific areas – including laboratories – classrooms, auditoriums, offices, social space, and catering areas. The college uses a large amount of energy carrying out experiments, complying with tissue-storage requirements and using research equipment.

PROJECT AIMS:

- Reduce the annual FM cost within the PFI agreement by £800,000
- Identify ways to make the FM operation more efficient and sustainable
- Increase operational collaboration between the parties
- Review the life-cycle needs of the portfolio and the use of the life-cycle fund
- Challenge the status quo.

Approach

A review body was set up, supported by five workstreams, which included groups looking at M&E maintenance, energy, and life-cycles. The review team identified which service outputs added tangible value to the business, and which were no longer fit for purpose. It found more than 150 opportunities – which were evaluated – and put them into a league table for the teams to tackle.

M&E workstream

The M&E workstream achieved savings of £250,000 per annum through a number of strategies and initiatives.

Under the original public-private partnership (PPP) contract, Bouygues employed a 20-person maintenance team, which was dedicated to the two buildings. While it met the needs of the college, the engineers were under-used. The surplus capacity within the core team was, therefore, employed by Bouygues to provide a floating,

New Hunt's House (right above) and a stairwell (inset) at King's College

reactive resource to local customers outside of the college. Savings associated with this surplus were then passed back to King's.

The college and Bouygues also identified opportunities where training staff – in areas such as heating and air-conditioning maintenance – would allow King's to bring in-house previously sub-contracted services.

The life-cycle replacement clauses within the contract required Bouygues to swap all assets with a like-for-like replacement upon life expiry. However, many of the systems originally specified and installed were 'closed protocol', thereby restricting the market for replacement, and increasing ongoing maintenance, expansion and adaption costs.

New mechanisms were therefore created – and variations made in the contract – to allow for the mutually agreed adoption of equivalent performance systems that may not be directly considered like-for-like, and to enable the college to supply top-up funding for higher-specification systems to be installed.

Bouygues introduced a new approach to asset management by using Lean Six Sigma tools. Developed in the car and mobile phone industries, these tools are designed to improve processes and minimise faults. They analyse assets in terms of performance, reliability and criticality.

This led to the redesign of maintenance schemes to be more data-driven and flexible, rather than being a traditional cyclical model, such as SFG20. This targeted model mitigated the service risks associated with King's critical assets, while providing increased resource capacity through the reduction of maintenance cycles on non-critical – or low-usage – assets.

The increased specialist skills of the maintenance team allowed for the adoption of non-intrusive maintenance methods, which go beyond the industry standard SFG20 approach. This involved identifying the performance of the plant while it was running, thereby removing the need to shut down and interrupt the service.

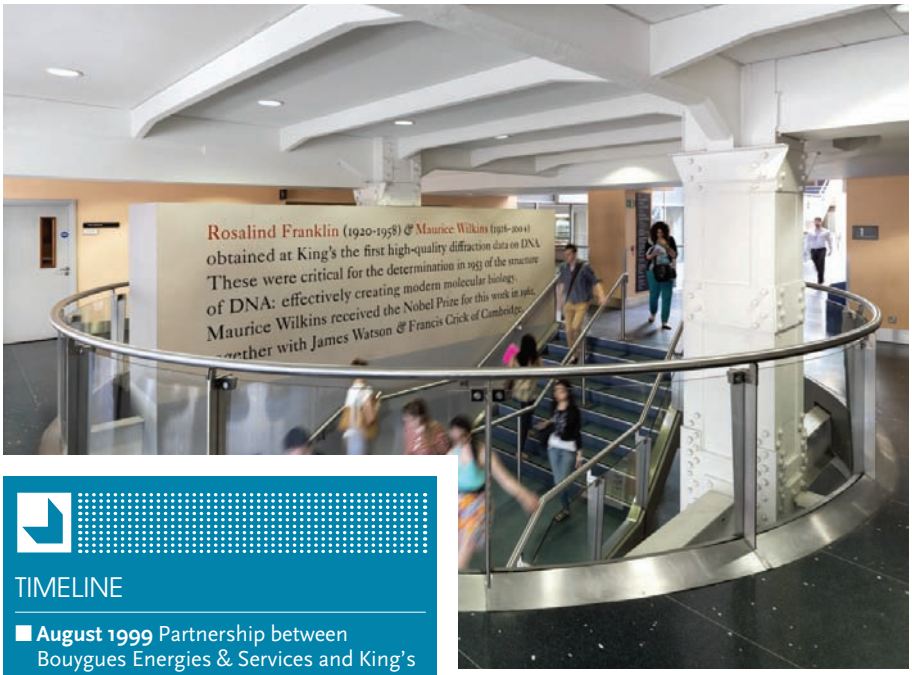
The identification of in-house repairs was another development, with the wider Bouygues engineering team involved in the assessment of repair capabilities. The approach goes beyond PAS55 (optimal management of physical assets Publicly Available Specification – now ISO 55000). The new methodology is continually tested and adjusted to ensure maintenance is in line with the equipment's criticality, and that the college is not placed at unacceptable risk.

Energy workstream

The team worked on 20 types of energy efficiency and savings projects, which contributed to an annual saving of £285,000. This package of projects is part of an investment programme with payback guaranteed under an energy-performance contract, and included: the use of variable speed drives for pumps and fans on equipment such as air handling units; LED or high-efficiency lamp replacement; insulation on pipework and ductwork; and improvements to chiller and boiler performance.

Light sensors have been introduced throughout the two buildings, especially in stairwells, which are only used for emergencies and do not require lighting to be switched on continuously.

An important intervention has been to vary ventilation profiles to suit user occupancy. For example, rather than run ventilation and lighting from 7am to 6pm in the postgraduate student offices, zoning controls linked to occupancy sensors provide an environment that matches use.



Savings of £1.1 m will be re-invested in student services

TIMELINE

- **August 1999** Partnership between Bouygues Energies & Services and King's College London started
- **June 2011** King's issues a major variation to the PPP so that FM services could be modified in response to changing patterns of demand. For example, the university was now hosting summer schools, and opening for extended hours
- **February 2012** Combined team discusses an initial target to reduce annual FM costs by £800,000 by June 2013, and to review the arrangements for the life-cycle fund. Bouygues Energies & Services also agreed to look to reduce King's College London's energy consumption, and to contribute to wider savings goals outside of the PFI partnership
- **March 2012** King's and Bouygues Energies & Services agree the terms of an 'efficiency review' in line with Treasury guidelines on ensuring value for money from PFIs and PPPs
- **June 2013** King's and Bouygues Energies & Services had a clear understanding of what was being achieved, and could see objectives being met. This concluded the review, and ensured that the break clause would not be triggered.

The energy-performance contract is on track to deliver a 13.2% energy-saving cost reduction of £212,000 per year, and an annual carbon emission reduction of around 960 tonnes of CO_2, with further savings expected to be achieved through behavioural-change programmes. Rising energy costs (6% to 8% annually) have reduced payback periods for many of these projects.

Results

The target of £800,000 savings per annum was exceeded by nearly 40% as £1.1m of savings per annum was achieved, with savings from soft services contributing to the final total (which will be reinvested in student services). The review also met the objectives of increasing operational collaboration, harmonising and improving services, and creating a better governance structure. The number of complaints about facilities, already moderate, dropped further.

Measurement has also improved significantly. As one of the first PFIs in the UK, setting the original key performance indicators (KPIs) and service-level agreements was a difficult task; there had been a tendency to be over-prescriptive. As part of the review, the KPIs were rewritten to reflect the new approach, and to present a more accurate picture of the facilities function. This has made performance measurement more realistic, and allows it to be matched with the rest of the college, and benchmarked accordingly. **CJ**

NICK O'DONNELL, director of real estate management, King's College London; **DAVID CARR**, managing director Bouygues Energies & Services in the UK

FINE **TUNING**

TM54 was designed to close the performance gap by enabling more accurate modelling of building performance, but how effective is it in the field? Inkling's **Clare das Bhaumik** reports on her experience of the prediction tool

> Generally we have found that the use of TM54 encourages an integrated design process and early dialogue between the design team and client on how the building is likely to be used

SMILEUS / SHUTTERSTOCK

CIBSE took a major step in the quest to address the performance gap in September 2013.

It published *TM54 Evaluating Operational Energy Performance at Design Stage*, groundbreaking guidance that seeks to address the difference between the anticipated energy performance of a building and the actual performance achieved post-occupancy.

The performance gap was highlighted by the Carbon Buzz project, which found that, on average, buildings consume 1.5-2.5 times the energy predicted at the design stage.

TM54 provides a methodology for designers to develop an informed energy performance prediction for their buildings while they are still on the drawing board, through the use of detailed building modelling. The TM54 process involves collaboration and dialogue between all members of the design team including the client.

The methodology starts at the design stage but is designed to follow the project through to the post-occupancy stage, providing valuable diagnostic information for interpreting the in-use energy performance, and determining whether these values are within the expected range or whether something is not as it should be. When a performance gap is identified it is often the trigger for much finger-pointing. TM54 should help teams work together to understand the factors at play in creating the gap and hopefully overcoming them.

Inkling spotted the potential within the methodology and has been an early adopter. We are applying it on several commercial projects and have run TM54 training.

This article focuses on our experience of applying the TM54 methodology and the possible opportunities it presents, such as its use for existing buildings and with schemes such as Soft Landings and the Energy Savings Opportunity Scheme.

For the TM54 projects carried out by Inkling so far, obtaining information at the early stages of design on how the building will ultimately be used has not always been straightforward. The modelling has been an evolutionary process with assumptions being gradually replaced by more accurate information as it becomes available.

This can be frustrating because the model's value is based almost entirely on the accuracy of the data it draws on, but it can be difficult to track down the right person on an extended design team who will be able to answer each question. Also, some information is simply unavailable until the design has progressed to a certain point.

There will always be uncertainty in energy predictions, because of the unpredictable way people actually use buildings. For example, there is a lack of understanding of occupant behaviour and how this can be integrated into simulation modelling. This is currently being addressed by International Energy Agency project Annex66 'Definition and Simulation of Occupant Behavior in Buildings'. However, its findings will not be available for a couple of years. In the meantime, we need to find a way to bridge this gap.

Importantly, the TM54 methodology recognises that there will always be uncertainty in the results. It recommends output formats to illustrate this, such as the low, medium and high energy use scenarios (see graph on page 40). The actual building energy would be expected to fall somewhere within this range.

Usefully, the TM54 outputs also assign responsibilities for each aspect of a building's energy use. For example, total installed lighting power is the responsibility of the designer, but hours of lighting use are the responsibility of the building operator. Although this example is trivial, responsibilities may not always be so transparent, and the identification of these is a useful exercise in order to focus minds.

Barriers to use

Generally, we have found that the use of TM54 encourages an integrated design process and

early dialogue between the design team and client on how the building is likely to be used. It also highlights all the different energy-consuming elements (not just regulated ones) that often get overlooked – lifts, catering and so on. However, there is still a significant shift in mind-set required within the industry in order to reap the benefits of early modelling and stakeholder engagement. The barriers to greater uptake of TM54 style modelling appear to be mainly financial and historical.

A further barrier to greater use of detailed energy prediction is the lack of industry skills for detailed modelling. The level of accuracy deployed in the model should match the design stage of the project. For example, after the concept design stage, detailed HVAC modelling is required in order to optimise plant and controls. Part L has encouraged simplified modelling and detached the modelling of building energy use from the consideration of occupant comfort.

TM54 energy prediction modelling must be coupled with thermal comfort and cost analysis to create a building design that works on all fronts. Having an understanding of this, and providing good quality models to support the TM54 process, requires skill to execute efficiently. Not all modelling practitioners have the experience necessary, although we hope that this will change as the industry increases its awareness and respect for the discipline of building physics.

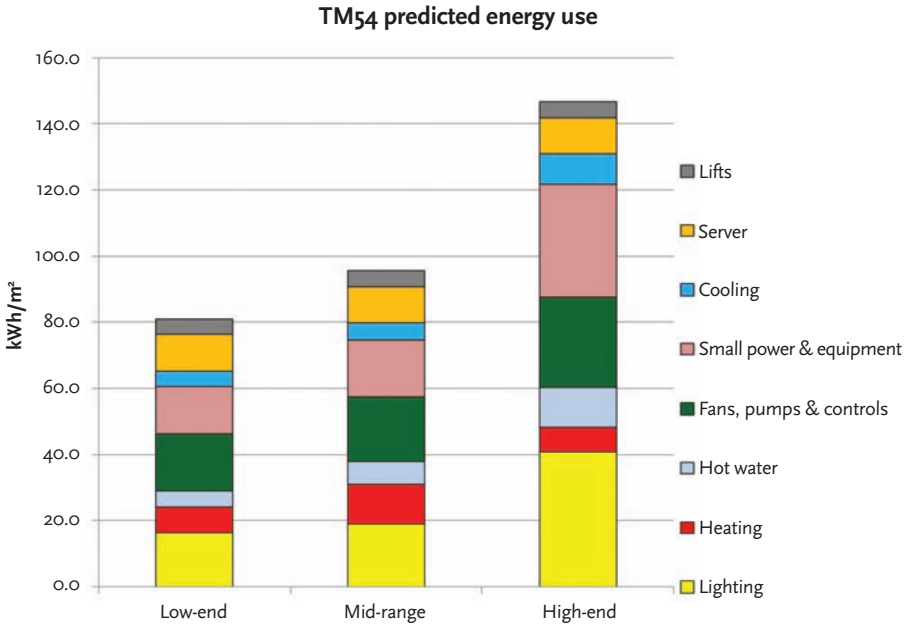
TM54 offers some opportunities to tie-in with existing and emerging methodologies and schemes. There is an obvious overlap between TM54 and the Soft Landings process. For example at Stage 1 (Inception and briefing) Soft Landings also relies on constructive dialogue between the design team, client and contractors. After construction, the TM54 model allows detailed fine-tuning and debugging of the building. The model is a powerful tool to inform the process at Soft Landings Stage 4 (Initial aftercare). At Stage 5 (Years 1-3) and beyond the model it can be used to de-risk future investment decisions or to test changes to operation or controls.

The broader TM54 methodology also provides a framework with which to assess energy use in existing buildings and to predict a likely range of energy savings and ultimately payback periods for building upgrades. There is, therefore, the potential for overlap with the Energy Saving Opportunities Scheme (ESOS) and the CRC Energy Efficiency Scheme, which is intended to improve energy efficiency and cut emissions in large public and private sector organisations.

ESOS requires large companies to audit their energy use to identify cost-effective energy-saving measures. Modelling the current building energy use, and applying improvements in the model, would enable companies to compare improvements to current systems, operation or fabric, and to assess savings. Although there would be an upfront cost for the modelling work, in most cases this would be small compared to the energy costs and potential savings. Additionally, improvements to thermal comfort could also be assessed in the model, potentially leading to a more comfortable building.

A further driver for energy efficiency improvements is the Energy Act 2011, which requires buildings for rent to meet Minimum Energy Performance Standards (MEPs)[1] from 2018 – likely to be an EPC rating of E or better.

In summary, TM54 is a valuable tool that can help close the performance gap, and be used in conjunction with the government's carbon saving initiatives. But it is only as good as the data fed into the model, and is dependent on the skill of the modeller. Users must be aware of the importance of allowing time to track down relevant information from the supply chain, and make sure they carry out – or work closely with those carrying out – detailed HVAC thermal modelling, as well as thermal comfort and cost analysis. **CJ**



TM54 recommends using the low, medium and high energy-use scenarios

> Part L has encouraged simplified modelling and detached the modelling of building energy use from the consideration of occupant comfort

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1 CIBSE's response to the MEPS consultation can be viewed at **www.cibse.org/consultations**

DR CLAIRE DAS BHAUMIK CEng FCIBSE is a partner at Inkling

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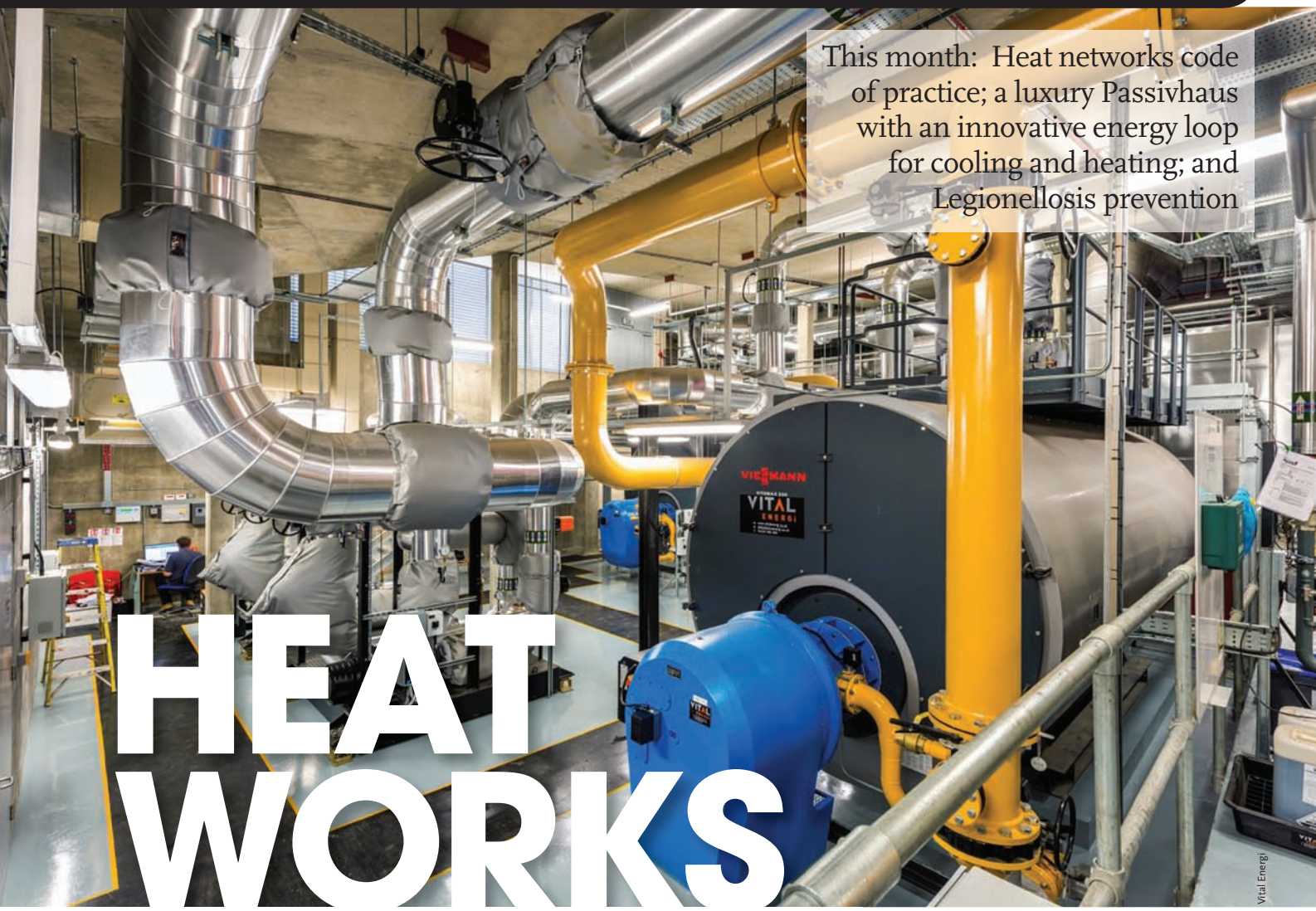
This month: Heat networks code of practice; a luxury Passivhaus with an innovative energy loop for cooling and heating; and Legionellosis prevention



Vital Energi

HEAT WORKS

With the government backing heat networks to supply 14% of the country's heating requirements by 2030, it's essential that they are designed, installed and operated properly. A new code of practice is therefore being produced by CIBSE and the Combined Heat and Power Association. **Alex Smith** reports

Heat networks are set to be a key element of the UK's energy policy. The government says their ability to deliver low-carbon heat can help the country meet its target of reducing carbon emissions to nearly zero by 2050, and it has, therefore, pledged to support the uptake of the technology.

Through a network of highly insulated underground pipes, heat networks can deliver low-carbon heat from sources such as waste industrial heat, and deep and large-scale heat pumps. The government wants to harness their potential, and increase the proportion of UK heat supplied by the technology from 2% to 14% in the next 15 years.[1]

To ensure the industry can deliver the rising number of heat networks, CIBSE and the Combined Heat and Power Association (CHPA) are producing a code of practice for the industry. Last month, they released the draft document, *Heat Networks: Code of Practice for the UK* for consultation, and – in the new year – hope to publish the final code, alongside a training and accreditation scheme.

The Department for Energy and Climate Change (DECC) is keen to support the development of heat networks, and – last year – announced it would contribute to the cost of early development work carried out by local authorities[2], and establish a heat networks delivery unit to help councils' project teams in England and Wales.

Despite the technology's potential to deliver low-carbon heat, some developers and councils have experienced poorly performing

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The code aims to ensure best practice across the industry

systems, with the amount of energy used during operation bearing no relation to predictions at the design stage. Heat network systems can fail for a number of reasons, including: poor pipework specification and layout; lack of insulation continuity; high operating temperatures; poor pumping and flow control; and a lack of accurate metering and commissioning.

To ensure the delivery of high-quality heat networks, CIBSE and CHPA announced that they would work together to create an industry code of practice that would raise the standards of design, installation and operation. The code aims to improve standards across the supply chain, and to provide assurance for those responsible for specifying and operating heat networks.

Phil Jones, chair of the joint party and CIBSE's CHP group, says: 'We are doing this to make sure heat network schemes are designed, installed and operated correctly. Heat networks can be low-carbon and low-cost if done in the right way.'

The code is written to cover all stages of a project, from feasibility study through to design, construction, commissioning and operation. For each stage, it spells out a number of objectives, and the minimum requirements to ensure these are achieved.

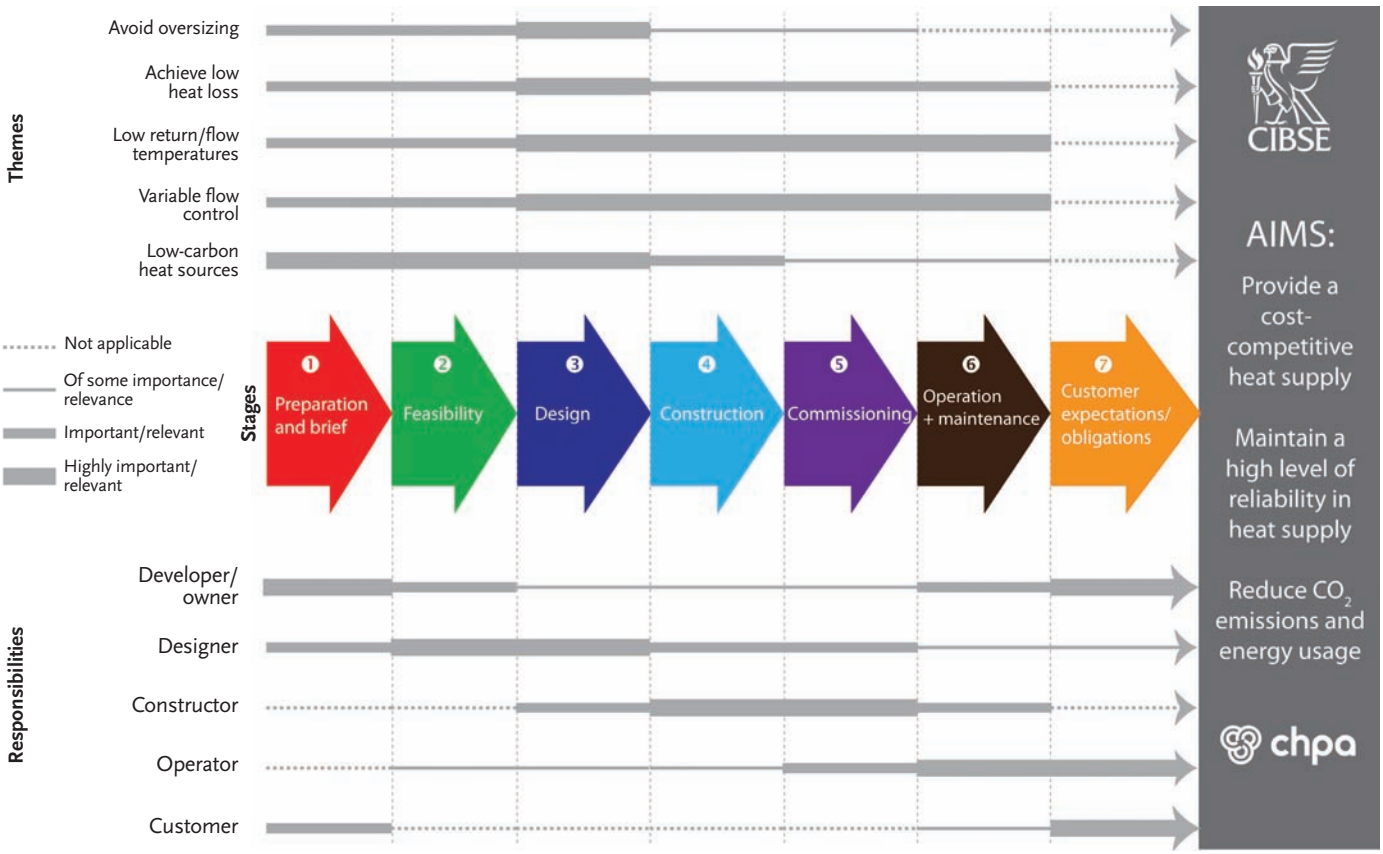
An important component of the code is the plan of works (Figure 1, below), which is included to help the industry understand the interlinked nature of the whole process, and how one weak link could result in failure. It sets out key responsibilities, and how they relate to the requirements of a successful installation – called themes in the code – such as correct sizing of plant and network, low network heat losses, and consistent low return temperatures.

'The plan of works is about bringing together the supply chain,' says Jones. 'At the moment, it's broken – it's a problem with the whole construction industry. The code is trying to tie together the supply chain into a structured and staged approach.'

A successful outcome for a heat network is threatened by this fragmented supply chain, according to the code, with the feasibility study carried out by the consultant, design by the design and build contractor, and operation and maintenance by a separate operating company. The code lays out seven requirements: preparation and briefing; feasibility; design; construction and installation; commissioning; operation and maintenance; and customer expectations and obligations.

Under each heading is a list of objectives

Figure 1: Heat networks – plan of work



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– and an explanation of why it is important – followed by a list of minimum requirements, and what is considered best practice.

The code is designed to be prescriptive – for example, Figure 2 shows preferred design operating temperatures for new building services systems – but it recognises that designers should also be able to identify options for clients, and supply the costs and benefits of each.

Jones says the success of the initiative depends on the training and accreditation programme that it is hoped will run alongside the new code of practice.

'I'm keen on the combination of minimum requirements and trained people,' he says. 'It's about upskilling the industry. We want to encourage clients and specifiers to ask for the code to be applied to heat networks.'

Jones says the proposal is to have accredited companies by January 2015, so that – when the final code of practice is published – clients will be able to choose from a list of approved heat network professionals on a register. He says that the training and accreditation scheme will give the code added credibility and, hopefully, will be included in the requirements of heat network tenders.

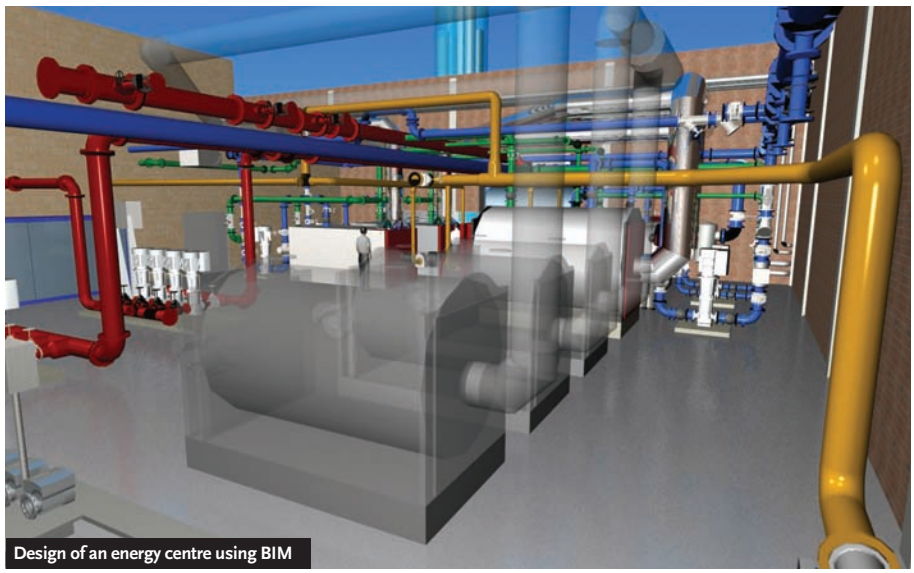
'It's not a code of practice that's going to gather dust on a bookshelf – there will be people who are trained to implement it,' Jones says. 'It's a unique step forward because it's marrying a code of practice with training.' **CJ**

● The consultation for *Heat Networks: Code of Practice for the UK* closes on 9 October. Please visit **www.cibse.org/heatnetworksconsultation**

References:

1 '*The potential and costs of district heating networks*' Report to DECC by Poyry/Aecom, 2009

2 'The future of heating – meeting the challenge', DECC, 2013



Design of an energy centre using BIM

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Figure 2: Preferred design operating temperatures

Circuit	Flow temperature	Return
	°C	°C
Radiators	max 70	max 70
Fan-coil units	max 70	max 40
Air handling unit	max 70	max 40
Underfloor heating	see note	see note
Domestic DHWS instantaneous heat exchanger on load	min 65	max 25
Domestic DHWS cylinder with coil heat up from cold	min 70	max 45
DHWS calorifier with external plate heat exchanger	min 70	max 25

Temperatures for new building services systems (ie secondary or tertiary systems)

Note: Underfloor heating systems will typically operate with floor temperatures below 35°C and typically flow temperatures of 45°C, which is advantageous for heat networks as this will result in low return temperatures.

OBJECTIVES OF THE CODE

- Improve the quality of feasibility studies, design, construction, commissioning and operation by setting minimum requirements, and identifying best-practice options
- Deliver energy efficiency and environmental benefits
- Meet good customer service needs
- Promote long-lasting heat networks, in which customers and investors can have confidence.

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PROJECT TEAM

- **Environmental engineer:** Kaizenge
- **Structural engineer:** Elliott Wood
- **Architect:** Baca Architects
- **Passivhaus consultant:** Etude

Passivhaus is no longer the preserve of the green building enthusiast; it is increasingly being adopted as a construction standard by mainstream builders, and is catching the attention of the super-rich.

Designers of a new home to the environmental standard have given the traditional British country house a makeover thanks to the fresh thinking of an affluent, twenty-something couple. With a different perspective on the form and function of the perfect manor home, the couple requested a sci-fi-influenced design, with gadgets and gizmos – but one that has a minimal impact on the planet.

Environmental engineer Kaizenge, and architect Baca, are the design team behind Serenity – a futuristic Nottingham country house aiming for Passivhaus certification and Code for Sustainable Homes level 5 (CfSH 5).

Their design – which resembles three giant mushrooms, with a hint of 'flying saucer' – certainly followed the brief for an aerodynamic, ultramodern living space, based on Tony Stark's pad in the *Iron Man* movies, and kitted out with James Bond-style gadgetry.

The house, which has a projected build cost of £7m, is intended to be both visually stunning and environmentally responsible. Its innovative, borehole thermal-energy store (BTES) and clever pipework mean the cost of heating and cooling the 16,000ft^2 property will be a fraction of what it would be for a typical Georgian townhouse.

Serenity's three hubs are façade solar orientated to provide a balance between passive solar gains and overheating. They are partly submerged in the ground to help insulate the spaces and stabilise internal environmental conditions. Its roof is sprinkled with a bespoke building integrated photovoltaic (BIPV) solar 'brow' – providing a minimum annual yield of 15,000kWh – to offset the residual CO_2 to achieve zero-carbon emissions.

SCIENCE FACT

but it is becoming a reality thanks to innovative energy-storage technology, writes **Liza Young**

The philosophy of the building services design was 'Passivhaus without compromise' – to meet a high environmental standard, without compromising on luxury components. At the same time, the services had to be as user-friendly as possible, so that performance matched design intent, long after the occupants have moved in.

Earthen heart

Kaizenge has proposed a radical approach to heating and cooling through a site-wide inter-seasonal energy network, harnessing natural energy found in the ground, sun and water.

Energy for heating, hot water and cooling will come from on-site renewables. Heat and cooling is delivered through a series of heat pumps located in each hub's plantroom, connected to a BTES system. PV on the roof will offset the CO_2 emissions from the electricity used by the pumps.

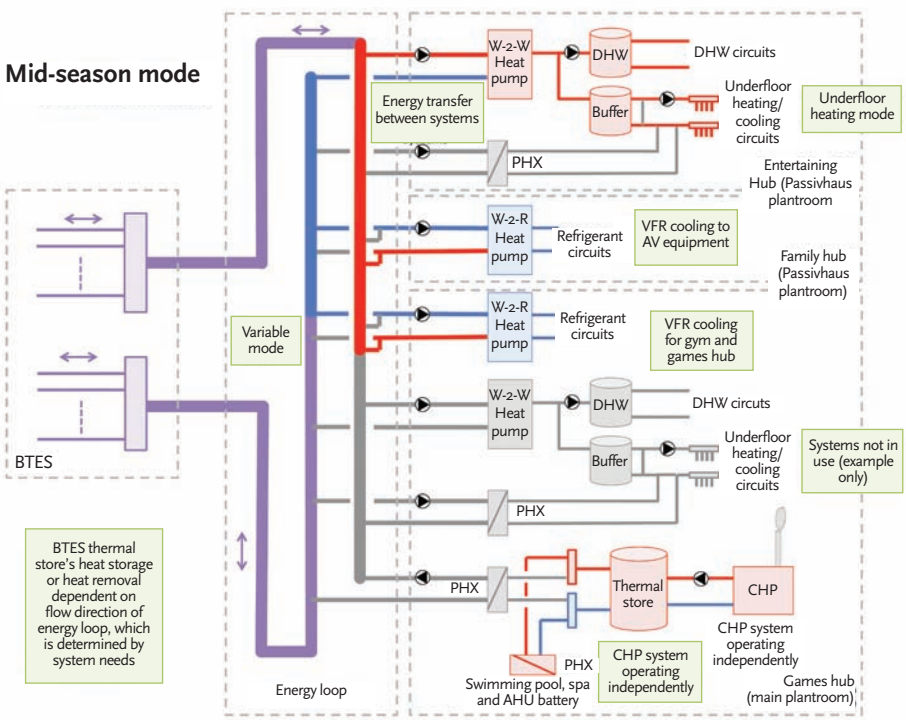
A gas-fired combined heat and power (CHP) unit will generate on-site, low-carbon electricity for the development – plus hot water for the swimming pool and spa facilities – and also top up any extra heat requirements.

The clients wanted an *Iron Man*-style luxury home

'The borehole system uses ground source heat pump (GSHP) technology, but in an innovative arrangement, to provide interseasonal heating and cooling using the ground as a thermal energy store,' says Josh Bullard, senior environmental engineer at Kaizenge.

The BTES will be the 'heart' of the system. Eight boreholes, resembling standard wells, are to be drilled 150m into the ground in a radial, circular array. The system – which will have a peak load of 70 kilowatt thermal (kWth) – will store rejected heat, collected during the summer months, for consumption in the winter. 'It is, basically, a large, underground heat exchanger,' says Bullard.

The technology works on the principle that – at a certain level – the ground is able to store thermal energy for a long period of time, says Bullard. In summer, rejected heat



Energy schematic of the system in variable mode

DESIGN FOR SERENITY'S BTES SYSTEM

- Ground collector array boreholes (eight, 150m deep, at 4m intervals, connected in series)
- Manifold (connection from borehole array to primary energy loop around building)
- Energy loop (primary pipework around building)
- Connections to heating, hot water and cooling equipment in plantrooms.

After drilling, a U-pipe (a plastic pipe with a U-bend at the end) is inserted into the borehole, which is then filled with a high thermal conductivity grouting material to provide good thermal contact with the surrounding soil.

At the surface, the U-pipes are joined together in groups that radiate from the centre to the outer edge, connecting to a short-term thermal storage tank. The entire BTES field is covered in a layer of insulation, with soil on top.

The design, to date, has been based on local trial, borehole geological data. A thermal response test (TRT) will be carried out on site – using a test borehole – before installation of the array, to confirm the actual heat abstraction rates and thermal capacity of the ground.

is stored in the ground, enabling the starting supply temperature in winter to be higher than with a standard GSHP. The flow direction of the BTES will change, depending on whether the system is in heating or cooling mode. In principle, heat will be stored, or extracted, in the centre of the array. However, in summer, energy for cooling is extracted from the array's periphery, where the temperature is lowest. This temperature profile is created by the borehole sequencing, which is controlled from the manifold.

For the system to be efficient and provide a year-round energy balance, Bullard says it is beneficial to match the heat demand of the building (heat taken from the BTES in winter mode) to the heat rejected from the building in the form of cooling or other processes (heat delivered to the BTES in summer mode).

Energy demand

The design team carried out extensive dynamic modelling to ensure the scheme was as autonomous as possible in terms of energy delivery, says Bullard.

The BTES manifold will link to the building's subsystems through a three-pipe energy loop around the house, which will connect to a series of heat pumps via heat exchangers. This will be a 'closed' loop system, with a brine-water mixture passed through the pipes to prevent freezing.

Brine-rated water-to-water heat pumps will deliver domestic hot water – and the underfloor heating and cooling – while water-to-refrigerant heat pumps will be used for VRF-based cooling in the gym and the audio-visual (AV) equipment area, comprising a home cinema, games room and music pod. Plate heat exchangers will also facilitate summer passive 'direct' cooling for the underfloor pipework system when the water supply temperature from the BTES primary energy loop is below 16°C.

The loop system allows local energy sharing between zones, with each system drawing energy from – and feeding heat back into – the loop, allowing simultaneous heating and cooling.

The AV plantroom and gym will need year-round cooling, with background cooling delivered via the underfloor pipework in the summer. At the same time, the swimming pool will need year-round heating to maintain a water temperature of 29°C when in use. As such, there are opportunities for load sharing between the spaces throughout the year.

Bullard says: 'The system allows the simple transfer of energy, according to the demands for each system. Any additional heating or cooling not required in the system will be stored back in the ground BTES.'

Heat meters on the energy loop will measure the total output from the system in both heating and cooling modes, while temperature sensors will determine the flow direction and the mode (see energy flow diagram, above).

Over the course of a year – and depending on the occupancy profile for each hub – there may be a greater heat demand, adds Bullard, so the CHP system can top up the heat store to offset any shortfall. The 30kW CHP engine will link to the energy loop via a series of plate heat exchangers, topping up supplementary heat load – and modulating output – according to demand for electricity and hot water.

Water demand

Baca, known for 'aquatecture' (water-based architecture), has integrated water throughout the scheme, designing a central reflecting pool that cascades to create a waterfall in the courtyard. Behind this, the client plans to store a collection of expensive supercars.

To comply with CfSH 5 – and to avoid compromising excessively on bath and shower flowrates – Kaizenge has designed an extensive rainwater reclamation system, to fulfil garden irrigation and swimming pool freshwater requirements, as well as sanitary flushing.

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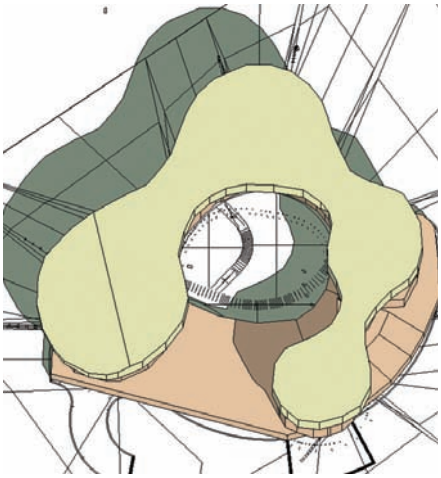
> The system is relatively simple in its controls. It will modulate according to the temperature demands from each space, with the heat pumps used to move energy from one location to another



A solar analysis model of Serenity, in Nottinghamshire

- 95% of WC flushing
- 40% of washing machine requirements
- 100% of swimming pool freshwater.

It will also help Serenity achieve a cold-water net flowrate of less than 80 litres/person/day, in accordance with CfSH 5 requirements.

Keeping it simple

Analysis early in the design process enabled the system to be simplified, while maintaining clients' expectations for an innovative building, and achievement of Passivhaus and CfSH 5. 'Throughout the design development phases, the client and team have been advised of the maintenance requirements for the various systems,' says Bullard. Maintenance contract stipulations – including a suitable F-Gas engineer – have been included in the design specification as part of the tender package.

'The system is relatively simple in its controls,' he adds. 'It will modulate according to the temperature demands from each space, with the heat pumps used to move energy from one location to another. The refrigerant in the heat pumps will help to increase the operative temperature of the water and provide suitable conditions for heating and hot water.'

Extensive modelling

Thermal analysis of the form was executed to ascertain the passive solar heat gains that could be exploited in winter, and minimise overheating in summer. IES Virtual Environment was used to determine the site's solar characteristics, and an ideal location for the PV array. Other modelling included temperature analysis for each occupied zone.

'The project is a once-in-a-lifetime opportunity,' Bullard says. 'The client had stressed that the building should be unique in character, and provide as much scope for innovation as possible. The design is integral to how the building functions, with solutions optimised to meet Passivhaus and CfSH criteria.' Kaizenge's value engineering exercise highlighted the implications for the environmental building standards if technologies were removed or replaced with alternatives. 'The primary energy targets under Passivhaus would not be met via a traditional gas heating and hot water system,' he adds.

Many of the Passivhaus buildings in Europe are austere and simple in form. Serenity has smashed this stereotype, with a design that closes the gap between pragmatic environmentalism and futuristic form. **CJ**

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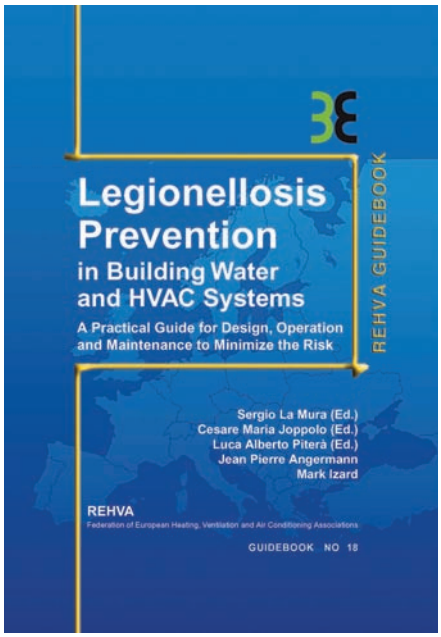
Moving FORWARD

It does not supplant HSE or CIBSE guidance but Rehva's new guidebook 18 on legionellosis prevention is a very useful document. The authors summarise key issues



Originally published by The REHVA European HVAC Journal

By Sergio La Mura, Cesare Maria Joppolo, Luca Alberto Piterà, Jean Pierre Angermann, and Mark Izard

A new practical guide to Legionellosis prevention in building water and HVAC systems has been prepared by a European working group – headed by the Italian Association of Air Conditioning, Heating and Refrigeration – and published by the European Federation of Heating, Ventilation and Air Conditioning Associations (Rehva).

The guidebook sets out techniques for each building services sector, covering:

- Introduction to specific Legionellosis risk
- How to design a new installation
- How to evaluate an existing installation
- How to effect corrective modifications to an existing installation.

A separate section of the book has been devoted to operation and maintenance from both a technical point of view and from the need to continuously maintain procedures to alleviate risk.

This is a selected summary of some of the key technical areas of the publication.

The source of legionella

The bacterium legionella is present in natural and artificial aquatic environments. It is found in springs – including hot springs – rivers, lakes, mists/vapours, and in the soil. And so, from these, it reaches man-made environments, such as mains water supplies and building systems water installations, including tanks, pipes, fountains, and swimming pools. Legionella bacteria have also been detected in river and silt from flooding, and even clay used in terracotta pottery.

A water temperature of 20-45°C, provides favourable conditions for the proliferation and presence of the bacterium and enables growth and accumulation of legionellae. Prime locations for legionellae includes:

- Water systems with temperatures less than 60°C
- Both acid and alkaline environments, with pH values between 2.7 and 8.3
- Water that is 'stagnated' in distribution piping networks and storage systems
- Scaling and/or sediments inside pipes
- The presence of nutrients and obstructions, producing amoeba and biofilm.

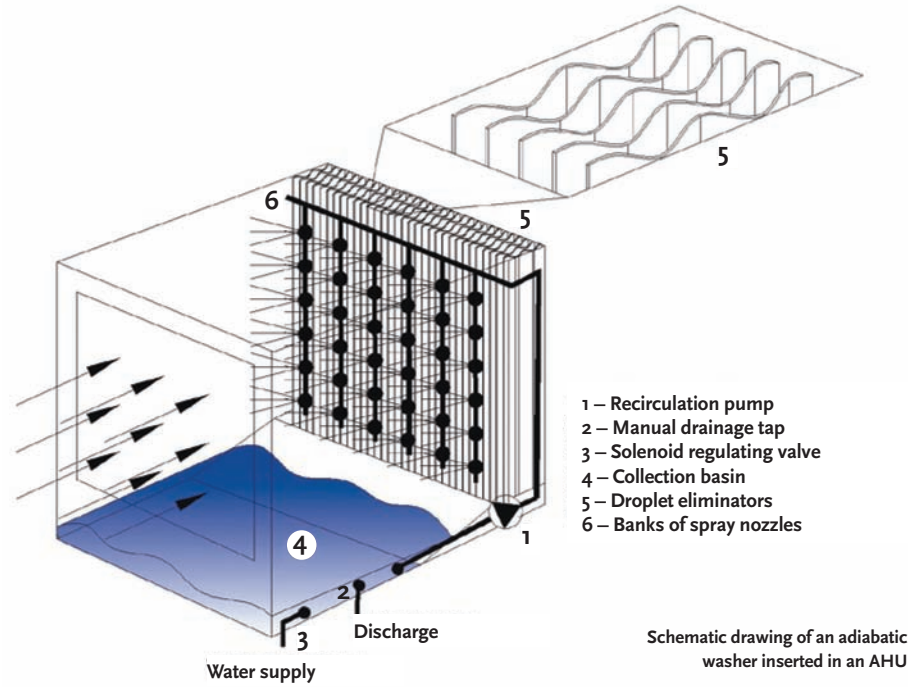
Air conditioning humidification

Humidification systems have often been considered as high-risk elements within HVAC systems. For example, as shown in the diagram at the top of page 56, there are many potential areas where Legionellae might proliferate in an inappropriately maintained (or manufactured) adiabatic humidifier with its continuously wetted surfaces.

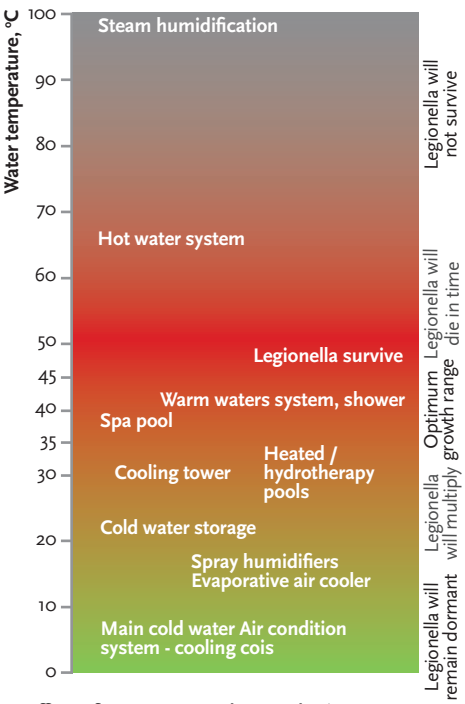
However, with appropriate operation and maintenance these risks can be controlled – the guide includes procedures for both adiabatic humidifiers and steam humidifiers.

Hot and cold potable water networks and installations

Risk of proliferation occurs when water remains stagnant for a long time at temperatures between 20 and 50°C, and particularly 32-40°C. These conditions can be found in domestic hot water service systems



Schematic drawing of an adiabatic washer inserted in an AHU



Effects of temperature on the reproductive mechanisms of legionella bacteria

(used for washing) where the distributed hot water can become warm/lukewarm (32-40°C) through poor choice of system design (mixing valve control distant form outlet), or through a malfunctioning system.

Temperatures above 20°C can also occur in cold water pipework that is considered to be below the temperature of legionellae proliferation because it is fed by mains water (usually at temperatures below 15°C).

The guide particularly highlights:

- The use of 'cold' water storage tanks that may allow temperatures beyond 20°C
- The application of local 'instantaneous' hot water to remove distribution risks
- The use of 'semi-instantaneous' production
- Design measures to alleviate risk
- Description of water treatment techniques appropriate to hot and cold water services.

Evaporative cooling towers

Evaporative cooling combines high thermal performance and cost efficiency through low cooling temperatures, which mean containment of energy and water use. The evaporative cooling tower is an energy efficient device of relatively simple design and operation, with many applications for buildings' HVAC systems, and for industrial processes. However, errors in design or construction, or poor maintenance procedures, increase the risk of legionnaires disease. Systems with seasonal use – such as summer air conditioning installations – can generate conditions for proliferation and diffusion of the bacterium if not properly maintained.

Areas highlighted in the guide include:

- Evaporative cooling tower operation
- Cooling tower forms and construction types
- Evaporative cooling towers systems design
- Evaluation of existing evaporative cooling towers systems
- Corrective modifications to existing installations
- Chemical treatment of the water.

Management of operation and maintenance

At the end of the guide, 25 pages focus on the principles and details of good operation and maintenance (O&M), which are key in the prevention of legionella growth. The following principles are explored, and several checklists are given for each action:

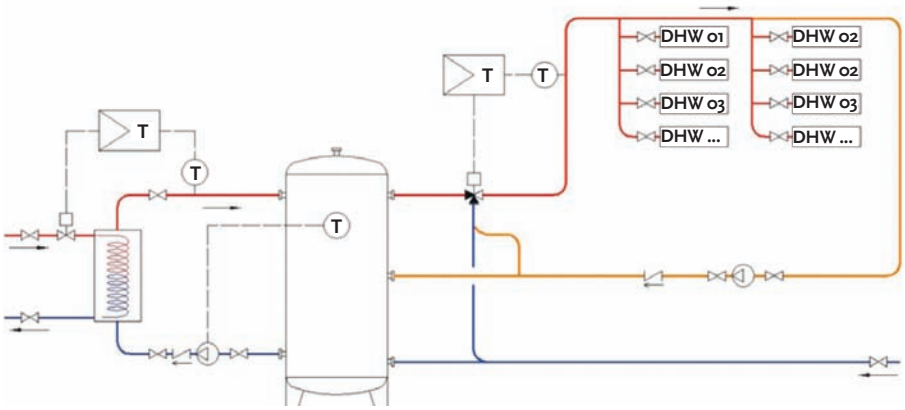
- Undertaking a hazard analysis
- Identifying critical control points
- Establishing critical limits for each critical control point
- Establishing a monitoring plan for critical limits at critical control points
- Establishing corrective action for each critical limit
- Establishing procedures to document all activities and results.

The guide also highlights the importance of establishing procedures to confirm that the plan actually works under operating conditions, is being properly implemented, and periodically reassessed – particularly after a critical dysfunction. **CJ**

OTHER GUIDANCE

This new Rehva publication does not replace the guidance from UK's Health and Safety Executive's 2013 edition of L8 *Legionnaires' disease. The control of legionella bacteria in water systems* – Approved Code of Practice and guidance, or indeed supplant CIBSE's recently-updated guidance *TM13 Minimising the Risk of Legionnaires' that itself is aimed at an international audience.*

For more information see the CPD article 'Preventing Legionnaires' disease in building services', published in *CIBSE Journal*, July 2012 **www.cibsejournal.com/cpd/2012-07/**



Schematic drawing of sanitary hot water network with semi-instantaneous production

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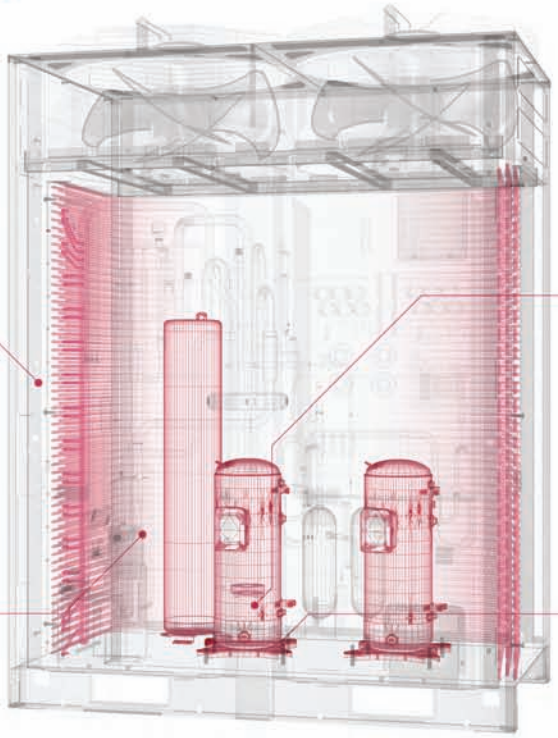

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Normal VRFs generate energy loss from collecting oil and refrigerant at the same time, through the pipe connected to the compressor's entrance. MULTI V IV, on the other hand, boosts the efficiency with LG's patent HiPORTM technology by collecting oil from the oil separator directly to the compressor.

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Heat Recovery	Heat Pump
ARUB-LTE	ARUN-LTE
22.4kW~ 224kW	22.4kW~ 224kW

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Delivering ventilation to occupied spaces

This module explores the link between fresh air ventilation rate and internal environmental quality

Every building services engineer will appreciate that the supply of 'fresh', outdoor, ventilation air into an occupied building is a fundamental requirement, both for occupant comfort and health, and for maintaining a productive living environment. The required amount of fresh air has been set in codes and standards and, for many designers, is a simple – often single – value that is remembered and applied. The increasing use of room units in commercial buildings – to cope with sensible heating and cooling loads – in conjunction with a mechanical ventilation system to deliver fresh air, provides a perfect opportunity for this CPD to look beyond current standards in an attempt to identify future trends, based on recent research work.

The need for ventilation

The primary reason for ventilation is to provide an indoor air quality that contributes towards a safe and effective internal environment by controlling airborne contaminants – both internally and externally derived – as well as temperature and humidity, and by promoting air movement. In general, in commercial buildings it is likely the ventilation will predominantly have to influence the elements listed in Table 1 (overleaf).

The World Health Organisation (WHO) has extensive coverage and information on internal and external pollutants, downloadable from **www.who.int/phe/health_topics/outdoorair/en/**

Even before ventilation designs are considered and developed, the sources of contaminant should be considered carefully to see if the emission rates might be effectively reduced – or negated – through alternative building materials or application, or by the use of localised extract systems.

Basic modelling of indoor contaminant concentration

When contaminants are being produced in a room, a relatively simple decay equation can provide a basic model to establish the average levels across the space.

$$C_{Pt} = ((C_{PO} + [10^6 \times P/Q]) \times (1-e^{-nt})) + (C_{Pi} \times e^{-nt})$$

where C_P is the concentration of the contaminant (ppm), with suffixes t = after time t, i = initial (at time = 0), O = outdoor air.

P is the rate of release of contaminant (for example, in litres per second), Q is the outdoor air supply rate (in the same units as P – for example, litres per second), t is the time (for example, number of hours), and n is the room air change rate per unit time (for example, room volume in litres/Q x 3,600).

This may be used with any contaminant that is not significantly absorbed by the materials in the room to provide a snapshot of the levels at any time. Using a spreadsheet, this can be developed to consider intermittent – and varying – use. This method is employed by the IAQ section of the spreadsheet that accompanies CIBSE AM10 (available at **www.cibse.org/knowledge/design-tool-for-iaq-analysis**).

So, for example, using the above relationship for the office building shown in Figure 1, the CO_2 levels can be modelled for different scenarios to provide the levels as shown in Figure 2. This has assumed a production of 20 $l.h^{-1}$ CO_2 per person. The result indicates that the outdoor air rates of 8.5 and 10 $l \cdot s^{-1}$ per person can provide an indoor CO_2 level of around 1,000 ppm, and illustrates that, as ventilation rates increase beyond this, there are diminishing benefits of CO_2 reduction.

The reality of practical ventilation

Pragmatically, the design 'ventilation rate' is often selected so that it meets the requirements of the appropriate local legislation – providing more air will increase fan power and distribution costs. In England and Wales, approved document Part F[1] that, for example, stipulates a general (whole building) minimum ventilation rate of 10 $l \cdot s^{-1}$ per person for offices. That outdoor air supply

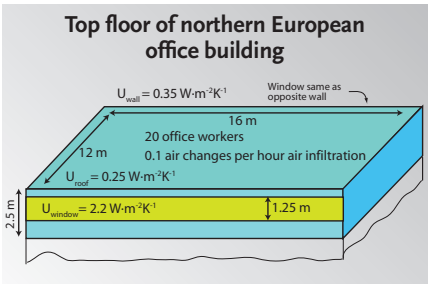
rate is based on controlling body odours, plus low levels of other pollutants. If there are significant sources of other pollutants, Part F suggests that the rate should be determined in line with the recommendations of CIBSE Guide A.[2] This provides recommended rates (Guide A, Table 1.5) for various applications and, in turn, also refers to the wide-ranging set of recommendations in CIBSE Guide B (section 2.3).

The value of 10 $l \cdot s^{-1}$ per person is broadly the value that is recommended by a number of standards, whether directly – (as in Part F) or through a combination of a fresh air requirement per person, plus an allowance based on the floor area and ventilation effectiveness. For example, applying ASHRAE Standard 62.1 2013[3] provides a basic combined office fresh air supply rate of 8.5 $l \cdot s^{-1}$ per person. As shown in the example above, this is the rate that will typically keep internal CO_2 levels at around 1,000 ppm.

So no need to look further?

With a reasonable consensus across global standards, is there any reason the outdoor ventilation rate should be higher than 8.5 $l \cdot s^{-1}$ to 10 $l \cdot s^{-1}$? CO_2 levels have often been used as a proxy to indirectly assess the quality of air in an occupied space, with 1,000 ppm being the traditionally-accepted limit. However, research is increasingly linking such CO_2 levels with less than ideal occupant performance. Satish[4] reported that in experimental studies at 1,000 ppm CO_2, compared with 600 ppm, performance was significantly diminished on two-thirds of the decision-making tasks tested. And at 2,500 ppm CO_2, compared with 600 ppm, performance was significantly reduced in more than 75% of the decision-making tasks –with some decreasing to levels associated with dysfunctional performance.

There has been much recent research into the effectiveness of increased fresh air ventilation rates. For example, in 2011 William Fisk[5] undertook a comprehensive review of the benefits of altering ventilation rates in US offices. He determined that increasing the rates to significantly above 10 $l \cdot s^{-1}$ per person would be economically beneficial, while also providing enhanced internal environmental quality. By considering previous studies of absenteeism, occupant performance and energy costs in offices – and allowing for additional capital costs that, in many cases, were likely to be small – he was able to show that by increasing the ventilation rate from the commonly-prevailing 8 $l \cdot s^{-1}$ per person to 15 $l \cdot s^{-1}$ per person, the US economy could save US$37.5bn dollars (£24bn) per annum.



Window area = 32 x 1.25 = 40 m²
Wall area = (12 + 16 +12 + 16) x 2.5 – (40 m²) = 100 m²
Roof area = 12 x 16 = 192 m²
Fabric conduction heat flow coefficient =
(40 x 2.2) + (100 x 0.35) + (192 x 0.25) = 171 W.k⁻¹
Infiltration heat flow coefficient = 0.33 x 0.1 air change per hour x 480 m³ = 16 W.k⁻¹

Figure 1: Simplified example of top floor office

Substance	Source
Carbon monoxide (CO)	Produced by the incomplete combustion of fuels
Nitrogen oxides (N_x)	From combustion and vehicles, react together with hydrocarbons, to produce nitrates and, with the assistance of sunlight, ozone
Sulphur dioxide (SO_2)	Produced in industrial and combustion processes
Polycyclic aromatic hydrocarbons (PAH)	Compounds containing just carbon and hydrogen released from burning of fossil fuel and biomass for both room heating and cooking
Radon (Rn)	Occurs naturally, especially in areas with granite
Volatile organic compounds (VOCs)	Compounds that have a carbon (organic) basis and evaporate readily. Sometimes odourless – all can be harmful
Mould and fungal spores	Moulds/funguses produce tiny spores that are carried in air
Viruses and bacteria	Bacteria is carried by people, animals, and soil and plant debris. Viruses are transmitted through the air
Carbon dioxide (CO_2)	Produced when any carbon-based material is burned, and via human and animal respiration
Ozone (O_3)	Internal sources associated with photocopiers and laser printers. Ozone levels rise in hot weather as more sunlight allows O_3-forming chemical reactions to occur more rapidly, while plants absorb less ozone at higher temperatures
Particulate matter	Created from many internal and external actions/processes, both naturally and anthropogenically
Water vapour	From people, processes and ventilation air

Table 1: A sample of the airborne contaminants that will affect the IAQ

Savings of a similar magnitude were predicted if basic ventilation rates were unchanged but heat recovery devices (for example, plate heat exchangers) were added to the systems and the fresh air rate allowed to rise when the heat recovery device enabled it to do so – without increasing heating/cooling costs.

Very recent laboratory studies reported by Maddalena[6] – using students in a test cell reminiscent of Fanger's original lab work that underpins the current international standards for comfort – indicate a statistically significant relationship between the improving decision-making performance of building occupants and increasing (per person) outdoor ventilation rates. Interestingly, the benefit goes beyond what the test subjects were able to record in terms of their perception of air quality (that is, predominantly odours). Although, at the increasingly higher outdoor ventilation rates the occupants could not sense any improvement in air quality, their decision-making powers were improved. Further studies are considering this is in greater detail.

While increasing outdoor airflow rates, the amount of particulate matter externally present – and other outdoor contaminants – will also increase. This may require some careful consideration of the filtration requirements. For example, recent work by Conson[7] showed that when outdoor air has extreme particulate concentrations of 200 $\mu g \cdot m^{-3}$ (this compares with average daily World Health Organisation (WHO)[8] maximum average daily recommendation of 25 $\mu g \cdot m^{-3}$), higher-efficiency filters (around 80%) are needed, which will increase the fan-operating energy. Another option would be to accept an increase of internal CO_2 by reducing fresh air.

Importantly, the movement of the air itself will affect the quality of the internal environmental space. Pasut[9] has recently published a paper that examined the opportunities to improve occupant comfort by increasing the velocity of the air across the body (not necessarily fresh air). Current CIBSE Guide A (Section 1.3) guidance is that, generally, air velocities greater than about 0.3 $m \cdot s^{-1}$ are unacceptable. However, this research indicated that a velocity between 0.8 and 0.9 $m \cdot s^{-1}$ has a positive – and statistically significant – effect on users' thermal comfort and thermal sensation when cooling was needed.

And, in a similar way to the increased fresh air proportions discussed earlier, air quality acceptability was improved by the air movement – even if the amount of air movement is not enough to alter

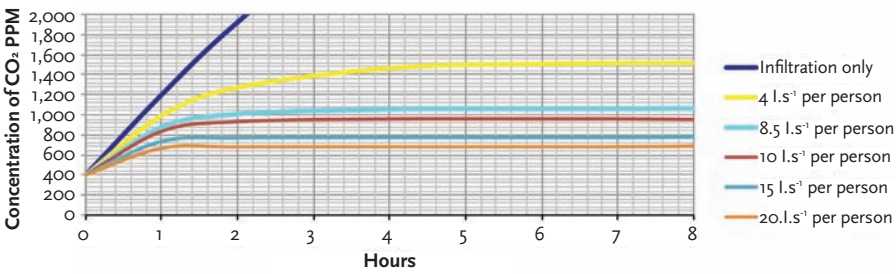


Figure 2: Average room CO_2 levels at various fresh air supply rates for example office with 20 people

noticeably an individual's thermal comfort and thermal sensation. In the experiments, ceiling-mounted 'propellor' fans were used to determine the effect of the higher velocities, finding that an air velocity of 0.9 $m \cdot s^{-1}$ directed on a subject's face did not cause any dry-eye discomfort. So, in times of high outdoor pollution, could there be opportunity to compensate – in comfort terms – for lower fresh air proportions with increased local air velocities?

Delivering the mechanical ventilation

The fresh air supply system (often referred to as 'DOAS' in the US) ideally should be able to respond to the varying ventilation demands of the occupied space, to ensure economical operation.

One of the advantages of decoupling the ventilation from being the principal heating/cooling device is that the flowrate may be altered to satisfy the required fresh air rate at all times. This could be modulated by CO_2 or mixed-gas sensors, or step-changed with the input of movement or counting sensors, or simply with time clock control; typically, the supply and extract fan speeds are varied by inverter controllers. If a room has a specific contaminant emission, the concentration of this can be used as the control input. To give an idea of how future guidance may move, a proposed addendum[10] to the ASHRAE Standard 62.1 is suggesting the outdoor ventilation rate may be reduced (controlled by occupancy sensors) to approximately 20%[11], based on a fresh air supply rate determined from the unoccupied floor area, compared with the normal fully-occupied rate.

Considering the office in Figure 1, the winter steady state heat loss may be evaluated readily using the fabric and infiltration heat flow coefficients.[12] At an internal temperature of 20°C, the heat loss at an outdoor temperature of -4°C would be $(171\ W \cdot K^{-1} + 16\ W \cdot K^{-1}) \times (20°C - -4°C) = 4{,}488$ W. During periods of occupancy, the heat losses will be offset by the occupant, casual and potential solar gains. In this example, it would not be unreasonable to expect equipment gains of 75 W per person, 60 W per person metabolic sensible heat gain, and lighting gain of $9\ W \cdot m^{-2}$ and, assuming overcast skies, very little solar gain. For the whole fully-occupied office, this would be $20 \times (75\ W + 60\ W) + (192\ m^2 \times 9\ W \cdot m^{-2}) = 2{,}700 + 17{,}28 = 4{,}428$ W internal gains.

This indicates that, when occupied, the internal space is unlikely to require significant heating, and for most of the year, it will require cooling, even when the outside temperature is below freezing.

However, this does not mean that un-tempered outdoor air should be supplied directly into the space – if it is more than 10 K cooler than the room[13], it is likely to create downdraughts. The ventilation system should be able to heat the air to a temperature that prevents downdraughts. A heat recovery device (HRD) with an integral bypass should be able to satisfy the majority of the fresh air heating requirement.

A unit such as that shown in Figure 3 employs a plate heat exchanger for the HRD that allows both sensible and latent heat transfer – this can be particularly useful in winter, when incoming air has a low moisture content. (In some cases, there may be a need for additional humidification.)

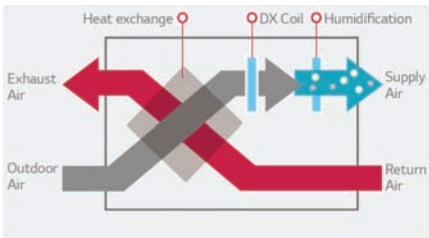


Figure 3: A compact ventilation unit with HRD (including bypass), DX cooling, heating and humidification

In mid-season, such a unit can provide 'free cooling', by bypassing the HRD and supplying air up to the maximum available flowrate that does not cause excessive noise or air movement. When the outdoor temperature rises above a point where useful cooling is being supplied by the ventilation air, the flowrate would be controlled back to the minimum required to meet IAQ needs, the HRD bypass would close, and the air – cooled and dehumidified as needed – supplied to the room.

Conclusion

Ventilation is essential to wellbeing but, without careful consideration, the functional purpose of the ventilation and the need to properly control the system might be forgotten and lead to excessive energy costs and potentially severe impacts on occupant comfort and productivity.

References:

1 *Approved Document F: Ventilation*, NBS, 2010.

2 CIBSE Guide A, Chapter 1, CIBSE 2006.

3 ASHRAE Standard 62.1 2013, **https://ashrae.iwrapper.com/ViewOnline/Standard_62.1-2013**, accessed 1 September 2014.

4 Satish, U., et al, *Is CO2 an indoor pollutant? Direct effects of low-to-moderate CO2 concentrations on human decision-making performance*, LBNL 2012.

5 Fisk, W., et al, *Changing ventilation rates in U.S. offices: implications for health, work performance, energy, and associated economics*, Building and Environment (2011). **http://dx.doi.org/10.1016/j.buildenv.2011.07.001**

6 Maddalena, R., et al, *Impact of independently controlling ventilation rate per person and ventilation rate per floor area on perceived air quality, sick building symptoms and decision making*, Lawrence Berkeley National Laboratory, October 2013.

7 Conson, K.H., et al, *Influence of mechanical ventilation system on indoor carbon dioxide and particulate matter concentration*, Hong Kong University, Building and Environment issue 76 (2014).

8 WHO (World Health Organization), *WHO air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulphur dioxide: global update 2005*, WHO Press, 2006.

9 Pasut, W., et al, *Enabling energy-efficient approaches to thermal comfort using room air motion*, Center for the Built Environment, University of California, Berkeley, presented at Clima 2013, **http://escholarship.org/uc/item/4488d1b8**

10 Proposed addendum b to standard 62.1-2013, *Ventilation for acceptable indoor air quality*, First Public Review, August 2014.

11 Based on each office worker normally occupy 20 m², as per the assumptions in ASHRAE Standard 62.1 2013. ww.

12 CIBSE Guide A, Section 5.6.2, 2006.

13 CIBSE Guide B, Section 4.3.2.4, 2001.

Turn over page to complete module

Module 69

October 2014

LG Life's Good

1. From the example, what would the room CO_2 content be after eight hours with a fresh air ventilation rate of 15 $l.s^{-1}$?

- ☐ A 400 ppm
- ☐ B 600 ppm
- ☐ C 800 ppm
- ☐ D 1,000 ppm
- ☐ E 1,200 ppm

2. In the research cited in the article, by how much was decision-making performance significantly reduced at room CO_2 levels of 2,500 ppm, compared with at 600 ppm?

- ☐ A 10%
- ☐ B 25%
- ☐ C 50%
- ☐ D 75%
- ☐ E 90%

3. In the proposed addendum to ASHRAE standard 62.1, by how much is it suggesting that outdoor ventilation rate may be reduced to, approximately, when a normally-occupied office is empty?

- ☐ A 10% of normally-occupied rates
- ☐ B 20% of normally-occupied rates
- ☐ C 30% of normally-occupied rates
- ☐ D 40% of normally-occupied rates
- ☐ E 50% of normally-occupied rates

4. What should happen to a ventilation unit with a HRD complete with bypass when the outdoor temperature rises above a point where useful cooling is being supplied by the ventilation air?

- ☐ A The HRD bypass would close and the fresh air supply rate would be set to the minimum rate to meet IAQ requirements
- ☐ B The HRD bypass would open to bypass the HRD and the fresh air supply rate would be set to maximum
- ☐ C The HRD bypass would open to bypass the HRD and the fresh air supply rate would be set to minimum fresh air requirement
- ☐ D The HRD bypass would close and the fan speed would go to maximum
- ☐ E The HRD bypass would close and the humidifier would switch on to maintain minimum room humidity

5. Approximately how cool can supply air be before there is significant risk of downdraughts?

- ☐ A 2K cooler than the room
- ☐ B 4K cooler than the room
- ☐ C 6K cooler than the room
- ☐ D 8K cooler than the room
- ☐ E 10K cooler than the room

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Glasgow and Grundfos keep up the pace

With significant medal hauls for all the home nations – and huge television audiences – it is acknowledged that Glasgow hosted a very successful Commonwealth Games this summer. Along with the medal-winning stars, many of the venues – including the Sir Chris Hoy Velodrome and the Emirates Arena, which hosted the cycling and badminton respectively – also basked in the spotlight. The wide range of energy-efficient pump solutions supplied by Grundfos delivered all of the HVAC needs to these venues, as well as ensuring that the all-water boosting requirements were met. Grundfos also supplied the fire-suppression system that will continue to keep these venues safe and secure for future generations of athletes who will pass through these sporting portals. Clever engineering – and the integration of hydraulics – mean the Emirates Arena can be transformed into a 200-metre, six-lane athletics track, as well as hosting badminton, netball and basketball fixtures.

● **Call 01525 850 000, email grundfosuk@grundfos.com or visit www.grundfos.co.uk**

Titan Products' TPZ-NET wireless CO_2 range expands further

The wireless CO_2 sensors launched by Titan Products include the TPZCO_2T/L, which adds LED indication for CO_2 to a battery life of up to three years. The CO_2 sensor is wireless and battery driven, so requires no wiring for power, or for the signal to controllers. The TPZCO_2T/L will monitor CO_2 and temperature, and transmit values to the Titan TPZ-COORD coordinator via Zigbee communications.

● **Call 0161 406 6480, email admin@titanproducts.com or visit www.titanproducts.com**

LG VRF at Aztec West in Bristol

LG's Multi V Heat Recovery VRF system has been chosen for the refurbishment of a 20,000ft², two-storey, glass-fronted office building – 710 Aztec West, in Bristol. The replacement air conditioning system has been designed and specified by Consultant Engineers Wye Solutions. LG's Multi V system met the tight performance specifications and the flexibility requirements, and had the advanced system controls. Multi V offers high efficiency and zoned temperature control, thus offering savings on utility bills, and on time and cost of installation.

● **Visit www.partner.lge.com/uk or follow @LGUK_B2B**

Monodraught appoint managing director

Monodraught is pleased to announce the appointment – as of 1 August – of Andrew McCubbin as its new managing director. He succeeds Steen Hagelskjaer, who will become chairman of the board of directors. During the past 20 years, McCubbin has held a number of senior management roles with Japanese air conditioning manufacturers, most recently at Daikin UK, and brings with him extensive industry experience in sales, marketing, product development and production.

● **Call 01494 897700, email melissa.vanegas@monodraught.com or visit www.monodraught.com**

ABEC is first choice for Imperial College London

Automated Building & Energy Controls (ABEC) has secured a building management system (BMS) maintenance contract at Imperial College London. The contract will last for five years, with a possible two-year extension, and covers the college's entire property estate. ABEC's high level of service, qualified engineers, and impressive infrastructure were the winning criteria for the tender agreement. ABEC won the contract based on its practical, cost-effective solution, and forward thinking ensured the company was able to deliver the optimum outcome for the college.

● **Call 01684 853780, visit www.abec.co.uk or follow @ABEC_UK**

New Stokvis interface units at Homes Exhibition

Stokvis Energy Systems will showcase a new approach to district heating on Stand H56 at the Homes 2014 exhibition, at Olympia, on 26 and 27 November. Stokvis will show its new Econoplate 'H' Series interface unit that has been developed in response to the growth in district heating schemes and centralised/satellite plantrooms. The system allows simple, effective and flexible integration of low- to zero-carbon technology at the central plantroom, and overall energy efficiency is increased.

● **Call 020 8783 3050 or visit www.stokvisboilers.com**

Take control of limescale prevention with the new, improved KalGUARD

Sentinel Commercial's scientifically proven solution to protecting commercial hot water systems from limescale, KalGUARD, has recently undergone a programme of development, making it easier to install and operate. This innovative, cost-effective device uses electrolytic technology recommended by the Compliance Guide to Part L permanently to prevent limescale build-up, and boasts significant cost, energy and water savings over other limescale solutions. As a result, KalGUARD is already installed in thousands of commercial facilities across the UK.

● **Call 01928 588330 or visit www.sentinelprotects.com**

Sustainable heating system for ethical hotel

Elco UK, formerly MHS Boilers, has supplied two gas-fired GB6-12 ENERGATOR CHP units, two 145kW THISION L wall-mounted boilers, and three INOX-MAXI single-coil cylinders to the new Qbic Hotel, in Whitechapel, London. The installation was part of the refurbishment of an office building, incorporating renewable energies to achieve a 'Very Good' BREEAM rating. The hotel's concept is created around the Cubi: a prefabricated room that arrives flat-packed from China, and which can be assembled in a day.

● **Visit www.elco.co.uk**

Joe Rose steps into new role at Big Foot Systems

Sussex-based firm Big Foot Systems, which leads the way in non-penetrative rooftop support solutions, is delighted to announce the appointment of Joe Rose as technical marketing manager. Rose has been with Big Foot for three and a half years, and was previously regional specification manager at Big Foot Systems, London & South East. In this role, he provided support solutions for plant and associated services on flat roofs, working with construction professionals – from architects to contractors – along the supply chain. Joe's new role will involve managing all the technical and marketing functions of Big Foot Systems, providing solutions for its customers throughout the world.

● **Call 01323 844355 or email enquiry@bigfootsupport.com**

Baxi Commercial expands sales team

Baxi Commercial has appointed three new area sales managers – Christine Thorne, Paul Hawkins (pictured), and Russell Barker. Thorne, who has worked in the plumbing and heating sector for nearly 30 years, will be responsible for the M40 and north London areas. Hawkins, who started in the industry as an apprentice plumbing and heating engineer, will look after the company's sales in the north east of England, while Barker – who has been involved in the industry since 1983 – will cover the East Midlands and Warwickshire areas.

● **Visit www.baxicommercial.co.uk**

New low-profile radio data loggers

Gemini Data Loggers is expanding its range of radio data loggers with its new Tinytag Ultra Radio units for monitoring temperature, humidity, voltage, current, and count. Their unobtrusive design makes them ideal for discreet indoor monitoring. Ultra Radio loggers monitoring different parameters can be combined in each system, and may also be mixed and matched with existing Tinytag Radio products. Environmental data is gathered automatically, and sent via a receiver for direct viewing on a PC, across a LAN, or remotely across the internet.

● **Call 01243 813000, email info@tinytag.info or visit www.tinytag.info**

NOx class 5 condensing boilers for refurbished care home

When the Avondale Mental Healthcare Centre, in Liverpool, was first built, it was fitted with Atlantic Boiler's world-leading 'Optimagaz' and 'Condensagaz' E Series gas-condensing boilers. The centre has just undergone a complete refurbishment, and two of these long-life boilers have been replaced with the latest technology: VF 100kW pre-mix, low-NO_x gas-condensing boilers – computer-controlled and programmed for continuous comfort and maximum economy. The advanced method of control allows the reduction in boilerplant and energy input.

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

Chris Bailie selected for WorldSkills 2015

Chris Bailie – of Toshiba Air Conditioning-accredited installer BL Refrigeration and Air Conditioning – has been selected for Squad UK to compete for a place in the refrigeration and air conditioning section of the WorldSkills championships, in São Paulo, Brazil, next year.

WorldSkills drives excellence in the workplace, and holds the largest skills competition in the world every two years. More than 1,000 young people – aged between 18 and 25 – from more than 60 countries will gather in São Paulo in August 2015.

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

Kingspan Koolduct for UK's largest Passivhaus residential development

Chester Balmore, situated in the leafy streets of Highgate, in north London, is to date, the UK's largest residential scheme designed to meet the demanding Passivhaus Standard. It is also the latest project to benefit from the premium performance Kingspan KoolDuct System. The 53 units are being built as part of Camden's Community Investment Programme, which invests in homes, schools, and community facilities. Designed and built to keep energy consumption to a minimum, these ultra-modern homes enable occupants to reduce their energy bills without compromising on the comfort expected at home.

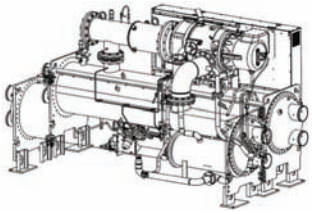
● **Call +44 (0) 1544 387 384, email presentations@kingspaninsulation.co.uk or literature@kingspaninsulation.co.uk, or visit www.kingspaninsulation.co.uk**

Advanced pressurisation unit

Arrow Valves' Midi-Fill Digital, compact, wall-mounted pressurisation unit – offering Fluid Category 5 backflow protection – is designed for the idling and top-up of non-house heating or chilled systems. The Midi-Fill Digital has been designed to comply with the Water Regulations, and features a lockable digital display – for ease of use of setting controls – as well as self-test monitoring, an anti-seize pump and daily pump pulse. Comprehensive BMS controls report faults before heating-system shutdown and excess water usage.

● **Call 01442 823123, email info@arrowvalves.co.uk or visit www.arrowvalves.co.uk**

Carrier launches award-winning chiller technology in UK



Carrier has launched its water-cooled, variable-speed, screw chiller line – the AquaEdge 23XRV series, with Greenspeed intelligence – in the UK. This tri-rotor, screw-compressor chiller complements and enhances the existing 30XWV AquaForce range of twin-screw compressor units. The two technologies give clients the widest range available for this product segment. The 23XRV range – formerly known as the 'Evergreen' chiller – has won many awards around the world, and has been improved for its UK launch.

● **Visit www.carrierrentalsystem.co.uk**

Frese UK announces major partnership with heat exchanger firm Swep

Frese UK has entered a value-added reseller partnership with Swep, after working with the firm on the development of the Frese Conheat Heat Interface Unit. Swep and Frese will work closely to develop specification and sales of the Swep brazed plate heat exchangers in the HVAC sector in the UK. 'Swep – like Frese – is an industry leader, and – as the need for more efficient delivery of climate control and hot water grows – we can offer the best product on the market,' said Frese UK managing director Stephen Hart (pictured).

● **Call 01704 896012 or email info@frese.co.uk**

Swimming pool air handling units – creating a good climate

Menerga, in the UK, has recently joined the Systemair group. Menerga specialises in low-energy, high-heat recovery ventilation for swimming pool halls and large spaces with high outside-air requirements. Menerga – with more than 30 years of expertise – remains a strong brand within Systemair, and offers a complete range of swimming pool units, for everything from domestic pools to large indoor water parks. This year saw the launch of enhanced, indirect adiabatic cooling with the highest achievable heat and cool recovery systems in large-scale, full-counterflow recuperators.

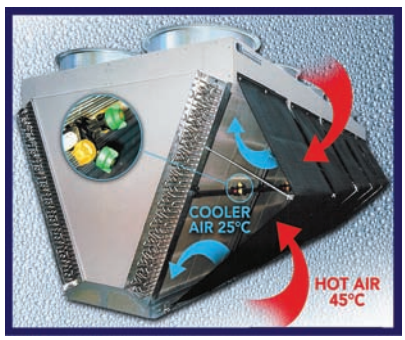
● **Call 01926 621770 or visit www.menerga.co.uk**

menerga
a systemair company

Adiabatic air inlet cooling

EcoMESH is a unique, mesh and water-spray system that improves the performance of air cooled chillers, dry coolers and refrigeration plants, while reducing the energy consumption by up to 44%. EcoMESH has been fitted to troublesome units worldwide, where its patented water-spray technology eliminates problems and, once fitted, is virtually maintenance-free. It can be retrofitted to any model, make or size of air conditioning and refrigeration unit.

● **Call 01733 244224 or visit www.ecomesh.eu**



Telephone: 020 7880 7633 **Email:** damola.sowole@redactive.co.uk

Remeha boilers: a degree above the rest

Six Remeha Quinta Eco Plus 115 passive flue gas heat recovery systems are providing energy-saving comfort and warmth throughout Talybont Gate, Cardiff University's new, flagship 179-bed student accommodation. Nigel Griffin, project engineer at Cardiff University, specified the Quinta Eco Plus systems 'as an affordable, quality solution to provide reliable, low-carbon, energy-efficient heating and hot water with a rapid recovery time and good financial payback.' Installed by M&E contractor Lorne Stewart, the recovered energy (up to 15% of the gross input) is used to pre-heat the two 2,000-litre cylinders that supply domestic hot water to the 179 en-suite bathrooms.

● **Call 0118 978 3434, email boilers@remeha.co.uk or visit www.remeha.co.uk**

Save on travel with Hitachi Air Conditioning Europe

To coincide with the introduction of its new high-efficiency Set Free FSXN1E model – to an already impressive product line-up – Hitachi Air Conditioning Europe SAS has launched an exciting customer VRF promotion. Buy any product from Hitachi's Set Free VRF range between 1 September 2014 and 31 March 2015 to earn fuel or travel vouchers relative in value to the size of units purchased. For example, a 4HP unit is worth £40, a 10HP unit £100 and an 18HP unit £180.

● **Call 01628 585 394 or visit www.hitachiaircon.com**

Harmer SML offers first-class solution at Stansted Airport

London Stansted Airport is the latest in a long line of prestigious installations of the Harmer SML lightweight cast-iron soil and waste system from Alumasc. Harmer's SML is a dry-jointed pipework system, which was fitted as part of an £80 m investment programme that included improvements to public facilities in the terminal building. Other upgrades on the site, owned by the Manchester Airports Group, include a greater choice of shops, bars and restaurants, as well as a 70% increase in seating capacity.

● **Visit www.harmerdrainage.co.uk**

Torin-Sifan Joins Evia

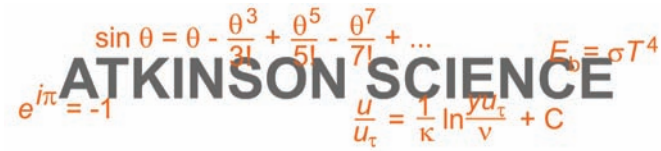
UK-based Torin-Sifan has announced that its application for membership of the European Ventilation Industry Association (Evia) has been successful. A leading manufacturer and supplier of motors, motorised impellers, fans and blowers, Torin-Sifan's membership of Evia heralds its continued growth in the European HVAC market. Evia represents the European ventilation industry, and aims to promote energy efficient ventilation applications across Europe. It also highlights the significant impact good indoor air quality has on health and comfort, says Paul Kilburn, commercial director, Torin-Sifan (pictured).

● **Call 01793 524291 or visit www.torin-sifan.com**

New Ecodan model from Mitsubishi Electric

Mitsubishi Electric has launched a new 11.2kW Ecodan air source heat pump to join its existing three monobloc models. The line-up for the self-contained outdoor units now boasts 5kW, 8.5kW, 11.2kW and 14kW models to make Ecodan suitable for almost any situation. 'This new model slots nicely into the range, to ensure we can deliver renewable Ecodan heating to almost any home in the country,' says John Kellett, general manager of the company's heating systems.

● **Visit http://www.mitsubishielectric.co.uk**



Simulation of fluid flow and design of scientific software

Atkinson Science uses use market-leading CFD software to simulate fluid flows in building services and construction. If you need verification of your HVAC design, or fault-finding in an existing system, the company creates software tools that exploit the latest scientific research. Likewise, contact Atkinson Science if you need a Windows or Web application to increase your productivity, or give you a competitive advantage.

● **Call 01256 766090, email keith.atkinson@atkinsonscience.co.uk or visit www.atkinsonscience.co.uk**

New compact RCBOs from Havells

Havells has launched its new range of compact RCBOs. Designed to maximise wiring and termination space in distribution boards, the new range is an impressive 25mm shorter than a standard RCBO, and offers fully electronic performance for speedy installation and testing. The new compact RCBOs are part of the Havells Powersafe range of industrial circuit protection and control products. The 17th Edition Wiring regulations, BS7671, continues to drive increased awareness of the importance of protection from electric shock through the use of RCD technology.

● **Call 020 7011 9794 or email gavin.williams@havells.com**

London Calling for Assa Abloy Security Doors

Assa Abloy Security Doors has designed, manufactured and installed a range of high-performance security doors for multiple specification projects across London. From the installation of innovative fire doorsets in the Shard, to supplying the London Underground's Bond Street tube station with its specialist steel doorsets, the company has proved its ability to specify high-profile projects. Working with some of the most respected contractors in the industry, Assa Abloy Security Doors has utilised its value-added service and consultancy skills for a range of specification projects.

● **Visit www.assaabloy.co.uk/securitysolutions or follow @assaabloyukltd**

New appointment for Alumasc

Alumasc Rainwater and Harmer Drainage has appointed a new managing director, Steve Durdant-Hollamby. He has joined from ACO Technologies, after a 25-year career in the construction industry. Durdant-Hollamby has experience in distribution markets, the merchant sector, and product knowledge in the rainwater and drainage industry. He said: 'I am looking forward to joining a very well-established and well-respected team. Together we will continue to drive the brands forward, encompassing greater market penetration and product development for the UK and export markets.'

● **Visit www.alumascrainwater.co.uk**

Vent-Axia's Kitchen Box Fan shortlisted in Energy Awards

Innovative British ventilation manufacturer Vent-Axia is delighted to announce that its Lo-Carbon EKF Kitchen Box Fan has been shortlisted in the Energy Efficient Product of the Year HVAC&R category, at the Energy Awards 2014. The event, which recognises and rewards companies leading the way in reducing carbon emissions, takes place on 2 December, at the London Hilton, on Park Lane. The Energy Awards will bring together key personnel from across the industry, to reflect on the major success stories during 2014.

● **Call 0844 856 0590 or visit www.vent-axia.com**

New evaporative humidifier Condair ME

JS Humidifiers is launching the Condair ME evaporative humidifier, offering low-energy humidification and evaporative cooling to an air handling unit or duct. Its innovative and patented features position it as the leading humidifier of its type. A unit can deliver up to 1,000kg/hr of moisture, and 630kW of evaporative cooling, to an air stream, while operating on less than 0.3kW of electricity. The Condair ME consists of an evaporative module located inside the AHU, a patented self-contained hydraulic unit, and a touchscreen control panel.

● **Call 01903 850200 or email dmarshallgeorge@jshumidifiers.com**

PCM offers thermal solution

Phase Change Materials (PCMs) are ideal products for thermal management solutions. This is because they store and release thermal energy during the process of melting and freezing, in the same way an ice cube maintains a prolonged cooling effect in a glass of water. This very simple concept enables a bridging of the gap between energy requirement and energy use. When applied correctly, PCMs can offer free cooling, increased efficiency, and lower system-running costs. PCMs between 8°C and 20°C can be simply charged using a free cooler overnight, without the use of a chiller, and later the stored free energy can be used to handle the daytime sensible building loads.

● **Call 01733 245511, email info@pcmproducts.net or visit www.pcmproducts.net**

New Bristol base for Mitsubishi Electric

Mitsubishi Electric's operations have grown so much in the south west region that the company is expanding into new offices in Bristol's northern business district. Vantage Court is within easy reach of the M4, M32 and M5 motorways. The newly built, self-contained premises offer flexible office space, training facilities, meeting rooms, and ample parking, enabling the company to better serve its customers across the region. 'In response to the strong business development in the south west, we needed a space that offered flexibility and the opportunity for continuous growth,' said territory manager Steve Reece.

● **Call 01454 202 050**

Telephone: 020 7880 7633 **Email:** damola.sowole@redactive.co.uk

Transportable MRI scanner equipped with high-tech Toshiba air conditioning solution

A bespoke Toshiba air conditioning system is being used to cool a state-of-the-art transportable MRI scanner – the first of its kind to be developed by Toshiba Medical Systems. The transportable facility enables high-resolution scans of either individual limbs or the whole body, to be carried out on location. Vital cooling for the diagnostic unit has been provided by Just Air Conditioning, working with Toshiba distributor AMP.

● **Visit www.toshiba-medical.co.jp/tmd/english**

Bottisham Village College uses Mikrofill

Bottisham Village College first opened its doors in 1937, with a vision to provide good-quality education for local children by day, and adults by night. The Cambridgeshire school has recently benefited from two Mikrofill condensing boiler packages to serve part of the main school and the sports hall/swimming pool area. Mikrofill supplied numerous Ethos 70kW and 130kW wall-mounted boilers complete with cascade control systems, low-loss headers – including air/dirt separation – and pressurisation packages.

● **Call 03452 606020 or visit mikrofill.com**

'Powerful' Marshall-Tufflex product mix for hospital improvements

Marshall-Tufflex's triple product mix of all-curved Odyssey trunking, DDA-compliant blue accessory boxes, and free-standing Powerpoles, proved to be a powerful team for the £500,000 refurbishment of a Norfolk hospital department. The James Paget University Hospital, in Great Yarmouth – which provides acute care services, and trains medical students – required a combination of cable-management solutions for the upgrade to its pathology department. It involved the complete gutting and refitting of the laboratory, ancillary rooms and plantroom.

● **Visit www.marshalltufflexenergy.com**

Svantek offers 24-hour noise and vibration monitoring

When 24-hour, real-time measurement of noise and vibration levels was required by McLaughlin & Harvey – one of the UK's leading construction companies – for a building project at King's College Hospital, three SV212 portable environmental vibration and sound monitoring stations, from Svantek, were considered the best solution for the job. The Svantek SV212 stations were chosen because they were the most competitive, efficient and accurate way of monitoring noise and vibration on site. McLaughlin & Harvey also liked their robust, compact design.

● **Call 01296 682040 or visit www.svantek.co.uk**

Ideal Commercial boilers chosen by Town & Country

Four 150kW Evomax boilers, and a Frame and Header Kit, from Ideal Commercial Boilers, have been installed as part of a refurbishment project at Monson House, Kent, the head office for housing association Town & Country Housing. Selected for their compact size, ease of installation and high efficiency, the Evomax boilers are also extremely straightforward to operate, ensuring optimised heating control within the building. Town & Country Housing provides more than 9,000 affordable homes, in 22 local authority areas.

● **Call 01482 492251, email commercial@idealheating.com or visit www.idealcommercialheating.com**

Biomass system design, training, and diagnostics

David Palmer, of the Campbell Palmer Partnership (CPp), is the principal author of *CIBSE AM15: Biomass Heating*, published this month. CPp is a specialist designer of biomass systems, small-scale biomass district heating, and heat-pump systems – all focusing on the effective use of a heat source, backed by thermal storage. Designs incorporate low flow temperature and high Delta-T loads whenever possible. CPp delivers CIBSE-accredited biomass training, and offers a diagnostic service for underperforming biomass systems.

● **Call 01360 312000 or email consultants@campbellpalmer.com**

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Panasonic launches Econavi sensor

Panasonic has launched its new Econavi sensor. Compatible with the PACi and ECOi ranges, the sensor detects human activity, and adjusts temperature by two degrees (up or down) to optimise comfort and efficiency. If there is no activity detected for a set time, the Econavi will stop the unit, or move to a new, previously set temperature. It modifies temperature output in real time depending on the needs of the room, and is compatible with cassette, wall-mounted, hideaway and ceiling systems.

Call 01344 853 182, email uk-aircon@eu.panasonic.com or visit www.aircon.panasonic.eu

Metsec makes cable management compliance easy

Metsec Cable Management makes IP4X-rated trunking systems attainable, with its new range of off-the-shelf clips. These provide the most robust cable-containment solution in line with the Wiring Regulations, without the need for bespoke parts or accessories. The clips are compatible with Metsec's standard trunking system, so ensure that a compliant solution to the ingress protection level of IP4X can be delivered at a standard lead time, reassuring M&E contractors.

Call 0121 601 6085, visit www.metsec.com or follow @MetsecPlc

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Sowing the seed to grow large energy savings

Powerstar has again emphasised its position as the global market leader for voltage optimisation, having successfully delivered annual savings of 14.1% for electricity – and more than 203 tonnes of carbon emissions – for manufacturing company Olam International. The firm – which operates in 65 countries, and supplies food and industrial raw materials to more than 13,600 customers worldwide – installed a Powerstar system at its facility in Goole, Lincolnshire. The company seeks to identify and implement energy-saving solutions, as it endeavours to contribute positively to social wellbeing.

Call 01142 576200 or visit www.powerstar.com

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We're looking for qualified engineer with experience in a similar role to lead our engineering strategy and programme plan. You'll play a critical part in developing our property portfolio by leading our in-house team of engineers to improve and modify buildings. You'll also lead on mechanical and electrical engineering resilience, maintenance and forward works planning. Your efforts will underpin our Corporate Real Estate (CRE) programme, ensure legal compliance and reduce our carbon footprint, as well as the financial impact of utilities. You'll be used to managing diverse teams, preparing client briefs and specifications, delivering projects and working with large multi-functional supply chain contracts.

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Acting as a Project Lead interface, this demanding role will take your engineering skills further. You'll deal with an external supply chain, providers and contractors to support mechanical and electrical engineering resilience, maintenance and forward works planning. You'll also help with the design evaluation of new developments and refurbishments, and drive environmental initiatives. You'll need a relevant Building Services/Engineering qualification and ideally experience of Energy Management systems and BMS. We'll also be looking for considerable engineering and facilities experience and an enthusiastic, determined approach.

To apply, please visit our website to download an information pack and application form.

Completed applications must be returned by 26 September 2014.

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Professional Support Services – Directorate of Estates and Facilities

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You will assist in the delivery of the University's mechanical strategic objectives associated with all project work including the Long Term Maintenance and Capital Projects, whilst developing outline design briefs to enable the commissioning of internal and external consultants, and set and maintain strict mechanical and low energy design parameters for all development work.

You will lead on ensuring compliance with legislation associated with mechanical services and energy including, but not exclusively, producing of DEC's, EPC's CRC and EUETS, whilst assisting in the delivery of an ongoing programme of mechanical and energy condition surveys.

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You will be able to demonstrate an established track record and experience in construction, engineering, and facilities management. You will hold or be working towards a current full membership of the Chartered Institute of Building Service Engineers Professional and hold, or be working towards, a full Chartered Member of the Engineering Council. You will hold an appropriate professional and academic qualification to degree level (or equivalent) in an engineering related discipline and possess substantial vocational experience.

You will also have experience of managing a multi-disciplinary team together with experience of managing and controlling budgets/resources/funding.

Informal enquiries can be made to Tony Small at antony.small@manchester.ac.uk or call 0161 275 4943.

Please apply at https://www.jobs.manchester.ac.uk/displayjob.aspx?jobid=8388

Closing date: 5 October 2014.

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Senior Electrical Engineer
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I am working alongside a world class multi-disciplinary engineering consultancy at the forefront of building services engineering. Their south west office has an outstanding Building Services group, and recent project examples include work aviation projects, major commercial and heritage projects in the Middle East, Premier League Football Stadia, as well as an ongoing portfolio of work in the local area. BAR 2156/JA

Senior Electrical Engineer
£45 - 50k + benefits, London

Working for a specialist consultancy and leading a team of engineers in specifying appropriate fire protection measures on iconic building projects you will report in to the board of Directors. With at least 6 years' experience working in a consultancy you will play a key role in the development of the company. Preferably Chartered or a member of the IFE and be proficient with fire / smoke / evacuation modelling. BAR2096/CB

Technical Associate
London, £55K - £60K + £5.5K Car + Healthcare

A top 5 Building Services consultancy are seeking 2 Technical Associates for key positions in the London team. You will be recognised at Associate level and be able to demonstrate extensive technical knowledge. You will be responsible for managing clients, developing relationships with external architects and contractors whilst consistently delivering design and consultancy services to a high level. This role will suit a degree qualified Chartered Engineer. BAR2167/CB

Public health Engineers (x5)
£40 p/h, Central London

Are you interested in working on a 5* Hotel Refurbishment on a 1 year contract with one of the top-10 Building services consultancies in the world? If you are keen to work on this project which requires a huge amount of attention from 5 Public Health engineers, you need to contact us ASAP. BAR2109/MA

Associate M&E Design Engineers
London, £72k + Benefits

Due to expansion, and the recent opening of a new Central London office, our client seeks additional Mechanical/Electrical resource to head their dynamic and hard-working teams. Successful candidates will be required to take a lead role on projects across a variety of market sectors. You should have 10 years previous Building Services design experience, and be comfortable in a client facing role. BAR1657/PA

Senior M&E Design Engineers
£30 - £37 p/h, Central London

We are working in partnership with one of the UK's largest M&E Consultancies in their search for a Senior M&E Design Engineer's for a minimum 6 month contract. To be considered for this role applicants must come from a building services background and have experience working on a mixture of Commercial, Residential or Healthcare projects. BAR 2094/WS

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Mechanical Design Engineer I Surrey or London I to £40LTD I ref: 6081
Prestigious M&E Consultant requires good Senior Mechanical Engineers for an initial 12 month contract. The role would entail working on major fit outs for a renowned banking group.

Electrical Design Engineer I London I to £45K + Bens I ref: 6270
Working within the heart of the design team you will work on projects including; signature high rise buildings, hospitals, airports and major international developments. Opportunities for career progression and Chartered status.

BREEAM Assessor I Various Locations I to £45K + Bens I ref: 6004
Exceptional opportunity to join one of the most diverse multi-disciplined consultancies as a BREEAM Assessor in their busy Energy and Renewables team. This role will involve advising clients and design teams on how to meet BREEAM requirements and monitoring projects. Competitive salary and benefits offered.

Associate Mechanical Engineer I London I to £65K + Bens I ref: 6171
A large multi-disciplined consultancy, have secured a major international project. They require an Associate Mechanical Engineer to supervise the detailed designs whilst maximising joint learning opportunities for the wider business. Excellent package and benefits.

Senior Electrical Engineer I London I to £40LTD I ref: 6256
Long term contract opportunity working on a confidential project in the Middle East. Ideally you will be Chartered, or working towards, and will have a track record of taking projects through to detailed design stage.

For further information or to find out about other positions Blueprint are recruiting for, please call one of our specialist M&E recruiters.

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East Sussex Healthcare NHS
NHS Trust

Estates and Facilities Team, East Sussex

Head of Estates and Facilities

Job Ref: 374-JA1037
Salary: Band 8d £65,922 - £81,618 pa Hours: f/t 37.5 pw

An exciting opportunity has arisen for an exceptional individual to work with an NHS Integrated Trust in East Sussex. As Head of Estates and Facilities, you'll direct strategic estate planning, estates and maintenance services, and execution of the Trust's Estates and Capital Projects functions.

To be successful, you'll be an effective and dynamic leader with exceptional organisational, decision-making and prioritisation skills. Your background will be in engineering, ideally with experience of NHS or other healthcare Estates and Facilities Management. You will be a chartered estates professional, with a professional qualification within an engineering/building discipline.

A relocation package is available to the successful candidate.

For further information or an informal discussion please contact Ian Humphries, Estates and Facilities Advisor on 01425 755470 ext. 8494 or Richard Sunley, Deputy Chief Executive/Chief Operating Officer on 01323 417400 ext. 8460.

Closing Date: 05 October 2014

Apply on-line: **www.esht.nhs.uk/recruitment**

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Senior Electrical Design Engineer
Singapore
S$120, 000 (£55, 000) + Benefits + Relocation
This UK owned building services consultancy has a team in Singapore, who are looking for a Senior Electrical Engineer. This team has an enviable reputation and are currently involved in some of the most exciting high-rise, leisure and large high-end residential complexes using pioneering sustainability and energy reduction techniques. This is a fantastic opportunity for a Chartered Electrical Engineer to get involved with projects which will help shape the industry in years to come.

Divisional Director
Southampton
£70,000 + Package + Bonus
A large engineering consultancy are looking to expand their building services team within their office in Southampton, by the strategic appointment of a Divisional Director. A fantastic opportunity to lead a focussed and committed team, and the role will offer full autonomy within an expanding multi – disciplined consultancy office.

M&E Technical Director
East Essex
£65,000 + Bonus + Benefits
A well-known multi – disciplined engineering consultancy are looking for a Technical Director to lead a team of M+E and Sustainability Consultants on projects in South- East England. This new building services team are going from strength to strength and now require a Director to spearhead this division where you will be given a free hand to grow the team as you see fit, and imprint your strong work ethic.

Associate Electrical Engineer/ Team Leader
Central London
£60,000 + Benefits + Bonus
This high profile, award winning architecturally and sustainability led practice are currently looking for an Associate level electrical engineer. You will head a small team of electrical engineers, working on a fantastic selection of pioneering projects within the residential, leisure and high-rise sector. This is a great opportunity to join this renowned consultancy who continue to expand, due to their recent award and project wins.

Senior Electrical Design Engineer
Cambridge
£45,000 + Benefits
A renowned building services consultancy, who have a famous project portfolio, working within the residential, leisure and retail developments are looking for a Senior Electrical Engineer to work in their Cambridge offices. This office is rapidly expanding and is looking for an engineer to join them and quickly get involved with the planning of the next expansion phase. This is a great opportunity to climb the promotional ladder quickly.

Revit MEP Manager
Central London
£50,000 + Benefits Package
Our client is looking for an experienced Revit MEP Manager to run a team based in London. The projects that you will be leading are some of the biggest and most publicised projects within the UK. Being one of the most prestigious and well-known consultancies in the UK this is an opportunity for a top Revit MEP Manager to move to the next level.

Senior Mechanical Design Engineer – 14 Months
City of London
£40 per hour Ltd
A Senior Electrical Design Engineer with over 4 years' experience at this level is required to join one of the UK's top 5 Building Services Consultancies. Projects to date include some of the most iconic places to visit in London, as well as the largest 5* Luxury Hotel in Shanghai. The next project will be one of the most prestigious to date.

Senior Electrical Design Engineer – Data Centre
North London
£40 - £45 per hour Ltd
The UK's leading Data Centre specialists are looking to add an experienced Electrical Design Engineer to their team. You will be working on the UK's largest data centre to date. Due to the size of the project this contract placement with a prestigious team will run for at least 18 months.

Associate Mechanical Design Engineer
Newcastle
£50,000 + Benefits
One of the largest building consultancies in the North East is looking for a talented and well –rounded Chartered Associate to lead a team of electrical engineers on fascinating, well publicised projects throughout the UK.

Find more jobs online at
conradconsulting.co.uk

For more information about any of these positions, please contact **george@conradconsulting.co.uk** or call **0203 1595 387**

For a confidential chat, call us 8am to 8pm on 0203 1595 387

Events & training

NATIONAL EVENTS AND CONFERENCES

Young Engineers Awards
9 October, London
The Graduate of the Year, and the Employer of the Year award winners are unveiled.
www.cibse.org/yea

SLL Masterclass series
23 October, Birmingham
The first in the new Society of Light and Lighting 2014-15 Masterclass series.
www.cibse.org/sll

Leadership in building performance
28 and 29 October, London
A major new conference and exhibition looking at efficient design, construction, maintenance, and operation of buildings.
www.cibse.org/conference

CIBSE GROUPS, REGIONS AND SOCIETIES

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

West Midlands Region: Lighting for residential buildings (LG9)
1 October, Birmingham
Rob Lancaster will present at an evening seminar.
www.cibse.org/events

Yorkshire Region: Intelligent buildings – an alternative approach to heating, ventilating and air conditioning?
7 October, Leeds
Dr Derek J Croome will present at a seminar on Intelligent buildings.
www.cibse.org/events

ANZ Region – New South Wales: Are you being certified?
7 October, Sydney
The latest monthly seminar arranged by the NSW chapter.
www.cibse.org/events

ANZ Region – Western Australia: Lighting – the art of visual design
7 October, Perth
The latest seminar arranged by the Western Australia chapter.
www.cibse.org/events

Integrated controls
7 October, Northampton
An East Midlands region evening event.
www.cibse.org/events

HCNW Region: The presidential debate
8 October, London
CIBSE President, Peter Kinsella, CIBSE president-elect, Nick Mead, and CIBSE immediate past president, George Adams, are welcomed for insightful debate.
www.cibse.org/events

ANZ Region – South Australia: Smoke control in atriums
9 October, Adelaide
The latest monthly seminar arranged by the South Australia chapter.
www.cibse.org/events

Pipe dreams or nightmares? Reducing the risk of water leaks in commercial buildings
9 October, London
A SoPHE event.
www.cibse.org/sophe

Urban landscapes/social nightscapes
13 October, London
A five-day workshop, supported by the Society of Light and Lighting, and organised by LSE's Configuring Light programme.
www.cibse.org/events

North East Region: Making buildings better – design from the operator perspective
14 October, Newcastle upon Tyne
Sue Gott, deputy chair, NE Region, of the British Institute of Facilities Management presents.
www.cibse.org/events

Can a 35% reduction in $C0_2$ emissions be achieved?
15 October, London
A CIBSE HCSE Region event, with a panel of specialists, including Murad Qureshi, London Assembly member, and Syed Ahmed, director of Energy London.
www.cibse.org/events

Merseyside & North Wales Region: Colour therapy
16 October, Merseyside
An evening seminar.
www.cibse.org/events

YEN NW – Whitecroft lighting tour
16 October, Ashton under Lyne
Tour of Whitecroft factory to demonstrate its latest technologies
www.cibse.org/events

West Midlands Region: Modulation CHP
20 October, Birmingham
An evening seminar, with Tej Uppal (SAV Systems) presenting.
www.cibse.org/events

HCNW Region: Membership briefing
20 October, London
Briefing that focuses on applications for the Associate and Member grades, and registration with the Engineering Council at Incorporated and Chartered Engineer levels.
www.cibse.org/briefings

HCNE Region: Remeha Fusion Hybrid – bridging the energy performance gap
28 October, Essex
Mike Hefford, of Remeha, will discuss hydraulic system design, and integration of LZC equipment, and compare air source heat pumps and gas absorption heat pumps.
www.cibse.org/events

Canada Chapter: Tour of PCL's modular construction yard
30 October, Toronto
A tour of PCL's prefabrication and modular construction facility, in Mississauga, followed by a Q&A.
www.cibse.org/events

Hong Kong Chapter: World workplace Asia 2014
30-31 October, Hong Kong
A two-day conference for facility practitioners worldwide, representing all aspects of the workplace environment.
www.cibse.org/events

CPD TRAINING

For more information, visit **www.cibse.org/mcc** or call **020 8772 3640**

Sanitary and rainwater design
1 October, London

HSE guidance on legionella control
1 October, London

Energy management system: IS050001 (ESOS compliant)
2 October, London

Gas safety regulations
3 October, London

Introduction to electrical services in buildings
3 October, London

Energy monitoring and targeting
7 October, London

Fire safety in purpose-built blocks of flats
8 October, London

Effective maintenance management
15 October, London

Design of heating and chilled water pipe system
16 October, London

Energy Building Regulations: Part L 2013
17 October, London

Introduction to combined heat and power
17 October, London

Fire safety Building Regulations: Part B
20 October, London

Mechanical (HVAC) services explained
21-22 October, London

Building services one-day overview
21 October, Manchester

Lighting design: principles and application
21 October, London

Electrical distribution design
24 October, London

Intro to building services
27 October, London

Energy surveys
27 October, London

Electrical services explained, three days
28-30 October, London

Fire sprinkler systems design, to BSEN 12845
31 October, London

ENERGY ASSESSOR TRAINING

For more information visit **www.cibse.org/events** or call **020 8772 3616**

EPC conventions
7 October, London

Part L update training
8 October, London

iSBEM training
9 October, London

HVAC systems and building services
13 October, London

EPC training – two days
15 October, Birmingham

Renewable Heat Incentive
21 October, Manchester

Metering requirements, RHI
22 October, Manchester

We're on our way to Wembley

Visit English football's national stadium, with a tour organised by the CIBSE Home Counties North West Region. The 90,000-seat arena is the second largest in Europe. It is owned by the Football Association/WNSL, and was designed by HOK/Populous and Foster & Partners. Featuring a partially retractable roof shell, and the 134m-high Wembley Arch, the stadium was built by Multiplex, and cost £798m.

The tour starts at 2pm on Sunday 1 November. Places are limited, and registration is essential. For more information – and to book your place – visit **www.cibse.org/events**

THE UK'S EUROPEAN UNIVERSITY

The University of Kent is one of the UK's most dynamic universities demonstrated by our strong European and international presence, our excellent RAE results which confirmed Kent's position as one of the UK's most research intensive universities, and the quality of our teaching and student experience; Kent was ranked 20th in the 2014 Guardian University Guide and achieved a 90% satisfaction rate in the 2013 NSS for overall student satisfaction.

Estates Department

Senior Energy Systems Engineer

Ref: OTR0995

Grade 8: £38,511 - £45,954 per annum

Reporting to and deputising for the Assistant Director of Estates, the primary role of the Senior Energy Systems Engineer is to maintain and develop the University's energy and environmental management systems, maximising their contribution to the delivery of the University's carbon reduction and sustainability goals. Providing and presenting reports and data to advise senior level decision making when; planning new buildings, refurbishing existing buildings, planning ongoing maintenance requirements or new environmental initiatives.

The successful candidate will need the ability to take ownership of projects and successfully see them through to a conclusion, within budget. This is a key requirement of the post as the postholder will take the lead role in the development and delivery of large scale energy related projects across the University's estate and their related budget responsibility.

Working with Estates colleagues and key stakeholders across the University to promote energy awareness, water conservation to minimise the consumption of utilities; you will need the ability to communicate highly detailed and high impact information ensuring full understanding in others, teamed with the ability to work closely with colleagues and customers to build relationships and improve customer service.

Candidates must be a Chartered Engineer or hold an equivalent professional qualification (completion within the next 6 months is acceptable), with a degree in Building Services or Energy Systems Engineering.

Proven significant experience in Building Services or Energy Systems Engineering in a medium to large organisation, along with experience with data handling and processing in a utility environment is essential for this position. Candidates must also have experience and an understanding of control systems relating to Building Services and the ability to operate/interrogate building management systems. In addition they must have knowledge of current legislation, regulation, fiscal incentives relating to energy use and carbon emissions.

For further details and to apply for this post please visit www.kent.ac.uk/jobs
Closing date for completed applications: **Wednesday, 22 October 2014**.
Interviews are to be held: **Friday, 7 November 2014**.

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We actively promote equal opportunity in education and employment and welcome applicants from all sections of the community.

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who we are

J H Partners was established in 2004 and has quickly become one of the leading companies in the construction industry.

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our aim

It is the aim of JH Partners to ensure all of their staff work with their clients to ensure that they understand their needs and expectations, ensuring promises made, are firstly achievable and secondly kept.

JH Partners offer quality design solutions within cost parameters and defined programmes. Our philosophy is based on prevention of error and the commitment of our staff to ensure that projects delivered exceed the expectation of our clients. Treating clients, colleagues and all those connected with our work with courtesy and respect, fully understanding that quality of service is paramount.

Do you have what it takes to become a member of our extraordinary design team?

We are currently recruiting in both our Durham and London Offices for the following positions-

- Electrical Design Engineers (All levels)
- Mechanical Design Engineers (All levels)
- BIM Technicians (Revit MEP)

Please visit www.jhpartners.co.uk for further details

If you are interested in applying for the above positions then please send your CV to lauren.harrison@jhpartners.co.uk
***No agencies please**

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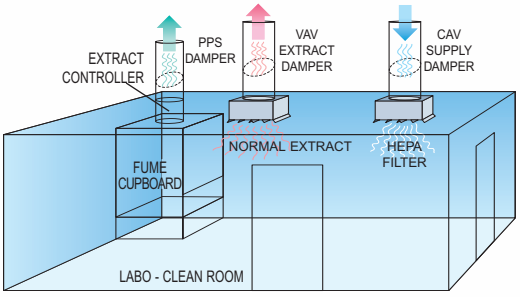

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