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JOURNAL



The official magazine of the Chartered Institution of Building Services Engineers

August 2014

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Recognising the projects

that achieve high levels of user satisfaction and deliver outstanding measured building performance and energy efficiency

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*Patrick Bellew
RDI, Founding
Director,
Atelier Ten*



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A hot potato

The UK is currently enjoying (enduring?) another hot summer, with daytime temperatures consistently in the mid-to-high 20s. While that's great for Glasgow and the Commonwealth Games, it's not so good if you live or work in a building prone to overheating. With changes in Building Regulations resulting in higher levels of insulation, there is a danger of buildings becoming too hot if not ventilated properly (see 'Home is where the heat is', page 20.) It doesn't help that one of the most marketable benefits of new flats contributes to the issue. Large floor-to-ceiling windows offer plenty of daylight and great views across the city, but can contribute to high temperatures through solar gain.

BRE's principle engineer Michael Swainson says the best way of bringing down internal temperatures is to address the gains at the design stage. This, of course, would be the perfect solution, if engineers were involved at the design stage.

One project that benefited from early involvement of the engineer is the Ortus centre in Camberwell, South London. I visited on a hot June day and, despite no mechanical cooling at the time, its interior was comfortable. By engaging with the architect at the building's inception, services consultant Skelly and Couch was able to influence

Large floor-to-ceiling windows offer great views, but can contribute to high temperatures through solar gain

the form to maximise daylighting and minimise solar gain. The open book form of procurement meant they could engage with contractors to ensure every design element was correctly executed. This was vital, as the success of the ventilation was dependent on a high level of airtightness, which meant there could be no compromise in the quality of design or installation (see 'Light fantastic', page 34).

One of the successful elements of the project was the ground source heat pump (GSHP). It achieved an average coefficient of performance of 3.8 over one winter and summer. This technology is relatively new in the UK, and Skelly and Couch paid special attention to its integration and optimisation of settings. Monitoring was vital in terms of maximising efficiency.

Sadly, the installation of GSHP is not always straightforward. Research by B&ES reveals that they don't always reach their potential (page 38). Unless renewables are integrated properly they are in danger of being cast aside for more conventional M&E systems. Guidance and codes of practice like those being developed by the CIBSE CHP and District Heating group with the Combined Heat and Power Association are the right way forward.

Alex Smith, editor

asmith@cibsejournal.com



Recession helped meet carbon targets

● Downturn disguised lack of progress on energy efficiency

The recession was a major factor in the UK meeting some of its low carbon targets and disguised slow progress in developing energy efficiency and renewable heat, according to the Committee on Climate Change (CCC).

The government advisory committee's latest update report said that the UK's first carbon budget was achieved, but future targets are under threat because of a lack of political ambition.

The country has done well in improving fuel efficiency of cars and in generating wind power, but 'previous good progress in residential energy efficiency fell away', partly as a result of weak government policies, the CCC report stated.

This has led the committee to conclude that future carbon budgets, which have been put



NORMAN CHAN / SHUTTERSTOCK

in place as milestones towards achieving an 80% cut in emissions by 2050 in line with the government's legal obligations, will not be met. Current policies, without the assistance of a recession-driven downturn in industrial activity are only likely to reduce emissions by 21 to 23% by 2025 – the target is 31%.

'Progress insulating homes plummeted with the introduction of the Green Deal and Energy Company Obligation,' the report stated.

'The ECO is now being redesigned to include more low-cost measures, and new financial incentives are being introduced for the Green Deal. This is welcome, but ambition remains low and should be increased.'

The CCC also said an increase in the use of low-carbon heat was 'a priority'. It described the Renewable Heat Incentive (RHI) as 'very generous', but reported that take-up of heat pumps had been 'very low', with just 1% of the funds available being spent to date.

'Rather than increasing subsidy further, the government should focus on tackling financial and non-financial barriers. This should include extending RHI funding beyond 2016, and allowing access to Green Deal finance for renewable heat installations,' the CCC recommended.

● See how the UK fared in the ACEEE *International Energy Efficiency Scorecard* – page 13.

Sainsbury's gears up for geothermal technology

A \$15m deal has been agreed to roll out geothermal technology at 15 UK Sainsbury's stores.

Geoscart agreed a financing deal with Macquarie Lending to deploy the technology, which integrates geothermal energy generation, heat pumps and solar thermal panels.

The initial phase of the rollout involves installing boreholes and ground source heating systems across the 15 stores.

Early bird rate for CIBSE conference

Reduced rates are being offered to delegates for CIBSE's major new conference and exhibition, Leadership in Building Performance.

Held in London on 28 and 29 October, the discounted rate applies until 15 September. The conference programme is available at www.cibse.org/conference

The event will identify developments, innovations and best practice that will assist the full supply chain in improving energy efficiency to deliver better building performance.



DRIMA FILM / SHUTTERSTOCK

GLASGOW IN THE SPOTLIGHT

Athletes from 71 countries have been competing in the 20th Commonwealth Games across Glasgow. Hampden Park football stadium was adapted for athletics, while the new SSE Hydro hosted gymnastics, boxing and netball (above). The arena is located

in the Scottish exhibition and conference centre precinct, which is also the location of the Clyde Auditorium. Track cycling took place at the Sir Chris Hoy Velodrome built in 2010, which is next to the Emirates Arena, the venue for badminton.

Industry urged to use skills funding

CIBSE is urging the industry to take advantage of three funding streams to help engineering firms employ more women and young people.

Applications for a share of £10m of government funds under the 'Employer ownership: improving engineering careers' scheme must be made by 5 December and applicants should first register on the department for Business, Innovation and Skills (BIS) e-Tendering Portal at www.bis.bravosolution.co.uk

The funding is aimed at growing the country's stock of engineers, according to BIS, with the funds ring-fenced for employers to: invest in training; to bring new

people into engineering; and support the progression of individuals through an engineering career.

A second £10m fund is available through the 'Employer ownership: developing women engineers' scheme, again with a closing date of 5 December.

These funds are targeted at conversion training to encourage employers to bring more women into engineering, and progression training to support employers' efforts to develop engineering career paths.

A third fund aimed at developing skills in smaller companies will be announced shortly, but small employers can register now at the BIS portal.

Property chiefs query cost of minimum energy standards

● Green Deal for non-domestic sector has not been well-received

The property industry has backed government plans to introduce minimum energy standards, saying they are vital for raising the quality of privately rented buildings.

However, it has also questioned how upgrading poorly-rated buildings will be paid for, particularly as the Green Deal for the non-domestic sector has not been well-received.

The Department of Energy and Climate Change (DECC) has launched consultations to gauge industry reaction to proposed Non-Domestic and Domestic Minimum Building Energy Performance Standards (MEPS) that would make it mandatory for all private rented properties to have an E-rated Energy Performance Certificate (EPC) or better from April 2018.

The British Property Federation (BPF) said the standards would have a 'significant influence on the future quality of the UK's rental stock', but said that ensuring buildings have an E rating would 'require



SHAHID ALI KHAN / SHUTTERSTOCK

significant investment'. Commercial buildings account for 8.25% of the UK's total carbon emissions, but the BPF said it might be 'prohibitively expensive or difficult to upgrade to an EPC rating of E' for some properties.

'The government's suggestion of a forward trajectory for MEPS, which will allow property owners to see how the regulations will change over time, is extremely welcome.'

Mystery Shopper to back SMEs

The government wants more SMEs to use its confidential complaints service about poor procurement practices in public sector contracts.

Describing small firms as the 'lifeblood of the economy', the Cabinet Office said it wants 25% of the £230bn annual public sector budget to be spent with SMEs by the end of next year. However, it added that many small firms are reluctant to even bid for this work, because of problems with late payment and unfair or overly bureaucratic

procurement practice on the part of many public sector clients.

The Mystery Shopper service is 'an informal, anonymous service allowing businesses to raise concerns and highlight the barriers they encounter when bidding for, or working on, public sector contracts', it added.

'We know that SMEs stand a higher chance of winning public sector business if the procurement processes are simpler and more accountable,' said a statement

from the Crown Commercial Service, which manages public sector procurement on behalf of the Cabinet Office.

Problems can be reported to the Mystery Shopper team by sending an email to mysteryshopper@ccs.gsi.gov.uk or by telephoning the Mystery Shopper service desk on 0345 010 3503. The Mystery Shopper team also carries out daily spot checks on procurement documentation.

<http://bit.ly/MysteryShopperGov>

'40% over-specifying' claim

Small power loads in offices are being over-specified by up to 40%, according to research by the British Council for Offices (BCO).

The BCO Guide to Specification, which is due to be published in September, will reflect the findings of consultant Hilson Moran, showing that much less energy is actually consumed at desks than is allowed for in typical building designs.

Hilson Moran's monitoring showed that at 10 m² per person, 40% less power is actually required, and, at the higher occupation densities of 8m² per person, power consumption rarely exceeds 19W/m², which is 24%

lower than the loads recommended in the BCO's 2009 guidance.

The researchers also discovered that, contrary to normal design practice, HVAC loads, should be slightly lower than electrical loads to reflect the improved performance of modern computers.

Changes to working practices, with employees now much more likely to use mobile devices rather than sitting at desks all day, is behind the falling power demand. This is expected to accelerate further in coming years and will allow landlords and building occupiers to reduce power specifications still further, the BCO said.

In brief

AECOM BUYS URS

Aecom has announced it will buy engineering and design consultancy URS Corporation for US\$4bn (£2.3bn).

The acquisition will give Aecom 'capabilities in the construction, oil and gas, power, and government services', as well as improving its 'integrated delivery model', according to a statement. The company, which now employs 95,000 people in 150 countries, said it expected to save \$250m annually by the end of 2016.

In the UK, URS employs 25 architects in Belfast, Teesside, Manchester, Basingstoke and Glasgow.

US BANS HFC REFRIGERANTS FROM 2020

The US government's Environmental Protection Agency (EPA), has announced that HFC refrigerants will no longer be permitted for use in 'aerosols, refrigeration and air conditioning' from 2020 as part of President Obama's Climate Action Plan.

It claims this will prevent 40m tonnes of CO₂ equivalent emissions entering the atmosphere, and US pressure groups have called on the 'international community' to follow suit.

The announcement came ahead of a meeting of the Montreal Protocol signatories who are expected to look at a timetable for phasing out HFCs.

SIX ON STIRLING SHORTLIST

Six iconic buildings are on the shortlist for the UK's top architectural award this year.

Europe's tallest building, The Shard, and the London Olympics' Aquatic Centre, are vying for the RIBA Stirling Prize, along with the Birmingham Library, Liverpool's Everyman Theatre, LSE's Saw Swee Hock Student Centre, and Manchester School of Art.

The winner will be announced on October 16.

RIBA said the shortlisted projects 'vary in size and use, and will be judged on their design excellence and significance to the evolution of architecture and the built environment'.

FLORIDA ADOPTS ASHRAE ENERGY STANDARD

Florida has approved the use of ASHRAE's energy rating and labelling programme for use on buildings in the Southern US state. Building Energy Quotient (bEQ) can be used to rate buildings both at the design and operational stages. Since 2013, Florida has required energy ratings for all residential, commercial and state-owned buildings. ASHRAE immediate past president Bill Bahnfleth said: 'ASHRAE commends the state of Florida for recognising the importance of requiring collection of the information necessary for making informed decisions about the energy use of buildings where we live, work and play.'



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Solar firms to sue state for £132m

The High Court has ruled that companies can sue government for £132m in compensation over cuts to feed-in tariffs (FITs).

The government's action in cutting tariffs by 50% was ruled illegal by the court two years ago, after it found the Department for Energy and Climate Change (DECC) 'failed to adhere to consultation rules'. The industry claims the decision damaged investor confidence and led to 9,000 job losses.

Mr Justice Coulson ruled that the claimants were entitled to 'just satisfaction' for the losses.

A spokesperson said DECC would appeal the ruling because it was trying to protect consumers from rising bills at a time when 'windfall profits meant the industry was booming'.

The spokesperson added that the solar industry is now worth £2.2bn a year and is a 'huge success thanks to government support'. It argued that the cuts in tariff payments had not hampered the sector's development.



FENTONONE / SHUTTERSTOCK

Businesses don't know what energy they are buying

● Energy should be sold with an 'electricity label'

Leading UK businesses say they are frustrated by current green energy regulation and have called on the government to introduce simpler and more transparent reporting.

At the launch of a proposed 'electricity label' for commercial energy buyers, the sustainable business alliance, Aldersgate Group, said the present system makes it very difficult for organisations to work out if they are buying energy from a sustainable source or not.

'It is confusing and needs to be more transparent because there is no way of reporting true performance,' said Aldersgate executive director Andrew Raingold. 'Organisations face a reputational risk because it is not clear what proportion of their energy is sustainable.'

Aldersgate members – including BT, Npower, EDF, Sky and HSBC – said a label displaying the carbon content of their electricity would introduce 'transparency and accountability' into the electricity generation sector.

Raingold said it would drive up demand for renewable sources, as well as exposing 'the role of "dirty power" in our purchasing'.

BT's director of energy and carbon, Richard Tarboton, told the launch that many companies would be surprised by how much 'dirty power' they are buying, and that greater transparency would incentivise renewable energy production.

Aldersgate claimed widespread adoption of its proposed labelling scheme would quadruple the amount of low-carbon electricity bought by the commercial sector, while simultaneously driving down demand for electricity generated by coal and gas – including shale gas.

Industry seeks to redress IAQ balance

A number of international industry bodies have joined forces to create an 'Indoor Environment Quality Global Alliance'.

The Alliance consists of ASHRAE; the American Industrial Hygiene Association (AIHA); Air Infiltration and Ventilation Centre (AIVC); the Air & Waste Management Association (A&WMA); the Indoor Air Quality Association (IAQA); and the

Federation of European Heating and Air-Conditioning Associations (REHVA), of which CIBSE is a member.

This follows an initiative started by ASHRAE immediate past president Bill Bahnfleth, who said the focus on energy conservation had been so intense that 'progress in indoor environmental quality has been obscured'.

'A broad, coordinated effort is

needed to fill gaps in research, transfer the results of science to practice, advocate for higher standards and better educate both the built environment professions and the public,' added Bahnfleth.

The World Health Organisation and the US Environmental Protection Agency have pledged to work with the Alliance to improve building indoor air quality standards. www.ieq-ga.net

Tide turning as construction growth starts to pick up speed

● Value of projects starting on site is up by 10%

The upturn in construction activity is gathering momentum, according to market research firm Glenigan.

Rising private sector confidence and investment is driving output, which rose by 6.2% during the first four months of 2014. Glenigan also predicted that growth would be sustained during the second half of the year and into 2015.

It also recorded a 10% rise in the value of projects starting on site during the first half of 2014, primarily driven by increases in private housing and non-residential building projects.

The value of projects securing detailed planning approval is up by 19% since 2011, supported in particular by strong growth in private housing projects.

Glenigan said it expected rising private sector investment and improved consumer confidence to underpin further growth in both detailed planning approvals and



ANT CLAUSEN / SHUTTERSTOCK

project starts during the second half of 2014.

Renewed consumer confidence and the accompanying revival in the general housing market have emerged as the key growth drivers for the sector. Business investment also rose by more than 10% during the first quarter of 2014, and is forecast by the Office for Budget Responsibility (OBR) to grow by 8% per annum in each of the next five years.

'This resurgence in investment

should provide sustained support for the industrial and commercial sectors,' a Glenigan statement said, adding that industrial starts are 'already set for double digit growth during 2014'.

'The value of underlying office project starts is forecast to rise by 9% this year, building on the strong recovery seen over the last two years. In addition, project starts in the hotel and leisure sector are forecast to rise 7% during 2014,' it added.

Contractors should be more influential in the final vision

The new President of the Building & Engineering Services Association (B&ES) believes specialist construction contractors should take more responsibility for delivering architects' visions.

Andy Sneyd, head of design at Crown House Technologies, said no other profession was as well placed to influence the design and construction process, but its members needed to become more 'corporate'.

'Specialists need to step up, take responsibility and become more influential,' he said.

He believes specialist contractors are in 'an incredibly strong position' because they understand all aspects of the project process and, therefore, can influence clients, architects, consultants, FMs and building occupants.

He urged them to create a new 'hybrid' profession that merges architectural and design vision with



technical innovation and site-based practical experience.

Sneyd said his message would not be 'universally popular' because 'not everyone wants us intervening at the top of the supply chain', but he insisted it was necessary to deliver 'truly innovative projects, cut construction costs and project times, as well as meet sustainability goals.'

He believes it is 'wrong that specialist contractors sit waiting for someone higher up the supply chain to tell them what to do' and urged firms to 'stop moaning' about what was wrong with the construction process and seek to influence it instead.

'Architects are often disappointed by their experience of mechanical contractors because our industry forces them to compromise their designs. We must stop criticising and finding problems,' he said.

In brief

SPEAK OUT ON BIM

CIBSE is calling all BIM users to take part in its 2015 survey to help develop protocols and training.

The 2015 BIM survey, compiled by the CIBSE BIM Steering Group, encourages participants from all aspects of the building process to reflect on their experiences of BIM.

It is aimed at aspiring – as well as the experienced – BIM users, so that results can help lead the development of protocols, tools, applications, education and training by CIBSE and the wider construction and software world.

The survey results will be published in the autumn on www.BIMTalk.co.uk and in the *Journal*. To complete the survey, visit www.bit.ly/CIBSEBIM2014

KINGSPAN TAREC TO SPONSOR YOUNG ENGINEERS' AWARDS

Derbyshire-based insulation specialist Kingspan Tarec Industrial Insulation has signed up as a major sponsor of this year's CIBSE Young Engineers' Awards (YEA).

The company is a joint venture between Tarec Insulation and Kingspan Insulation's pipe and slabstock business. It joins Daikin UK and Ruskin Air Management as sponsors of this prestigious awards scheme, which concludes with live presentations and prize-giving at the Institution of Mechanical Engineers (IMechE) in London on 9 October.

The awards scheme consists of the Employer of the Year Award; the CIBSE/ASHRAE Graduate of the Year Award and an IMechE special lifetime achievement award.

For more details, go to www.cibse.org/yea

WALKING AMONG THE BEASTS

An urban climate walk through the centre of London will highlight the impact of buildings on microclimates. The walk, on 23 August, is being led by Julie Fletcher, author of 'Shadowlands', *CIBSE Journal*, July 2014.

The walk will look at the impact of the Heron Tower, the Loyds Building, and 20 Fenchurch Street (the Walkie Talkie), and talk about the importance of the River Thames as a ventilation route. For more information, contact Julie Fletcher at julie@climate22.com

Cold climate expertise sought

CIBSE is seeking authors with experience of designing, constructing, commissioning or maintaining buildings in cold climates for its forthcoming publication *Buildings in Extreme Environments: Cold Climates*.

Particular geographical areas of interest include Northern Scotland, Russia, China and the Antarctic.

The specialist areas of knowledge include: system selection, design data, specialist equipment or systems, designing sustainable buildings, energy conservation, materials, temperature and humidity considerations.

If you can help, contact Sanaz Agha on sagha@cibse.org

Guidance helps tackle Urban Heat Island effect

Three Design Summer Years now available for London

The new CIBSE guidance TM49, and the accompanied Design Summer Years for London, enable designers to analyse the summer performance of their buildings, and to investigate the impact of Urban Heat Islands (UHI) when carrying out overheating risk assessments for buildings in London.

It is evident that the world is facing an increase in extreme weather events affecting people's health and wellbeing, and cities will experience more intense and frequent summer hot events

Design Summer Years for London



exacerbated by the UHI effect.

TM49, and the accompanied datasets for building thermal simulation, introduce the concept

of incorporating the UHI effect and the severity of hot events in building design. Specifically, instead of having a single Design Summer Year (DSY) for London, three DSYs are now available, capturing the local climate in each of three different London locations (urban, semi-urban, and rural) and for three years of varying severity of hot events.

The publication enable designers to analyse the summer performance of their buildings under future conditions.

To download a copy, visit www.cibse.org/knowledge Read our feature on overheating on page 20.

New members, fellows and associates

FELLOWS

Bukorovic, Nicholas Kampala, Uganda
Cheng, Wai Lung Tsing Yi, Hong Kong
Clements, David Norwich, UK
Das Bhaumik, Claire Harpenden, UK
Devitt, John Francis Hornchurch, UK
Field, John Walker London, UK
Fok, Mun Fai Davies Kowloon, Hong Kong
Gulacsy, Eszter Adel Huntingdon, UK
Ho, Chi Sing Ho Man Tin, Hong Kong
Ip, Kwok Cheong Kowloon, Hong Kong
Kwan, Kam Tim Diamond Hill, Hong Kong
Lai, Hung Kit Shauiwan, Hong Kong
Layng, Mitchell Clive Orpington, UK
Lee, Wai Ling Kowloon, Hong Kong
Leong, Wun Wa Yuen Long, Hong Kong
Mellon, David Dover, UK
Russell-Smith, Geoff Nottingham, UK
Sneyd, Andy Wilmslow, UK

Taylor, Rebecca London, UK
Yung, Kin Kwong Kennedy Town, Hong Kong
MEMBER
Alex-Eyitene, Kwame Claude Tipton, UK
Arnold, Steve Bishop Auckland, UK
Arnold, Michael London, UK
Babalola, Ifeoluwa S Oluwatoyin Dartford, UK
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Broughton, Lee Bradford, UK
Burgon, Peter Jack London, UK
Burnett, Mark Andrew West Midlands, UK

Carpenter, Katherine London, UK
Carter, Laurence London, UK
Chan, Kai Man Tuen Mun, Hong Kong
Chan, Yu Wang Ma On Shan, Hong Kong
Chandler, Andrew James Leeds, UK
Chau, Chau Fung Tsuen Wan, Hong Kong
Cheng, Kai Tat Tseung Kwan O, Hong Kong
Cheng, Kin Sang Franki Sham Shui Po, Hong Kong
Choo, Beng Wooli Bayan Lepas, Malaysia
Connor, Gerry Reigate, UK
Cooper, Paul Raymond Ripley, UK
Corney, Andrew Donne Cambridge, UK
Cosker, Thomas London, UK
Dabee, Yudish London, UK
Daniels, Stuart Nathan Cobham, UK
Davies, Andrew Thomas Cambridge, UK
Dixon, Richard Martin Gorey, Republic of Ireland
Dowson, Mark London, UK
Duerdin, Phillip David Trowbridge, UK

Dutton, Edward David Stratford-upon-Avon, UK
Dyer, Christopher Watford, UK
Eddie, Robert Gordon Falkirk, UK
Ebrahim, Richard Abu Dhabi, United Arab Emirates
Eckelt, Joshua Charles Weston-super-Mare, UK
Edwards, Trevor Darlington, UK
Farman, Derek Charles Bristol, UK
Fatogbe, Tolu Rickmansworth, UK
Fischhof, Dorota London, UK
Fitzsimmons, Jason James Exeter, UK
Fletcher, Maxwell Finchampstead, UK
Fok, Chi Kong Desmond Sham Shui Po, Hong Kong
Froud, Karen Oxford, UK
Gerrard, Paul Antony Manchester, UK
Giovenzana, Davide London, UK
Goolamhossen, Mohammad Imteeaz Dubai, United Arab Emirates
Hamilton-Fletcher, Guy James Alexander Chichester, UK

Hannigan, Gerard Dromore, UK
Haran, Jakub London, UK
Hardy, John Leigh, UK
Harris, Mark London, UK
Harris, Mark Coventry, UK
Hart, Andrew James Manchester, UK
Harvey, Helen Mary Reading, UK
Hasan, Rafay Slough, UK
Hathway, Elizabeth Abigail Sheffield, UK
Hayes, John Charles Waltham Cross, UK
Hearn, Gary Market Harborough, UK
Hussain, Ammar Feltham, UK
Jack, Netza London, UK
Jin, Xin London, UK
Jones, Jason Trevor Cardiff, UK
Jung, Jong Rim Seoul, Republic of Korea (South)
Kaneswaran, Suthan Croydon, UK
Kay, Simeon Swadlincote, UK
Khan, Yharees

Young engineers challenged to sanitise developing cities

● Challenge to develop waste water systems

The annual Society of Public Health Engineers (SoPHE) Young Engineers Award is now open for entries.

Each year the award, which is run in association with Water Aid, asks teams of engineers, aged 18-35, to develop an engineering solution for a given scenario.

This year, the challenge for teams (of up to three people) looks at the use of decentralised wastewater treatment systems, such as baffled reactors and small-bore sewers in peri-urban areas of developing cities, which are increasingly under threat from flooding due to climate change.



As part of the competition, teams will also have to find ways to adapt such systems for flood-prone areas.

Teams have to submit an A1-size poster demonstrating their ideas. Those with shortlisted entries will then be invited to give a 20-minute presentation on their

ideas in front of the judging panel.

Winners will receive an in-country technical visit to verify the applicability of their design.

For more information on the challenge, and how to enter, visit www.cibse.org/sophe The closing date to receive entries is 1 September 2014.

Growing up green

GEA Consulting, registered CIBSE low carbon consultants and energy assessors, have published tips to reduce energy use in schools.

The article, which is available on the CIBSE blog, highlights that reducing energy use in schools improves the learning environment, enhancing a school's reputation.

Research shows that pupils who are empowered to take action on energy become more positive towards other environmental issues.

Tips include encouraging schemes that involve the whole school. Suggested approaches include a school energy-saving day, and appointing energy monitors to encourage peers to switch off computers and lights.

It also refers to Display Energy Certificates. Read it at www.cibseblog.co.uk

Birmingham, UK
Kwok, Ka Chun
 Kowloon, Hong Kong
Lau, Fung Shing
 North Point, Hong Kong
Lau, Man Fai Davis
 Tuen Mun, Hong Kong
Lau, Yuen Fung
 Tsuen Wan, Hong Kong
Law, Wai Keung
 Auckland, New Zealand
Lay, Mark Keith
 Grays, UK
Leahy, Christopher
 Latina, Italy
Lelyveld, Thomas Peter
 Lancaster, UK
Leung, Shuk Yan
 NT, Hong Kong
Leung, Ka Yan
 Tuen Mun, Hong Kong
Lewis, Cormac
 London, UK
Li, Yan
 London, UK
Lisiewicz, Piotr
 Edinburgh, UK
Little, Richard Francis
 Virginia Water, UK
Lowe, Richard
 Huddersfield, UK
Luk, Chung Man
 Kowloon, Hong Kong
Ma, Wai Wang
 Kowloon, Hong Kong
Marsh, Craig
 London, UK
Marshall, Emma
 Newcastle upon Tyne, UK
Martin, Tom Henry

Newcastle upon Tyne, UK
Masood, Adnan
 Southall, UK
Maxwell, Patrick
 Ashby de la Zouch, UK
Mbah, Larry
 Port Harcourt River State, Nigeria
McGrath, Brian
 Caterham, UK
McKenna, Barry
 Motherwell, UK
McLoughlin, John David
 London, UK
McQuilliam, Richard
 Amersham, UK
McVittie, Gary Kenneth
 Glasgow, UK
Meakin, Christopher William
 Birmingham, UK
Mohamed Hashim, Arafath Yasir
 West Bromwich, UK
Morgan, Kingsley
 Hertford, UK
Murphy, Niall
 Glanmire, Republic of Ireland
Murphy, Martin
 Kilkenny, Republic of Ireland
Murray, Liam John
 Fortitude Valley, Australia
Nayna, Patrick
 Quatre-Bornes, Mauritius
Neville, Luke Michael
 Colchester, UK
Ogle, David
 Edinburgh, UK
O'Kane, Niall Patrick
 Eglinton, UK
O'Sullivan, Cornelius James
 Leicester, UK

Owen, Michael Charles
 Huddersfield, UK
Potter, Mark Lee
 Stratford-upon-Avon, UK
Pritchett, Izabela Weronika
 London, UK
Puchades, Andres
 Epsom, UK
Quinn, Colm
 Malahide, Republic of Ireland
Randall, Jennifer Clare
 Leeds, UK
Rerak, Marcin
 London, UK
Rezaei, Neda
 Witney, UK
Santos, John Derrick
 Walsall, UK
Sharpe Christopher John
 London, UK
Skippins, Simon
 Enfield, UK
Smith, Iain
 Glasgow, UK
Smith, Paul Anthony
 Coventry, UK
Smyth, Neil David
 Belfast, UK
Soteriou, Christakis Charalampous
 Cyprus, Cyprus
Stephens, Owen
 Dublin 15, Republic of Ireland
Swann, Michael
 Abingdon, UK
Taylor, Greville Christopher
 Wolverhampton, UK
Thompson, Lee
 Tadworth, UK
Ting, Kuan Jei Ghazi
 Tsim Sha Tsui, Hong Kong

Toczek, Anna Katarzyna
 Croydon, UK
Todd, Simon Edward
 Newcastle upon Tyne, UK
Tong, Kei Ho
 NT, Hong Kong
Tsang, Wing Yu
 Tsuen Wan, Hong Kong
Walford, James Michael
 Manchester, UK
West, Allan
 Leeds, UK
Williams, Michael
 Reading, UK
Willoughby, Philip
 Bromley, UK
Wilson, Alan David
 London, UK
Witt, Magdalena Maria
 Epsom, UK
Worthington, Katie Sarah
 Epsom, UK
Wu, Jin Yoong
 Leeds, UK
Zara, Riccardo
 London, UK
ASSOCIATE
Balakrishnan, Praveen Chandra
 Doha, Qatar
Brown, Adam
 Dartford, UK
Cox, Lee Stephen
 Leeds, UK
Craven, John Michael Douglas
 Plymouth, UK
Everington, David
 Manchester, UK
Farrow, Richard James
 Hull, UK
Grenville, Colin

Wolverton, UK
Haworth, Neal John
 Fareham, UK
Lim, Adrian
 London, UK
McChesney, Ian
 Bangor, UK
Mungovan, Michael William
 Cambridge, UK
Poborskyy, Oleksandr
 Bromley, UK
Poplett, Andrew Peter Seymour
 Alnwick, UK
Preddy, John
 Ashford, UK
Roden, Colin
 Oxford, UK
Togher, Mark
 Kings Langley, UK
Voges, Brian Ross
 Surbiton, UK
Wash, Neil James
 Southend-on-Sea, UK
Zalewski, Dominik
 Bristol, UK
LICENTIATE
Bamber, David Paul
 Liverpool, UK
Kiplimo, Daniel Nyango
 Nairobi, Kenya
Lowes, Edward Ian Green
 London, UK
Penn, David Michael
 London, UK
Perham, Daniel Steven
 Bristol, UK
Vafis, F F Stratis
 Warrington, UK
Wilson, Andrew
 Dewsbury, UK

Annual general meeting

● Year's key developments highlighted in report

The annual general meeting of CIBSE was held at the Royal Society, Carlton House Terrace, London on 8 May 2014. George Adams, outgoing President, chaired the meeting. Chief executive Stephen Matthews read the notice convening the meeting.

The minutes of the 36th annual general meeting, held on 9 May 2013 and published in the July 2013 issue of *CIBSE Journal*, were accepted as a correct record and signed by the chair.

Annual report and financial statements

George Adams presented the Annual Report, highlighting key developments during the year. The performance of the urban environment had been firmly established on the agenda, and plans had been initiated for a special interest group on sustainable and adaptable cities, with support from Geoff Levermore, one of the lead authors of the fourth IPCC climate change report. Engineering excellence had been introduced as a main theme during David Fisk's Presidency, and the development of the Knowledge Portal had been a great success, with plans being made to further develop and enhance it. A new CIBSE website had been developed during the year, and the Institution's vision of whole-life thinking had been developed. The time was right for engineers to step forward, and for CIBSE to develop global thought leadership, while addressing climate change and sustainability and promoting diversity in industry. In particular, the small number of women in the industry needed to be further addressed, and attention was drawn to Royal Academy of Engineering funding, which had been received by the Institution for a diversity research project.

He went on to stress the need for CIBSE to add value to society, and drew attention to efforts to collaborate more effectively with other Institutions including RIBA and the Landscape Institute, stressing that the expertise of many disciplines was needed to build sustainable cities for the future. Regarding building information modelling, CIBSE had acted as the lead body of a consortium of Institutions in preparing a bid under the digital plan of

works, and further efforts would be made to develop effective collaboration.

George Adams thanked Stephen Matthews for his support in developing the management team to address sustainability more effectively, noting the establishment of a revised head of sustainability development role within the HQ team, and the provision of additional support within the technical department. He referred to the establishment of the operations monitoring and advisory panel to help develop the Institution's operational plan, and plans to revise the operation of council, making it more effective.

The growth in CIBSE membership was very positive, and links to education and industry were being enhanced. The Class of your Own project, which encouraged young people to consider careers in the built environment, was highlighted, and CIBSE was working to develop this further.

The Institution's visit to India had been well received, with important contacts having been established and the scene set for further development in that country.

In conclusion, George Adams recognised that the global challenges faced were huge, but that the future cities challenge was achievable. The industry would have to deal with resource shortages in future, and the importance of encouraging people to join the profession was stressed. He expressed his thanks for the support he had received during his Presidency, and for the work of the whole Institution, including the societies, groups, regions, networks, and patrons, as well as the staff, chief executive and management team.

Adams then introduced Bill Devitt, of Chantrey Vellacott DFK LLP, who read the audit report and confirmed that the accounts provided a true and fair view of the Institution's affairs.

Adams thanked Stuart MacPherson for his work as honorary treasurer, and invited him to introduce the financial statements. Stuart MacPherson reported that the financial position was very stable, reflecting the hard work of the team during times that had remained challenging. Firm financial control had been maintained, and attention was drawn to the composition of the Institution's income, which had remained at very similar levels to 2012.

The range of income sources within the trading subsidiary CIBSE Services Ltd was noted, and it was pointed out that – in total – this was slightly reduced compared with the previous year. The group expenditure breakdown was noted as largely similar to the previous year, but with £199,000 spent developing the content management system for the new website. This system was seen as vital to the Institution's delivery of knowledge in future years, and it was anticipated that £800,000 to £1m would be spent on the overall IT strategy over a period of three to four years. This was a potential drain on the Institution's reserves; however, for 2013 the expenditure had been contained within the Institution's revenue for the year. The Institution's fund balances now stood at £3.5m after unrealised gains, which was very positive, but it was noted that this could be affected by future changes in investment conditions.

AUDITORS

Stuart MacPherson proposed that Chantrey Vellacott be appointed as the Institution's auditors for 2014, and that the board be empowered to agree their remuneration. This was seconded by David Wood and approved *nem con*.

SPECIAL RESOLUTION

Stuart MacPherson proposed adoption of the special resolution for membership subscriptions for 2015, as set out in the calling notice. This was seconded by David Wood and approved *nem con*.

Board and Council for 2014/2015

Stephen Matthews declared the following individuals elected to serve as officers, board members and council members following the AGM 2014:

Officers:

President:	Peter Kinsella
President-elect:	Nick Mead
Immediate past president:	George Adams
Vice presidents:	John Field Tadj Oreszczyn Cathie Simpson Stuart MacPherson
Hon treasurer:	

Members of the board:

Elected members:	David Pepper Andrew Saville
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Members of council:

Elected members:	David Cooper Farah Naz Peter Raynham
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AND THE WINNER IS... GERMANY!



While Germany's footballers triumphed in the World Cup, the nation also topped a second global survey of national energy performance. **Hywel Davies** has been analysing the results

‘A country that uses less energy to achieve the same – or better – results, reduces its costs and pollution, creating a stronger, more competitive economy. While energy efficiency has played a role in the economies of developed nations for decades, cost-effective energy efficiency remains a massively under-utilised energy resource.’ So begins the second edition of the *International Energy Efficiency Scorecard*, compiled by the ACEEE (American Council for an Energy Efficient Economy) and published in July.

It analysed the world's 16 largest economies, including the EU as a whole, as well as the five largest member states, against 31 metrics. The metrics look at national policy efforts and then at energy use in buildings, industry and transport. Half the metrics assess policies and half evaluate quantifiable performance measures of how efficiently these economies use energy.

The policy metrics scores are based on whether the country or region has adopted specific best-practice policies, such as: a national energy savings target; fuel economy standards for vehicles; and energy efficiency standards for buildings and appliances.

The performance metrics measure energy use as well as providing



ANDRE DURAO / SHUTTERSTOCK

quantifiable data such as average miles per gallon for on-road passenger vehicles, and energy consumed per square foot of floor space in residential buildings. The maximum possible score for a country is 100 points, with 25 points allocated to each of the four sections, with a point value between one and eight assigned to each metric.

All economies were scored based on the results of the ACEEE research, which was subject to extensive review by an international panel of experts.

In the inaugural scorecard published in 2012, the UK came out top. Germany tops the table in 2014 – with 65 points out of a possible 100 – with Italy, the EU as a whole and France also now ahead of the UK. China was ranked equal fourth with France overall and, in the performance measures, came out on

top, with 32 out of 50 points, while the UK managed just 22 points.

China topped the buildings category. Chinese homes consume less energy per square foot than those in any other country, and commercial buildings have the second lowest consumption. Buildings in urban areas are subject to mandatory building codes, though the report notes that there is still room ‘for improvement in the compliance and enforcement of building codes, which have been historically stronger at the design stage than the construction stage’ (in China).

In the buildings area, the scorecard notes that the UK has a relatively high residential energy intensity, and that we could do more to improve the energy performance of buildings when they are retrofitted (or refurbished), as was noted in the Presidential Address in May.

The UK's Achilles heel is the industrial sector, where we are ranked 12th. At least we can point to the Energy Savings Opportunity Scheme, which is just getting started, as evidence of an energy auditing scheme, which is one of the recommended improvements for the UK. But it is worth noting both that this is an EU policy, so our neighbours will also be adding to their scores with this measure, and that this only applies to large enterprises, not all industry.

It is a real call to effective measurable delivery of energy efficiency policy

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P-Sensor

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➤ So what can we learn from our competitors? Germany has made a strong commitment to adopting energy efficiency best practices in its industrial sector (with the lowest industrial energy intensity of any country except Australia) generating 13% of electricity with combined heat and power, and drafting government legislation to increase this to 25% by 2020.

Australia, meanwhile, was strong in building energy efficiency because of its comprehensive building codes, building labelling programme, and appliance and equipment labelling programme. It scored highly in the industrial sector thanks to a low energy intensity in manufacturing, voluntary energy performance agreements with – and financial incentives for – manufacturers.

France has achieved the greatest decrease in overall energy intensity, with a 50% cut over the last decade, plus significantly strengthened building codes and a building energy labelling scheme. Yet again, from a world-leading position on these policies, the UK is falling behind as others realise the benefits of not wasting energy.

The UK scored 35 points on policy measures, just a point behind France and equal with Germany and the EU. But this leading policy position is not being followed through into performance. CIBSE has argued for some time that policies such as the energy elements of Building Regulations – and the Energy Performance of Buildings Regulations – are not being enforced, and that the Green Deal has failed to deliver as the government's own Impact Assessment predicted.

As preparations begin to elect a successor to the 'Greenest government ever', the ACEEE Scorecard offers contenders some handy guidance on how to improve the UK energy efficiency policy framework. Above all, it is a real call to effective measurable delivery of energy efficiency policy.

References:

- 1 The ACEEE 2014 International Energy Efficiency Scorecard, Rachel Young, Sara Hayes, Meeagan Kelly, Shruti Vaidyanathan, Sameer Kwatra, Rachel Cluett, Garrett Herndon: July 2014. Report Number E1402 <http://www.aceee.org/sites/default/files/publications/researchreports/e1402.pdf>

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

DITCHING THE OILY RAG



Building services needs a 'professional' image to attract a young crowd, says David Fitzpatrick

In his recent *Review of Engineering Skills*, Professor John Perkins identified a worrying skills shortfall that threatens the UK's long-term economic prosperity.

Perkins, chief scientific adviser to the department of Business, Innovation and Skills (BIS), estimated that the UK will need a further 1.3 million engineers by 2020 to achieve its infrastructure improvement targets.

Only half of all 11- to 14-year-olds say they would consider a career in engineering; and that proportion falls to less than 35% among girls, with only 24% of parents saying they believed engineering was a suitable profession for their daughters.

The growing importance of building services makes our shortage particularly acute. However, this issue goes much further than gender stereotyping. We have a deep-rooted image problem and struggle to shake off our 'oily rag' identity.

Guarantee

Perkins identified a need to focus young people on maths and science – particularly physics. But even if they are taking those subjects, what guarantee is there that they would want to work in building services?

The emergence of so-called 'digital engineering', where the new wave of projects is driven by computer model, is an opportunity to reach out to the teenage 'gaming' audience, but to attract the very best, we must

improve our 'professional' image. This has been identified by the new president of the Building & Engineering Services Association (B&ES) Andy Sneyd. He has called for building services contractors to create a 'hybrid profession' that merges their technical and practical skills with wider architectural appreciation and the 'corporate' business approach.

This is so important because young people will be more likely to join a profession that has status and offers good career prospects. Architecture has held that position for decades; and we now have an opportunity to stand alongside them.

For too long mechanical engineers have scoffed at architects and their 'delusions of grandeur' and delighted in telling them why their latest scheme was

Young people will be more likely to join a profession that has status

impractical. That attitude was a hangover from the time of the oily rag – today we are a modern, high-tech industry playing a key role in delivering economically vital projects. We just need to make sure young people realise that, too.

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MAKE EMBODIED CARBON AN ALLOWABLE SOLUTION



Transportation and manufacture of materials is responsible for a very large proportion of a building's carbon emissions. **Guy Battle** argues that the government should add it to its list of Allowable Solutions

It is a little appreciated fact that, even before a building is occupied, more than 40% of total lifetime carbon emissions has already been accounted for in its construction, and in the transportation and manufacture of materials. Indeed, for some buildings – such as distribution centres – embodied carbon can make up more than 70% of a lifetime's emissions.

Yet, in the current debate on the definition of zero carbon, embodied carbon hardly features. With around 10% of UK emissions (c. 57MtCO₂e per year) associated with the manufacture and transportation of construction materials, surely such a profligate use of energy must be tackled if the UK is to meet its carbon budgets?

Some argue there are valid reasons for this lack of activity: 'Embodied carbon is too difficult to measure'; 'It has insignificant impact, and a lack of comparable data'. These views are disputed by the Embodied Carbon Task Force, which comprises practitioners, academics and developers with an interest in ensuring embodied carbon is integrated into normal good practice for building design and development.

It is looking to build industry-wide consensus on how embodied carbon should be measured and reported, and to develop a methodology so that it may

be included as an Allowable Solution within the definition of zero carbon Building Regulations.

The Task Force submitted its findings and recommendations to the Secretary of State for Communities and Local Government at the end of June:

- Embodied carbon should be an Allowable Solution, for both residential and commercial development
- Government should support and fund the development of a UK-wide materials database, similar to those in Germany and the Netherlands
- Government should continue to support the development and upkeep of the WRAP Buildings Database
- Building Regulations should be developed, eventually to include whole-life carbon emissions
- In light of the Social Value Act, government should support further research on the benefits of managing and reducing embodied carbon.

The Task Force is not alone in pushing for change. In July 2013, Construction 2025 – supported by the Green Construction Board – reported its findings on the delivery of a more sustainable construction industry. This document sets out a route map for a reduction of embodied carbon of 21% by 2022 and 39% by 2050.

For some buildings, embodied carbon can make up more than 70% of a lifetime's emissions

There is a good business case for action. At present, cutting emissions by using materials with lower embodied carbon is very competitive – compared with 'in-use' solutions – because such measures as increasing insulation and improving window U values are already a requirement of Building Regulations. Embodied carbon reductions now will also have a greater impact than operational emission made in the future, when grid carbon intensity will be much lower, as a result of the wider use of renewable energy sources.

The measurement and management of embodied carbon has proven benefits as a proxy for capital investment reductions – Anglian Water has realised capital-cost savings of between 30% and 50% by tracking embodied carbon¹. Measurement is also likely to promote manufacturing innovation, job creation and local sourcing.

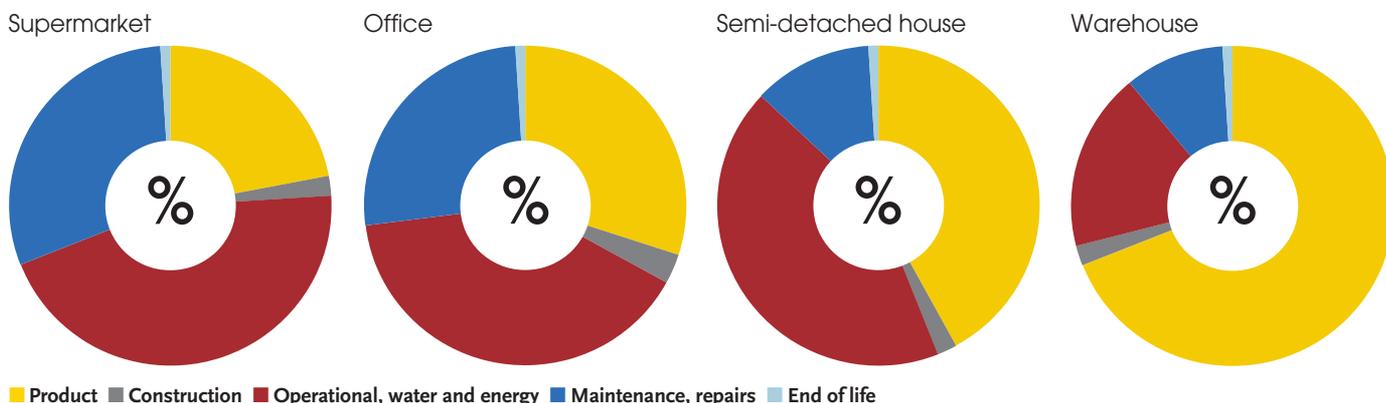
The 'nay-sayers' will argue that the regulations need to be centred only on in-use solutions – but, as the Task Force has proven, the industry is ready, standards are in place, and the benefits will be worth the effort. If climate change is our enemy, we must fight it on all fronts, not just one.

References

¹ www.anglianwater.co.uk/_assets/media/GHG_Emissions_report_2013.pdf

● **GUY BATTLE** CENG MCIBSE director of the Sustainable Business Partnership, has coordinated the Embodied Carbon Task Force

Figure 1 – Typical breakdown of embodied v operational carbon by building typology (RICS Professional Guidance, Global Methodology to Calculate Embodied Carbon, 1st Edition)



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Feedback

The *Journal's* readers question the security of smart grids, and the definition of zero carbon



Is smart secure?

Blaise Kelly suggests that smart grid systems will be far more resilient and efficient than anything before. In fact the electromagnetic vulnerabilities of widespread electronics in electrical distribution – and the need for dependable communications – are both becoming very significant security concerns. In a changing world, we do not seem to have addressed the question of whether protecting an electricity grid – essential for social stability – is a consumer cost, or a defence cost.

Chris Jones

Zero carbon definition

Can any of your readers point me to a reliable definition of 'zero carbon' that will form the basis of the changes in Building Regulations? It is clear that zero does not mean zero to many commentators on the topic, and Hywel Davies' usefully direct report on the Queen's Speech shows how HMG has not used the numerical definition either ('It is not always technically feasible or cost-effective for housebuilders to mitigate all emissions on-site.')

It would be immensely useful if zero was recognised as the

practically speaking unachievable ideal, much as 100% boiler efficiency still eludes us in almost all realistic installations.

Mitigation also needs a proper definition, both in itself and in its method of use, because it is intrinsically part of the meaning of zero carbon. For instance, it is ridiculous to allow a less carbon-efficient building to outperform a more efficient one through its connection to renewable sources. The 'scoring' ought to be solely on the building itself, plus its energy use. One also hopes that buying electricity from a green supplier cannot be used in mitigation, because grid supplies operate at the mean of all the generating sources connected to the grid, allowing for grid losses. It would be unhelpful for a building close to a connection of a renewable source to the grid to mitigate better than one that is close to the feeders from the River Trent complex of coal-fired generators.

We simply cannot afford to have regulations that allow passes or grading through misuse or twisting of wording, rather than genuine technical excellence.

John Moss, consultant, Arup Advanced Technology and Research

On CIBSE's LinkedIn group, readers ask if simple buildings are better, and whether water cleanliness makes a difference to efficiency

Mike Barker

Without a doubt! Einstein said: 'Any intelligent fool can make things bigger, more complex. It takes a touch of genius to move in the opposite direction.'

BRE's Prince's Natural House is a perfect example of a solution that avoids complexity, draws on tried and tested traditions, and still performs at the highest level.

Simon Owen

Look at Passivhaus – thoughtful layout, careful insulation and best use of natural ventilation and light.

It is that old adage of KISS – Keep It Simple, Stupid. I guess

the big question is whether we are clever enough to manage it?

Bruce Boucher

Complex building services create loss of profit, lack of operational understanding, heavier running costs, prospective legal issues, poor servicing, poor maintenance, angry client/operator. Add an FM company and the lot goes BANG!

Alan Taylor

The more complex, the more problems and increased chance for something you probably don't understand going wrong or breaking down.

Should an inhibitor be specified in water systems?

Eddy Warren

As someone who deals with both boiler plant and equipment to eliminate sludge and magnetite from both LPHW (low pressure hot water) and CHW (chilled water systems), I'd be rather alarmed if consulting engineers don't take this as a priority. It is not uncommon, however, to find clients and their FM contractors struggling with the problem at a later date.

Steve Munn

The correct type of inhibitor (if one is being used) is essential to prevent problems during operation. This can be decided only when all the materials to be used in the system are known. At the moment, water treatment specialists normally decide on which inhibitor to use, but unfortunately not all get it right.

John Coleman

There is often uncertainty about the best solution, thanks to the late decision-making on the boiler manufacturer to be used and their recommendations. Allied to this is the potential – under value engineering – to opt for a change in the pipe material (and even system volume).

● CIBSE LinkedIn discussion group hit 15,000 members in July. Join the group at www.linkedin.com.

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.

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V IS FOR VOLUNTEERS

The ASHRAE 2014 Annual Conference hails contribution of members after delegates hear of the successful outcome of a seven-year legal battle. **Tim Dwyer** reports from Seattle



Littleton said the stakes were high – not only financially, but also in terms of the integrity of the society

The volunteering efforts of ASHRAE members have been hailed by CEO Jeff Littleton in a key address at the society's annual conference in Seattle.

He praised volunteers and directors of ASHRAE (formerly the American Society of Heating, Refrigerating and Air Conditioning Engineers) who had supported the organisation during a seven-year legal battle with an insulation company that claimed ASHRAE guidance had put their products at a competitive disadvantage.

The case demonstrated the importance of the efforts of ASHRAE members around the world. The awards ceremony at the 2014 conference, once again, rewarded those who had given their time and expertise to benefit the building services industry over the previous 12 months.

The audience at Littleton's annual address were clearly taken aback by his revelations surrounding the legal claims. The insulation system manufacturer contested that the committee for the flagship building energy conservation Standard 90.1 had conspired to manipulate its content specifically to put

the company's products at a competitive disadvantage.

As well as potentially putting the whole ASHRAE consensus standards process on trial, as an anti-trust claim, any damages from a successful lawsuit could automatically be doubled or tripled.

Littleton said the stakes were high – not only financially, but also in terms of the integrity of the society. He said that the support of volunteers and directors and their ability to make tough decisions had enabled ASHRAE to dispute the claim.

The CEO reported that after six years of legal discovery, depositions, and countless court motions (including potential injunctions to prevent distribution of Standard 90.1) the case had finally been dismissed. Despite the dismissal, he noted that ASHRAE had allocated valuable volunteer and staff time, and more than \$3m (£1.76m) in legal fees to defend Standard 90.1 and the ANSI (American National Standards Institution) process.

This should act as a timely reminder to the many global institutions that are involved in setting standards or guidance. If appropriate

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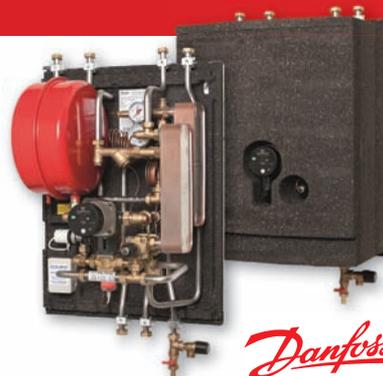
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Among this year's 89 award recipients was past CIBSE President David Arnold who was presented with a ASHRAE Exceptional Service Award by Bill Bahnfleth

process and rigour had not been followed in the development and quality assurance of, in this case, Standard 90.1, the outcome may well have been very different and could have had a far more devastating effect on ASHRAE than the, already not inconsiderable, legal bill.

The active participation of the volunteer membership will be crucial if ASHRAE's new strategic plan – mapping out its aspirations over the next five years – is to be achieved (www.ashrae.org/strategicplan). Those hopes and plans will depend on the active participation of the volunteer membership, and the ASHRAE leadership understand that the efficient use of their time is vital.

Passing the baton

In the same plenary session as Littleton's address, outgoing ASHRAE president Bill Bahnfleth reflected on his year in office. Speaking of his year in terms of a relay race illustrated by an image of Craig Virgin – the only American ever to win the world cross-country championship – Bahnfleth was keen to emphasise that it was teamwork that builds ASHRAE success as the baton passed from one president to the next.

Bahnfleth added that no one could afford to be complacent. Perhaps with Littleton's address in mind, he told delegates that with 'a bad pass, you not only will lose, you may be out of the race'.

Although previous presidents have made tentative forays into the world of social media, Bill Bahnfleth was already an avid Facebook user prior to taking office and he reported how he had made a truly global impact through his frequent and regular postings to the online social media site. This meant that, probably for the first time, many ASHRAE members (and others) understood something of what a presidential year entailed (www.facebook.com/ASHRAEPresident).



ASHRAE president Tom Phoenix opened his year in office by launching his annual theme 'People, Passion and Performance'.

He identified that the strength of ASHRAE was its 54,000 members, but he also recognised that they were finding it increasingly difficult to commit time for volunteer participation.

He quoted recent statistics that just over 20% of workers are (at least) moderately engaged with work activities: the percentage of ASHRAE members who volunteer for activities to maintain the working and development of the Society is very similar.

In his year of office there will be a number of committees that will be working on implementing the newly-revised ASHRAE strategic plan and one of these committees

will consider ways to maintain and improve the vital volunteer participation.

He cited an interesting shift in how ASHRAE members wish to engage from a recent member survey where the time required to participate in the regular conferences has been identified as one of the main reasons that many volunteers do not want to advance into leadership positions at ASHRAE.

This indicates a change in the ASHRAE society from that of the 20th century where large numbers of members regularly brought their whole family along to the meetings as their annual vacation.

Perhaps the online revolution, which allows Bill Bahnfleth to share his experiences, is also making the membership more reticent to spend time, money and environmental resources travelling to traditional meetings.

The challenge for Phoenix and the board is to ensure ASHRAE is both accessible and meaningful to the 54,000 global members so that a significant proportion of them continue to believe that volunteer activity is worthwhile and beneficial for them, as individuals, as well as to the broader community.

Phoenix finished up by quoting the words of late past ASHRAE president Lynn Bellenger: 'People will judge us on our performance, not our promises...' This is probably never more true than today where the ASHRAE member (as with all other institution/society members) is able to connect virtually and graze the torrent of information with little thought of real engagement at a technical committee, working group, board or conference. **CJ**

TIM DWYER, UCL teaching fellow, CIBSE Journal technical editor, has previously served as a director-at-large of ASHRAE and is currently vice-chair of ASHRAE Publications Committee and chair of the CIBSE ASHRAE Group

HOME IS WHERE THE HEAT IS

As global temperatures rise, overheating is becoming an urgent problem for the residential sector. With no government-enforced sanctions on maximum temperatures and little incentive for developers, **Liza Young** finds out what can be done to keep cool

6 We've forgotten how to design for natural ventilation in dwellings – we've lost the art
Michael Swainson

The consequences of climate change are not a problem for future generations – they are an immediate threat. Already, there is growing evidence of overheating in homes. According to the Committee on Climate Change (CCC), one fifth of domestic properties could be overheating, even during a cool summer. Flats, which make up 40% of new dwellings, are especially vulnerable.¹

By the 2040s, half of all summers are expected to be as hot, if not hotter, than in 2003, when temperatures of up to 38°C led to more than 2,000 excess deaths in the UK. A recent CCC adaptation sub-committee report predicts that annual deaths caused by high UK temperatures will triple to 7,000 on average by the 2050s.²

Yet at the same time, we are designing and building for winter energy efficiency, with

more insulation and higher levels of airtightness. The question for the industry is how to maintain these levels of efficiency, while ensuring that buildings are safe and comfortable in a hotter climate.

How hot is too hot?

One of the biggest challenges for industry is to define the term 'overheating'. What feels 'too hot' will always differ from person to person. It also depends on other factors such as humidity, duration and an individual's susceptibility.

According to Nicola O'Connor, projects adviser at the Zero Carbon Hub, it is more than just a measure of maximum temperatures. 'When we talk about overheating, are we talking about temperature thresholds or excess heat, or is it excess heat over prolonged periods of time? Are we talking about people's comfort being impaired, or is it to do with health issues?'

Current design guidance aims to minimise heat discomfort in buildings. For homes, the CIBSE *Environmental Design Guide A* sets out temperature thresholds of 28°C for living rooms and 26°C for bedrooms, and defines overheating as when these temperatures are exceeded for more than 1% of the time.

CIBSE's *TM52: The limits of thermal comfort: avoiding overheating in European buildings* says overheating 'implies that building occupants feel uncomfortably hot'. It goes on to state that 'there are some environments where conditions get so extreme that thermal stress is the issue, rather than thermal comfort'. Further research by CIBSE and Arup, in the UK Climate Impacts Programme report

Air conditioning as status symbol

At the 17 residential buildings on the King's Cross development in London, mechanical cooling was installed in one-third of the penthouse and duplex apartments. But it wasn't always necessary. Although this was confirmed by modelling, Robert Evans, partner at Argent, says the developer was 'slightly pushed into it by the market'.

'It irritates me that we have to put cooling into buildings that don't need it, but once you get above that £1,000 per ft² market price, it's really hard to ignore, and people will actually walk away from the product unless they have cooling.'

He adds: 'The big problem is that carbon is still very cheap. Cooling is a very small component of the service charge.'

Ashley Bateson, Hoare Lea partner, who



Cooling was installed into some King's Cross apartments despite the buildings's natural shading and ventilation

organised the CIBSE Homes for the Future overheating debate in June, puts it succinctly: 'If you had £750,000 to spend on an apartment, and you were asked "Would you like comfort cooling or – for £500 less – no comfort cooling?" what would you say?'



MICHAELJUNG / SHUTTERSTOCK

Beating the Heat: keeping UK buildings cool in a warming climate, adds that the heat stress 'danger line' is 35°C, particularly when combined with high levels of humidity.

Despite this, there is no statutory maximum internal temperature in Building Regulations.

This is contributing to a culture of ignorance among designers, suggests Michael Swainson, BRE principal engineer. 'To lower an average [temperature], you've got to lower the peaks, so you've got to kill all the solar and internal gains. But it's this that as designers we're missing,' he says. 'We've forgotten how to design for natural ventilation in dwellings – we've lost the art.'

Where there's gain

So why have we lost that art, and how do we rediscover it? Often the cheapest and most effective way to ventilate a room is to open a window. However, single-aspect flats render cross-ventilation impossible, and such flats are common in urban areas because of pressures on developers to meet density and commercial targets.

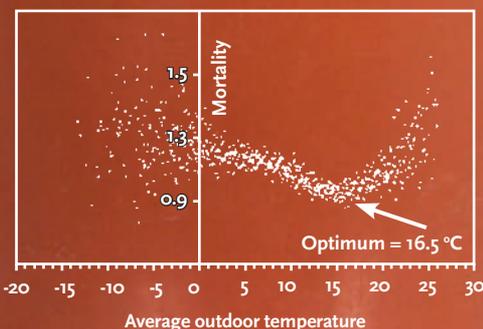
'Designers should start by looking at the ventilation strategy,' says CIBSE technical adviser on climate change and the built environment, Anastasia Mylona CENG MCIBSE. 'In single-aspect flats, an internal flue or atrium could get that flow of air.'

Noise pollution is another concern. Double glazing provides a good acoustic barrier, but this is broken as soon as the window is opened. Also, those unaccustomed to noisy environments are more reluctant to open windows.

Moreover, it is often the extent of glazing that is called into question when attempting to prevent overheating. Big floor-to-ceiling windows that provide daylight and 'killer views' are often seen as a status symbol in high-value locations, but these make flats far more susceptible to overheating.

Susie Diamond, building physics engineer at Inking, says: 'There's always tension between the desire for good daylight and not overdoing it in terms of solar gains. To my

Mortality rates rise as temperatures increase³



In extreme temperatures, mortality increased significantly during the heatwaves studied in the Netherlands (1979–1997)



Shading helps minimise solar gain in these King's Cross apartments

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RECENT CIBSE GUIDANCE

TM52 The limits of thermal comfort: avoiding overheating in European buildings is a new methodology for assessing overheating risk at the design stage. The three new criteria are based on an indoor adaptive comfort temperature, which varies daily according to the outdoor temperature over the previous few days.

TM49 Design Summer Years for London introduces the concept of incorporating the UHI effect and the severity of hot events in building design. Three DSYs are available capturing the climate in three London locations and for three years of varying severity of hot events.

Probabilistic Climate Profiles (ProClips) are representations of the UKCP09 climate projections. They are location and variable specific, and present changes for three time periods, three emissions scenarios and five probability levels.

Design for Future Climate – Case Studies illustrates lessons learned by design teams on improving adaptation resistance and resilience of building projects, and shows the impact that embedded adaptation strategies can have on design decisions.

Assessment tool for 'adaptive' thermal comfort and overheating risk in free-running buildings is a web-based tool developed with the Met Office to provide graphical information about daily local running mean temperatures, relevant bands of acceptable (adaptive) thermal comfort and overheating for a range of buildings. Visit www.cibse.org/knowledge

mind, there's no need for full-height glazing – it's possible to have a well day-lit space with a responsible amount of glass.'

Diamond suggests 'a happy medium can be struck' by positioning windows high up in the wall so that light can come as far back and as deep into the space as possible.

And then there are the other heat gains. In a typical two-bedroom flat with a thermally efficient façade, lighting and appliances can add up to 2kW before anything is even turned on. In smaller flats, where there are more overheating issues, people tend to squeeze the same amount of equipment in, adds Diamond.

Building services, such as hot water distribution and storage systems, although vital in winter, can cause unwanted heat in summer. A common problem is community heating pipework routed through corridors and common spaces. Diamond says: 'We're not often asked to model corridors or domestic overheating because it's not mandatory. There are designers that do, but housebuilders often don't have the margins to afford that or simply aren't invested enough.'

Cool attitude

One fear is that air conditioning and mechanical ventilation systems could be seen as the go-to solution as temperatures rise. A recent UN Intergovernmental Panel on Climate Change report⁴ warns that a growing international middle-class will spend more money on mechanical cooling to counter hot weather (see box on page 20). It expects demand for residential air conditioning in summer to rise from about 300 terawatt-hours (TWh) in 2000 to 4,000 by 2050, and then to

more than 10,000TWh in 2100.

No one solution for preventing overheating fits all dwellings. But simply changing the orientation can have a huge impact on both heat gains and the ability to reject heat, says Swainson. Solar gains late in the day from a west-facing façade result in higher evening temperatures and therefore the need to reject heat overnight. Solar gains early in the day from an east-facing façade, on the other hand, result in high daytime temperatures, but provide a long period of time to reject the heat, therefore minimising the risk of overnight overheating.

Swainson says: 'The key must be to address and minimise all gains at the design stage, but within that, an effective means of heat rejection must be provided. If it's not, then the internal temperature will reach and remain at an elevated level.'

Time for enforcement

A huge barrier for industry is that while energy is strictly regulated, summer performance is not, says Mylona. 'There's no regulation that tells you to make sure building design is not to exceed certain degrees.'

'Without any government supported "carrot or stick" it will be difficult for the industry to implement any methodologies for assessing overheating at design stage,' she adds.

The Zero Carbon Hub is building an evidence base for a proposed strategy by undertaking monitoring studies. The first of its reports, due in March 2015, will look at evidence of overheating in homes. In the long term, the Hub hopes to propose a methodology that could be implemented by government to ensure overheating is regulated and addressed by developers.

The Hub's O'Connor says the adaptation agenda tends to overlook overheating. 'The finding from our work is a feeling of lack of confidence at the policies, processes and regulations we have, and whether they are going to prepare us enough for the future climate and ageing population.'

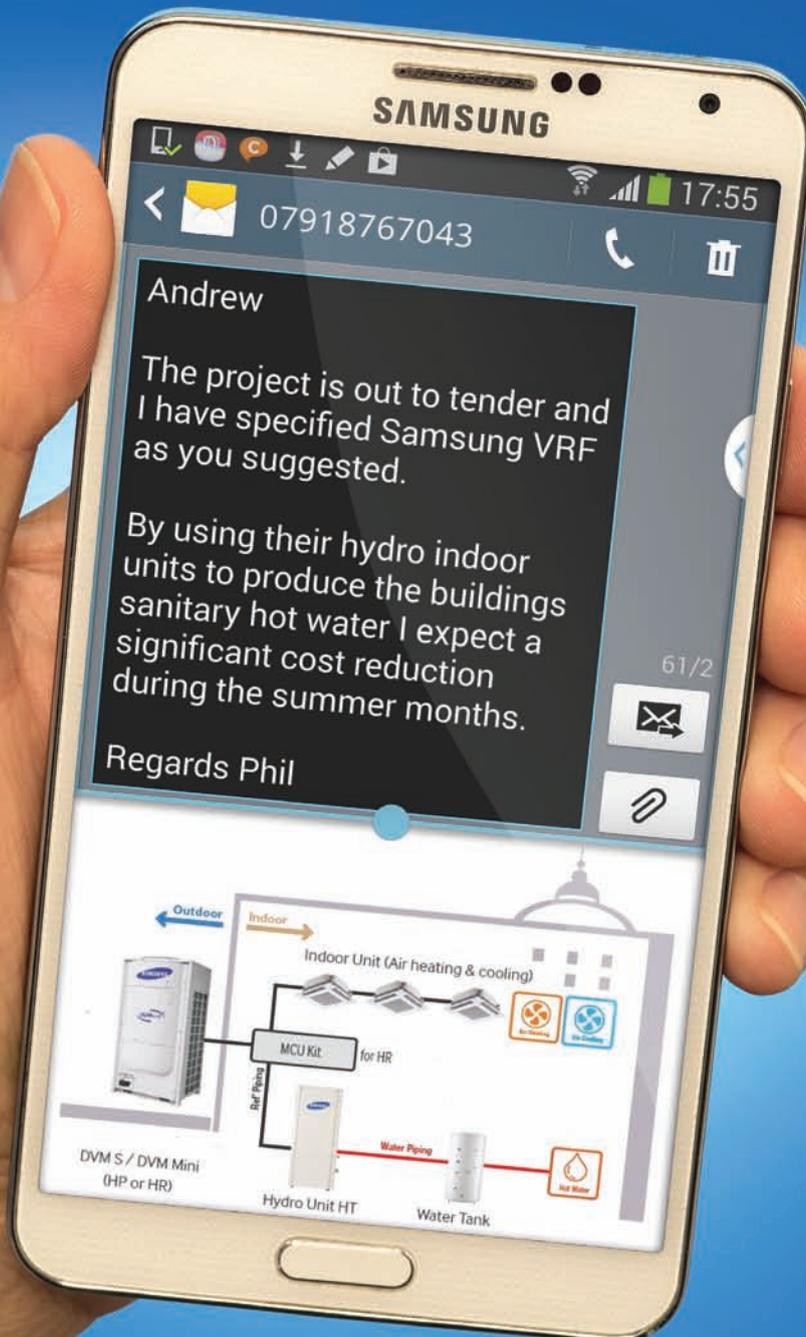
'The questions we're asking are,' she adds, 'Is good practice standard across the industry? Is there more that needs to be done? And will it be adequate in 10 to 20 years' time?' CJ

References:

- 1,2 *Managing climate risks to well-being and the economy*, CCC adaptation sub-committee progress report 2014.
- 3 *The impact of heat waves and cold spells on mortality rates in the Dutch population*, Environmental Health Perspectives, Volume 109, number 5, May 2001.
- 4 *Climate Change 2014: Mitigation of Climate Change*, UN IPCC fifth assessment report 2014.

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Air conditioning and
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HEADLINE ACT

Since launching five years ago, the Ska environmental rating for fit-outs has become an established assessment tool, and proved popular with retail and office sectors. However, says Aecom's **David Cheshire**, few building services engineers are yet marching to its beat

From a standing start, Ska has become a widely recognised assessment method that is mentioned in the same breath as BREEAM and LEED

The fit-out market is huge, both in terms of its value to UK construction and its impact on the environment. Existing non-domestic building stock represents 18% of UK carbon emissions, while fit-out and refurbishment activity accounts for roughly 10% of UK construction spend. Fit-outs represent a great opportunity to improve the environmental performance of a building, and yet – until the RICS Ska Rating was launched – it was something of a sustainability blind spot.

Fit-out projects typically involve a significant amount of building services input, with work ranging from renewing light fittings and taps, to major plant replacement.

Ska is an environmental assessment method designed to promote environmental and sustainable good practice in the fit-out and refurbishment of existing buildings. It provides good-practice measures that can

be implemented on a project, and has been widely adopted by property occupiers in the office and retail sectors, including the Bank of China, Yell, the BBC, GE, Westpac Banking, Derwent London, Nationwide and Lush.

GE has adopted Ska for its comprehensive fit-out of the Ark in Hammersmith (above). The fit-out included a complete re-fit of all nine floors, with a new cafe space and meeting rooms, as well as open-plan office spaces. The fit-out was completed in phases, with each section achieving an impressive Ska 'Silver' rating.

Ska covers eight topics, four of which are directly related to building services: energy, water, health and wellbeing, and pollution. The assessment criteria advocate: the specification and installation of energy- and water-efficient equipment; plant with low emissions (such as refrigerant and nitrous oxides); and controls and systems that help



the relevant criteria would achieve another point. This means that each time the design team decides to incorporate one of the good practice measures, they get rewarded.

Other assessment methods often require several different things to be incorporated before any points are awarded, and most other labels require calculations to be performed, based on the overall performance of the building. Ska has deliberately avoided assessing the overall building's performance, because fit-out projects are usually only related to a few floors of a building – or even one small section of a building. The design teams on these types of projects would have no influence over the performance of the envelope, or the central plant, of the building.

Ska assesses the project, whereas other environmental assessment tools tend to assess the whole building. So the project team can be rewarded for implementing a good practice fit-out, even if it has an inefficient central air conditioning plant. This means the design does not have to undertake calculations of energy use, which is more difficult for a fit-out project when the performance of the fabric and central plant is difficult to establish. The project can be assessed based on the efficiency of the equipment that is being installed, all of which is readily available to the assessor.

Selecting equipment from the ETL provides a simple way of ensuring that the installed equipment is efficient – and it means that the Ska criteria are kept up to date, because the list is regularly updated.

Equipment selected from the ETL is also eligible for enhanced capital allowances (ECA). This government scheme enables businesses to claim a 100% first-year capital allowance on investments in certain energy-saving equipment. This can save clients thousands of pounds on a project, but the financial benefits of this scheme are not that well known.

Clients are sometimes made aware of ECAs after the project has been completed, but many of the opportunities have been missed by this point. Applying Ska to a project both ensures that clients and designers are aware of the scheme at the early design stage, and makes it more likely that equipment will be on the ETL and, therefore, eligible.

The installation of more efficient equipment means that the fit-out can use less energy, providing it is well managed and the use – or the intensity of use – has not changed. A British Council of Shopping Centres report on low-carbon fit-out – *Cutting Carbon, Cutting Costs: Achieving Performance*

to promote comfortable and healthy internal environments.

For example, to meet the energy-efficiency requirements, equipment either has to be selected from the government's energy technology list (ETL – eca.gov.uk), or to meet the criteria set out for these products. For health and wellbeing, dedicated extracts have to be provided in printing and photocopying rooms to reduce the build-up of toxic gases – such as ozone – in the workplace.

The assessment method is broken down into a long list of 'good-practice measures'. Each of these represents one simple design principle or technology that can be incorporated into the project to help improve the environmental performance of the fit-out.

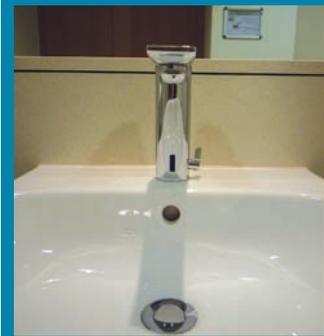
Ska is designed to be granular: ensuring that boilers meet – or exceed – the criteria set out in ETL would achieve one point, while selecting HVAC controls that meet

To date, there have been a small proportion of building services engineers who have qualified as Ska assessors



SAVING WATER

Spray taps with infra-red control were installed for wash hand basins at GE Capital's Ark fitout to reduce water use



PHOTOCOPIER EXTRACT

To meet Ska's health and wellbeing criteria, dedicated extracts have been provided on the Ark fit-out for the multi-function devices in the printer and photocopying rooms, to reduce the build up of toxic gases – such as ozone – in the workplace.



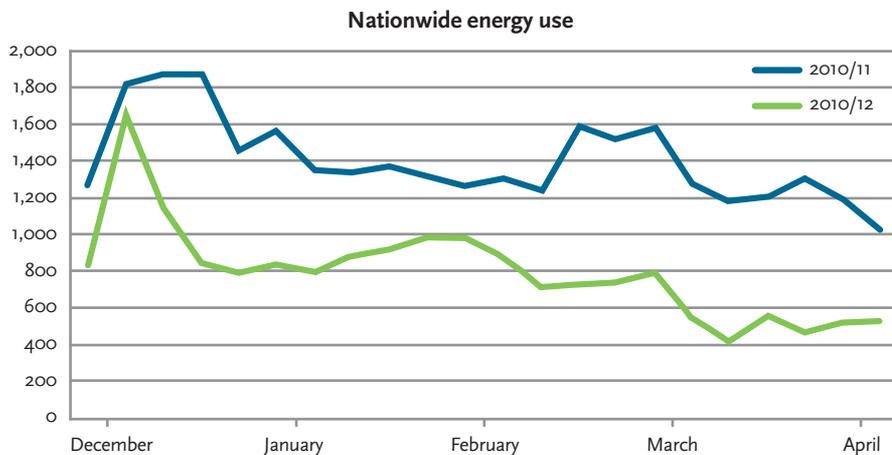


Figure 1: Comparison of energy use before and after fit-out of Oxford branch



SUB-METERING

Multiple electrical sub-meters were installed on each floor of the fitout to provide GE Capital with better information about where the energy is being used within the building. This data is then used to identify opportunities to reduce energy use.



Product labelling

Product selection is a key part of Ska. This includes everything from procuring energy-efficient technologies to using furniture that has low environmental impacts during manufacture, and high levels of recycled material. Grigoriou Interiors – a Ska development partner – is now looking to produce a label and directory for products that are proven to be Ska-compliant. This will allow designers to find and specify products much more quickly, and it will make the assessment process even simpler than it is now.

in *Retail Fit-outs 2013*¹ – includes a case study that demonstrates the potential savings.

Nationwide building society moved its premises from one location in Oxford to another on the same street. The fit-out was specifically designed to be low carbon, and achieved a Ska Gold rating.

Figure 1 (over the page) is a comparison of the energy use in the two buildings. The case study shows that it is more than 40% lower after the fit-out of the new branch.

The growth of Ska

From a standing start, Ska has become a widely recognised assessment method, mentioned in the same breath as BREEAM and LEED. It is referenced in documents such as the UK government’s *Low Carbon Construction Action Plan* and the British Council for Offices’ *Guide to Fit-out*, and the number of projects using Ska is growing exponentially.

The key to Ska’s growth is that it is designed to be much cheaper and simpler to implement than other environmental assessment schemes. It is entirely online, with guidance, assessment methodology, and even certification generated through the tool.

Its aim is to promote good practice in fit-out projects, so the online tool – and the associated good-practice guidance – can be accessed by anyone. Anyone can also train to be an assessor, and RICS provides a two-day training course that includes a one-day, face-to-face session, followed by online modules and an exam. There are currently more than 300 Ska assessors, and the number is growing. Qualified assessors can evaluate projects, and generate certificates once it has been demonstrated that the project meets the Ska criteria.

To date, only a small proportion of building services engineers have qualified

as Ska assessors. This seems like a missed opportunity, bearing in mind the number of fit-out projects that require input from building services engineers. (See rics.org for more information.)

Ska broke new ground when the offices scheme was launched in 2009, and in 2011 the retail version was launched. The aim is to increase the adoption of Ska – particularly in retail – and to continue to push out sustainable good practice into other sectors.

Volume certification

RICS is developing volume certification for the retail scheme that will allow clients to assess the fit-out activity on their entire portfolio. It will enable retailers to assess hundreds of branches and stores for a fraction of the cost of certifying each one individually.

Volume certification works on the basis that retailers often have one, base, fit-out specification, which they roll out across their portfolio. The volume-certification approach would first assess the base specification and the framework contractors delivering the projects, and then audit a sample of the branches to ensure they are compliant. The pilots for volume certification have already started, and two high street banks are involved.

Higher education

More than 30 universities have been using the Ska online tool for fit-outs for office areas. For example, UCL and City University have their own assessors to review their projects. UCL has even developed its own criteria for laboratories, which it is applying, informally, to projects. RICS is now working with the Association of University Directors of Estates and Aecom to develop a formal version for higher education facilities, including laboratories and lecture spaces.

Conclusion

Ska has been a great success story, and has helped to promote sustainable good practice in fit-out and refurbishment projects. It can provide tangible and reputational benefits to occupiers and other stakeholders. The ultimate aim is to get it widely adopted – to the point that it is embedded in all projects – and building services engineers could play a much bigger role in achieving this goal. **CJ**

References:

¹ http://www.bccsc.org.uk/publication.asp?pub_id=474

DAVE CHESHIRE is a regional director in Aecom’s sustainability team. Aecom developed the Ska rating tool and technical standards, and delivers the technical training on behalf of RICS.

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This month: energy piles gain ground in the UK; Skelly and Couch's 'passive first' approach at the Ortus learning and events building; and research reveals issues around ground source heat pumps

Therm FOUNDATIONS

Energy piles and other thermal foundations are gaining in popularity in the UK, thanks to government incentives and rising energy prices. **Tony Amis** and **Fleur Loveridge** on how designers are using the concrete structure to help heat and cool buildings

The concept of energy piles is not new. The approach was pioneered in Austria in the 1980s¹ and taken up in a number of other northern European countries².

In a typical scheme, all or part of the building foundation is equipped with geothermal loops connected to a ground source heat pump, leading to delivery of, on average, 15 to 25% of the building heating and cooling requirements.

A single energy pile may deliver between 25 and 50 W/m, depending on its size, construction details, the surrounding soil types and how the system is operated³.

These figures are not dissimilar to borehole heat exchangers, but the larger diameter of many energy piles offers the opportunities for greater heat transfer rates. Even without considering heat transfer rates, placing geothermal loops into building foundations, is a 'no brainer'. Energy piles, or other thermal foundations provide a very simple, low-cost and time-saving solution,

compared to other ground loop options. There are three major benefits.

Firstly, energy piles can be installed without having to increase the size of the foundations. Very few projects have been designed around the geothermal requirements. Instead, calculations for the amount of heat and cooling that can be provided is based on the building's structural design requirements.

Secondly, geothermal loops can be attached to structural reinforcement cages being installed within the foundation, thus adding little additional cost to a project, compared to other geothermal solutions. A minimal amount of extra steelwork may be required where cages do not extend the full depth of the pile, and for continuous flight auger type piles.

Thirdly, significant advantages can also be applied on the construction programme; with good early coordination, little extra time is required for the installation of geothermal loops in the buildings foundation. ➤

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Energy foundations installed for the Crossrail in London

ENERGY PILES INSTALLED AT CROSSRAIL IN LONDON

Source: GI Energy

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150kW – 300kW cooling
- **Collector type:**
Energy Piles, Energy D. Wall
- **On site:** Farringdon Street, Tottenham Court Road, Bond Street, Fisher Street, Paddington

► **Energy piles in the UK**

In the UK, heat pump systems were slow to take off, principally due to the availability of relatively inexpensive gas. However, as the difference between electricity and gas costs is reducing, the UK heat pump industry is consequently expanding⁴. As part of this expansion, installing geothermal loops into building foundations is becoming increasingly popular in the UK (Figure 1) and, with recent changes in planning policy, is likely to become increasingly so.

In central London there are very costly penalties for buildings that do not achieve the 40% energy savings above Building Regulations Part L. In addition, the UK's Renewable Heat Incentive (RHI) is making all types of renewable heat, and especially GSHP schemes, more attractive. Significant growth is expected this year as the final parts of the incentive scheme come into place, and consequently, the costs of energy piles and other ground loops schemes decrease further.

There have recently been a number of landmark energy pile schemes constructed in the UK, as well as numerous smaller projects. GI Energy has recorded more than 50 projects

across the UK with installed and functioning systems. GI Energy has completed most of these 50 projects, with the most notable being the 2MW heating and cooling solution at One New Change (figure 2), which is currently delivering annual energy savings of £65,000, and saving almost 300 tonnes of CO₂ every year. GI Energy has recently started work on two similar-sized energy pile projects during 2013 for Network Rail (the UK rail asset owner) at London Bridge Station and also at a new London embassy building.

Geothermal loops have been successfully installed into all foundation types, and in both large-scale commercial and residential developments. There are a multitude of options for installing geothermal loops. For a project to be successful, it is recommended that a GSHP specialist should be appointed early in the development of a project to assist in providing various options, with a view to identifying the best value solution – which may even be a combination of ground loop techniques.

It is important to set clear guidance on roles and responsibilities, and to ensure coordination is central to all parties. The UK Ground Source Heat Pump Association Thermal Pile Standard sets out clear guidance on roles and responsibilities in this respect (www.gshp.org.uk).

It is not just foundation piles that are suitable for installation of ground loops. GI Energy also completed geothermal loop installation into the first diaphragm retaining wall at the Bulgari hotel in Knightsbridge in 2010, after much early coordination with the project management team. The project also included energy piles, and is now delivering more than 200kW of heating and cooling.

The UK's largest civil engineering project, Crossrail, has also offered the opportunity to equip piled foundations and retaining walls with geothermal loops (figure 3).

The last decade has seen an increase in research into energy pile applications at UK universities. Roger Bullivant, a piling contractor with a strong business in the domestic housing sector, was keen to develop energy pile solutions and worked with Nottingham University to develop a test-bed site⁵.

The first year of operation showed the viability of short energy piles for the domestic market. However, it also illustrated some limitations of existing design methods – such as Earth Energy Designer – when applied to such short heat exchangers for which it was not designed⁶. The research also suggests that for heating-dominated domestic properties, it

6 Geothermal loops can be attached to structural reinforcement cages being installed within the foundation, thus adding little additional cost to a project

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will be important to ensure appropriate solar recharge in the summer months, to provide for the long-term sustainability of schemes.

Research is also being carried out at the University of Southampton into the thermal performance of energy piles. A key result from the work is the importance of the contribution, from the concrete within the pile, to the short-term thermal storage within the heat exchanger⁷.

The heat capacity of the ground heat exchanger is not normally taken into account in traditional ground loop design methods, but research suggests that this approach could lead to underestimation of the energy capability of energy piles⁸.

This means that the true potential for energy piles is yet to be fully realised. Some resistance to the adoption of energy piles arises from concerns that the temperature changes, occurring within the piles impacting the structural and geotechnical performance of the pile.

Despite the successful operation of energy piles schemes in Austria for many decades, some clients require more robust assurance. The University of Cambridge and collaborators have been working to set out the mechanisms of thermo-mechanical response of energy piles,⁹ and to develop a new design approach, which will allow any such concerns to be allayed. Other work has shown that previous approaches may have overestimated the temperature changes that would be occurring in the soil surrounding the piles¹⁰ and this is also helping to show that properly designed and operated energy piles will pose no risk to the structural operation of the foundations.

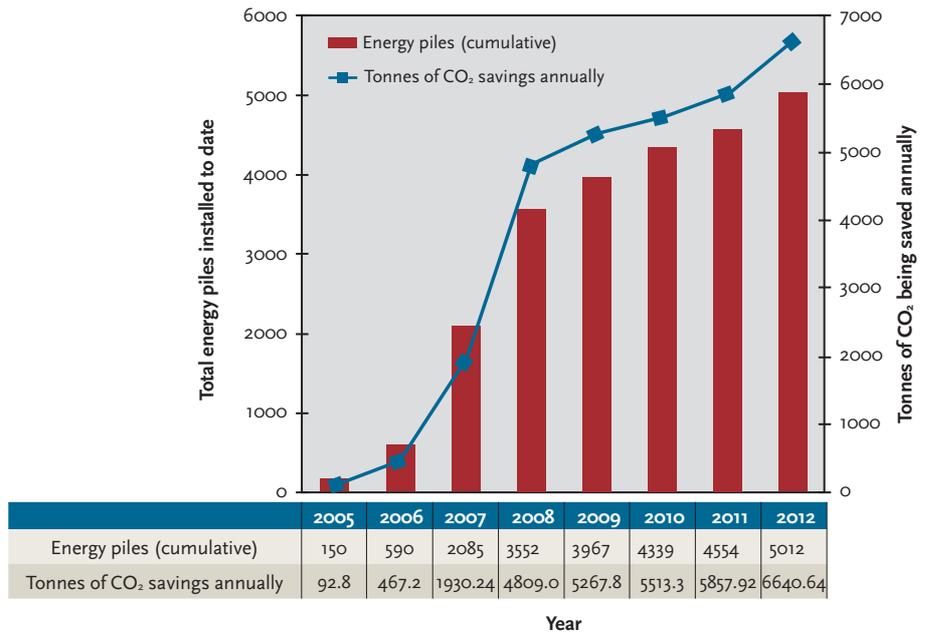
Conclusions

Energy piles, and other thermal foundations, are a technology with a growing take-up in the UK. Implementation of energy piles has been supported by an active group of researchers, who are working with industry to show the benefits of making dual use of building foundations. A number of successful projects have recently been implemented, and these include the developments at One New Change and the Bulgari Hotel in London. With the recent UK government incentives for renewable heat, the potential for further adoption of energy pile solutions is growing fast. **CJ**

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Energy piles installed in the UK and resultant annual CO₂ savings to date at September 2012



Tonnes of CO₂ savings have been increasing year on year since 2005

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DAVIDJOUNG / SHUTTERSTOCK

For heating-dominated homes, it will be important to ensure appropriate solar recharge in the summer months to provide for the long-term sustainability of schemes



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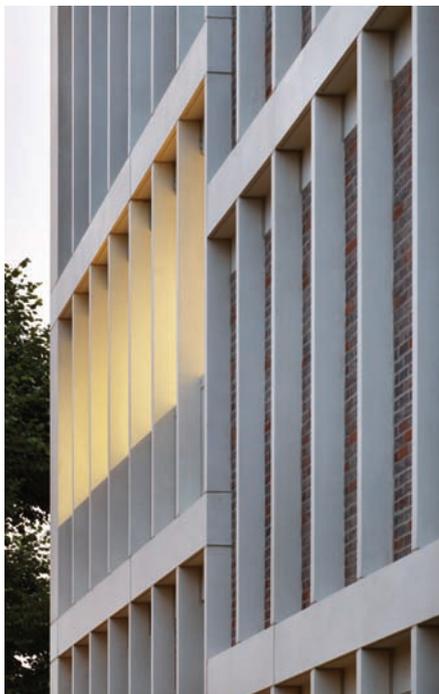
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THE LIGHT FANTASTIC

The Ortus learning and events centre is an uplifting addition to the Maudsley hospital estate that benefits from a collaborative approach to design. **Alex Smith** reports



The deep window reveals help both to provide shading to the interior and reduce solar gain



PROJECT TEAM

- **Client:** Maudsley Charity
- **MEP, acoustic and environmental consultant:** Skelly and Couch
- **Client representative:** Articulate
- **Architect:** Duggan Morris Architects
- **Construction manager:** Cavendish Berkeley
- **Structural engineer:** Elliott Wood
- **Cost consultant:** Measur
- **Mechanical contractor:** Elmstead Mechanical
- **Electrical contractor:** Livewire
- **Controls specialist:** AIS

In recent years health experts have identified five factors associated with mental wellbeing: connecting with others; learning; giving; being active; and taking notice were identified as the elements key to good mental health by the New Economics Foundation in 2008.

Now there's a building that reflects these findings. The Ortus learning and events centre in Camberwell, South London, is a light-filled cube that invites the public to share space and resources with academics, doctors and patients on the Maudsley mental health campus.

The £6m event and conference building, sponsored by the Maudsley charity, is designed to be an uplifting, welcoming space that is open to all. It's the antithesis of the fortified Victorian asylums that were closed after the NHS moved from institutional to community care 30 years ago.

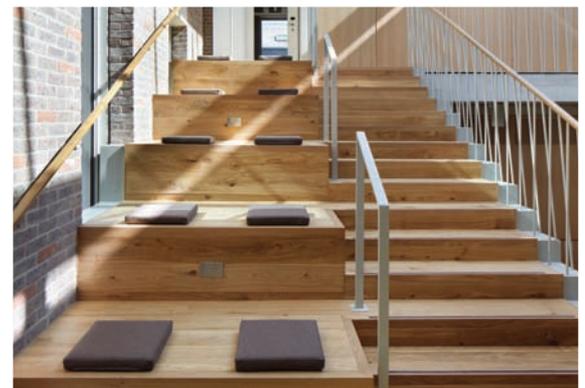
'It's got the Festival Hall factor,' says Ken Cowdery, the client representative from Articulate. 'Everyone is welcome. There are no barriers or security guards at the entrance. You can't tell who's a doctor, a visitor, a patient, or the local who's come in for a cup of coffee. It's changing the perception of what mental health is.'

Designing such an open, collaborative building presented the building services consultant, Skelly and Couch, with some tough design challenges, particularly around acoustics, thermal comfort and daylighting. The Maudsley wanted large, open spaces that could also function as intimate, contemplative spaces when required. The challenge was amplified by the decision to pursue a natural ventilation strategy as far as possible and to flood the building's core with daylight – Skelly and Couch had to devise a strategy allowing the free flow of air and penetration of daylight, while blocking noise.

Fortunately, the consultant was able to



Generous amounts of daylighting mean lighting is rarely needed in the interior during the day



Half levels encourage connectivity as people are more likely to walk up small flights of stairs – the lift is hidden away

influence the design at an early stage by engaging with the architects at building inception and then working closely with the trade contractors, thanks to the use of PPC2000 procurement. This awards projects to trade contractors on the basis of an outline brief and cost benchmark, and allows them to work



JACK HOBHOUSE



Ortus was positioned away from other buildings to minimise overshadowing

The charity's vision of an open, engaging building is reflected in its design, which is arranged over seven half-levels on a sloping site. Daylight floods in via windows and rooflights into a central atrium, where people are encouraged to meet and relax on the main staircase and half landings. The café has been placed at the entrance to tempt passersby inside, while wooden floors, exposed brick walls and burgundy drapes give the environment a warmth not usually associated with hospital estate buildings. As well as a large conference space, there are also smaller meeting rooms, offices and a terrace on the roof with uninterrupted views towards central London.

The requirement for an open, connected building helped drive the services strategy, according to Skelly and Couch director Mark Maidment. 'The Maudsley's philosophy works for us,' he says. 'We pursued a passive first "aircon light" strategy and its open form aids natural ventilation.'

Engagement with the architect at inception meant that Skelly and Couch were able to drive the form of the building at an early design stage. The consultant was responsible for positioning the building away from other structures on the estate to maximise daylight. It used the sloping topography of the site to step the structure and create half levels that give a sense of openness in the atrium and allow sunlight to penetrate deep into the plan (see diagram on page 31).

Skelly and Couch minimised the need for mechanical plant, by utilising the passive stack ventilation effect in the atrium (which also doubles up as a theatre space on the ground floor). Fresh air enters the building through



Skelly and Couch used the topography of the sloping site to create half levels which helped maximise daylighting

automated and manual windows, before passing up through an atrium and out of the building via louvres in the roof (see diagram on page 31).

In the main conference rooms, which can accommodate 120 people seated, the raised flooring acts as a supply plenum. Fans can be turned on to encourage the movement of air, and cooled, if required, by a closed loop ground source heat pump (GSHP) consisting of 120m vertical loops and a heat/cool pump. An open loop system utilising the 'Camberwell' was considered, but the site's position at the top of a hill made the option unfeasible. A 71m² PV array on the roof (44 panels measuring 1.6m x 1m offering 10kW peak) helps power the GSHP, and saves at least

collaboratively with design teams to an agreed budget. The result was that everyone on the design and construction team – from architect to contractor to M&E specialists – shared the client's vision for the building and were able to feed their expertise into the designs.

Opening doors

The Ortus learning and events centre is the home of Maudsley Learning whose mission is to 'support and provide world class and accessible learning in mental health and wellbeing.' Together with Ortus Online, Maudsley Learning aims to reach a local and world wide audience.



The ribbed design of the concrete soffit – seen here in the cafe and atrium – boosted thermal and acoustic performance



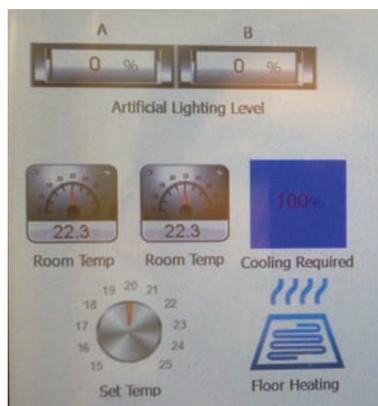
IN CONTROL

By combining the lighting and HVAC controls on one network, Skelly and Couch were able to cut control costs by 40%.

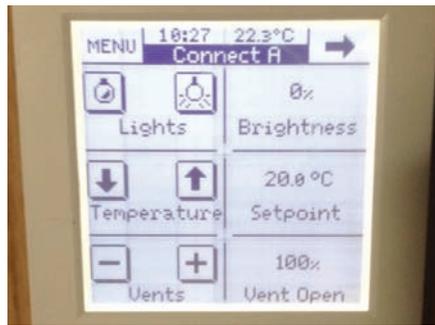
The controls specialist AIS suggested combining the controls using the well-established KNX protocol, which meant that lighting and HVAC could share field wire and the control system.

Temperatures, lighting, and windows can all be controlled from a single control panel in each room (right), so avoiding the clutter of multiple wall panels.

A lot of thought went into the design of the control panels. 'People are often intimidated by controls and don't understand them, but they don't like to say in case they appear stupid,' says Maidment. 'The person managing the building has no building services experience so we had to make sure the systems were understood.'



Graphics on the plant room control panel designed to be operated by non-engineers



Single control pads operate lighting and HVAC

► 4 tonnes of carbon dioxide each year.

While only the conference room is mechanically cooled (when occupied), every room – the café being the only exception – has underfloor heating.

Exposed concrete soffits are a key component of the 'aircon light' strategy. The thermal mass provides cooling, and Skelly and Couch were able to increase the area of effective thermal mass by using a ribbed design that increased the surface area of the exposed concrete.

The success of the ventilation strategy depended on air being able to flow between separate rooms. To stop noise interference between connected spaces, cross talk attenuators were used, which allowed acoustic privacy without inhibiting air flow.

For Skelly and Couch's low energy design strategy to be realised in the operation of the building, design details and installation had to be of a high quality. For example, the envelope needed to have very good airtightness and the supply plenum in the conference room had to be well sealed.

Maidment says the two stage open book procurement method enabled consultants and subcontractors to speak to each other and ensure a high quality installation. 'Often there's a main contractor in the middle who doesn't understand what we're doing, and they make the decisions.'

Maidment says the airtightness of the façade was dependent on quality workmanship. 'It was about making subcontractors understand why they've got to do things in a certain way. If they know why they are doing it they are more likely to do it properly,' he says.

Another area where close collaboration between subcontractors was crucial was in the underfloor heating, where the heating elements had to be in close contact with the metal plates, in order for the floor to radiate heat. Discussions between the base floor contractor and mechanical engineer ensured a good result.

One year on

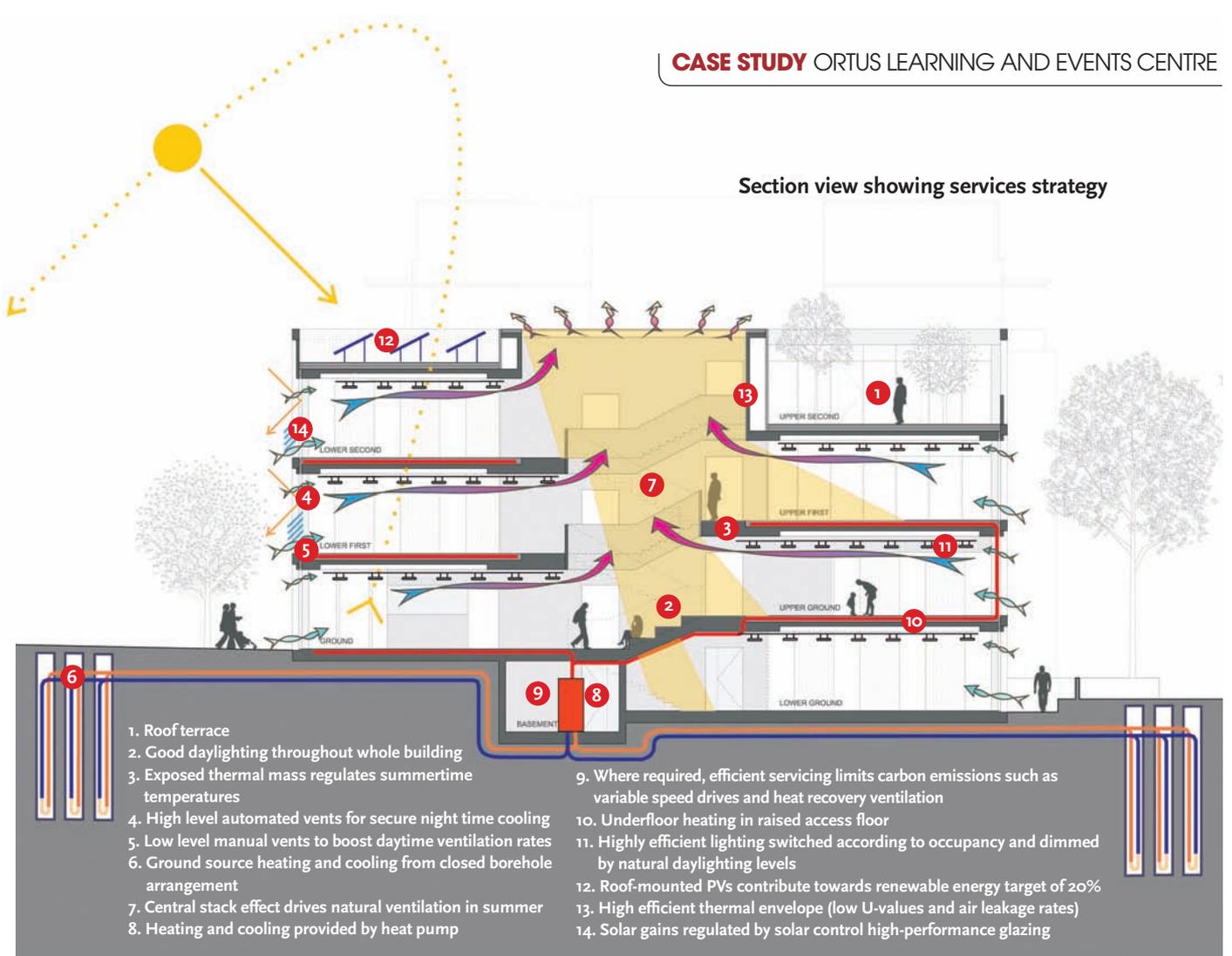
Ortus has now been in operation over one winter and summer. Maidment says the GSHP has worked well during that time achieving a COP of 3.8, slightly better than expected. The COP was calculated by measuring the complete electrical demand including all circulation pumps, an element that often gets missed says Maidment.

Skelly and Couch has been monitoring energy during the defects period, and may be employed on a soft landings strategy when this comes to an end. During that time it has worked with the control contractor to come up with winter and summer settings. 'The settings are very different,' says Maidment. The period when you go from winter to summer is quite short, which I was surprised by. As soon as you have a few hot days you need to change over.

Maidment says it has taken a little while to get the meters to read properly, but says figures from the spring and summer were looking very good and approaching the design figures. 'We are looking at huge savings on the artificial light because the building is very well daylit, and as we move into the summer we are seeing the benefits of the passive cooling strategy.'

The open book partnering agreement meant that everyone knew what budget was being worked to, so if any element was coming in over budget, design teams looked at how they could value engineer costs elsewhere.

As a result the project came in 'on budget, on time, and on quality,' according to Cowdery and the Maudsley now has a world-class building to match its reputation. **CJ**



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WHAT LIES

A huge number of ground source heat pump (GSHP) installations are failing to meet their performance targets, leaving end users angry and frustrated, according to B&ES's David Frise. He goes beneath the surface to find out what is going wrong

It is not uncommon for as much as 9kW to be lost in transmission from a GSHP calculated to deliver 28kW of heating capacity to a sizeable domestic property



TECHNICAL SYMPOSIUM

University College London is the venue for the 2015 CIBSE Technical Symposium. The event on 16-17 April asks if 'we are making our building systems too complex'. To submit your papers, presentations and case studies for consideration go to www.cibse.org/symposium or email symposium@cibse.org. Deadline for 250-word proposals is Monday 8 September 2014.

Ground source heat pumps (GSHPs) are being misapplied, poorly designed and installed, and badly operated, right across the country.

Expert teams from the Building & Engineering Services Association (B&ES)¹ have analysed a large number of installed systems and found them wanting. Poor understanding of the technology and failure to calculate system capacities properly are undermining projects, and leaving clients with an expensive legacy.

A reduction of one third of a system's capacity is not uncommon as a result of transmission losses, as heat leaks away from poorly insulated pipework and plant components. This, in turn, leads to problems with system undersizing. In some cases, the B&ES team found losses as high as 45% of the total capacity, as a result of poorly insulated pipework.

The insulation does not meet the level set out in the approved guidance to Part L, and even that is inadequate, with twice the level given in the guidance required to reduce transmission losses.

Capacity

The industry is still on a steep learning curve with GSHPs, so is applying many 'rules of thumb' learned from more traditional

heating systems. As a result, it is massively underestimating the capacity required in many projects. Buildings are becoming better sealed – so the requirement for space heating is reduced – but the systems still need long pipe runs that must be properly insulated.

A common fault is that valve bodies and strainers are not insulated because installers believe they need to be left clear for service and maintenance purposes. However, this creates another source of heat loss, further degrading the performance of the system. Insulation products are available that will allow removal of the covering for access.

It is not uncommon for as much as 9kW to be lost in transmission from a GSHP calculated to deliver 28kW of heating capacity to a sizeable domestic property. This completely undermines the design strategy, and means the system is not up to the task.

The Microgeneration Certification Scheme (MCS) will usually advise installers to upgrade the ground loops in this situation – but this drives up the capital cost and increases the ground area required for the system. Doubling the size of the ground work is usually practically – and commercially – impossible.

It is possible to abandon the ground loop approach and drill boreholes, but these would need to go down to around 100 metres below the surface. That is a considerable, and expensive, civil-engineering challenge – and totally impossible in many places, because of geological conditions. Rather than embarking on such an expensive and potentially harmful exercise, the B&ES experts are urging contractors first to address the fundamental problems of

BENEATH

transmission losses, so the systems will perform more efficiently.

[See *CIBSE Journal*, August 2013 issue, in which former-Hoare Lea design management consultant Huw Blackwell addresses the problem of transmission loss in district heating, in his article 'Foiling the great escape'. CIBSE and the Combined Heat and Power Association have formed a partnership – CIBSE CHP-District Heating Group – to develop a code of practice for heat networks, which is due in the winter.]

Retrofitted

GSHP systems are seeking to deliver coefficients of performance (CoP) in the UK of between 3 and 3.5. However, you can potentially achieve this more simply with air source heat pumps (ASHPs) that deliver the heating load at the point of use, without the risk of transmission losses. ASHPs are cheaper and easier to install, and they can be retrofitted to existing properties, and to a wider range of buildings, because they do not require so much space.

Air source should not be seen as the perfect solution for every project, but they do represent a lower risk for the user because there is no need for geological surveys and groundworks. However, this is not a popular message for many contractors who have invested in groundwork expertise in anticipation of a growing market.

One common failure on GSHP installations in the UK is with manifolds. Metal manifolds, connected to plastic pipework by brass fittings, regularly suffer stress fractures because the connecting nuts are subject to almost constant condensation in ground conditions just above freezing.

A high percentage of metal manifolds have now been replaced with plastic alternatives, but this is not cheap or easy.

Most of the GSHP systems used in the UK are supplied by manufacturers from continental Europe, where they have not had the same level of failures. This is largely because we have tried to adapt their systems to much more complicated projects. In the main, European projects supply a single building, using a packaged system with all the components pre-installed and tested. A lot of UK firms have tried to adapt the equipment designed for one building to supply multiple properties, and have over-complicated the design.

A common finding of the B&ES team was that space-heating capacity would disappear when the system was delivering domestic hot water (DHW), because the system was undersized and/or poorly controlled. A packaged approach keeps the installation simple, but – more importantly – contractors should seek to 'modularise' their designs. By breaking down the system into sub-systems, it becomes easier to calculate capacities and performance characteristics accurately.

The importance of keeping things simple is a message that has travelled across the Atlantic. Steve Kavanaugh – professor emeritus of mechanical engineering at the University of Alabama, and author of ASHRAE's guidance on GSHPs – says manufacturers' salespeople have confused the process. He points out that early installations for commercial and institutional buildings mimicked simple residential designs, but this approach 'was largely abandoned in preference for



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6 Metal manifolds, connected to plastic pipework by brass fittings, regularly suffer stress fractures in the UK because the connecting nuts are subject to almost constant condensation in ground conditions just above freezing



GETTING IT RIGHT

Read how issues with a ground source heat pump were successfully resolved at the Department of Earth Sciences at the University of Oxford. All hands to the pump, *CIBSE Journal*, August 2013. The project illustrates the importance of the involvement of the design and construction team during the post-occupancy stage.



more complex systems'. Results from his field studies showed simple systems outperformed complex GSHPs by a wide margin in the US.

'In complex systems, you have a lot of equipment generating extra heat, which pulls a lot of energy. Sometimes you end up with COP of 2.2, which is rather low for something you have paid a lot of money for,' he said.

Ratings

Kavanaugh added that it was easier to get Energy Star (the US energy efficiency certification scheme) ratings with the simple GSHPs. He also said US field studies had revealed that only one out of 14 systems with variable speed drives was working properly.

'Many engineering companies are not training their junior engineers properly, which means too much of the direction on equipment specification is coming from equipment vendors, who would rather sell something more complex,' he said. If there is an information gap in our industry, it is only natural that manufacturers will move in to plug it.

However, the engineering community has to be able to assimilate that information and shape it, so it can deliver the right solution. That is not to say manufacturers' information is not good, but it is technology specific, and aimed at giving the contractor the cheapest solution to secure the projects – whereas contractors require a project-wide overview.

At the end of the day, it is the end user

who is left to pick up the bill, and electricity suppliers are now getting wise to heat pump installations. They will check the starting current for the system, and those without 'soft start' functions will be put on a much higher tariff. Starting currents can be between six and eight times higher than running currents in heat pump systems.

Also, many manufacturers' figures are based on the equipment's full-load performance – as soon as demand drops off, efficiency plummets. In one case, our researchers found that pump efficiencies had dropped to just 11% in part-load conditions.

We have to stand back and reassess what we are doing. The industry cannot continue to do the same things it has been doing for 20 years. This applies just as much to gas boilers as renewable technologies. In particular, we have to focus on how systems are integrating, and how well they are being controlled – a single technology improvement will not deliver the performance goals required on large projects. We have to split the system down into sub-systems, and ensure each part is properly engineered and controlled.

Ideally all projects would reference CIBSE Guidance TM51 and be designed to that level. However, clients don't always like spending on design so D&B contractors are often under pressure to either leave out this level of detailed design work or find a way of absorbing the cost. The best way is to take the modular approach, standardise it as much as possible so it can be used on repeat projects.

At the moment, there is a lot of guessing going on. Using degree days to estimate annual performance figures for an installation can deliver a result as much as 40% away from operational reality. Can we really say to a client: 'I estimate this will cost you £5,000 a year to run – give or take 30 or 40%?' That is one hell of a performance gap.

Not good enough – and with energy prices rising, not a recipe for a happy client. **CJ**

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- 1 Research into ground source heat pumps for B&ES was led by energy consultant Clive Earp, who presented on the general topic of simplified design and the difficulties of integrating renewable technologies at the 2013 Technical Symposium in Liverpool <http://bit.ly/1p1NAkF>. Case studies are being prepared from the research so that B&ES can provide guidance to its members and anyone else interested.

DAVID FRISE is head of sustainability at the Building & Engineering Services Association (B&ES). www.b-es.org

THE GREAT SOURCE

Groundwater, widely available in the UK, has great potential for energy and CO₂ reduction. An integrated heat pump technology may help to harness it sustainably and profitably.



Integra unit, by Climaveneta@Portanuova

With energy security issues and carbon reduction targets on the top of the agenda for country and urban authorities, groundwater as a renewable energy source for heating and cooling through heat pumps is enjoying renewed popularity in the UK as well as in the whole of Europe. This is no surprise, as indeed water source heat pumps offer an ideal answer to many energy and sustainability challenges relating to built environment heating and cooling, maybe a bigger surprise is that groundwater is actually more largely available and more easily accessible than we think.

Looking at an example in London, research from London University and the Environment Agency maps the existence of a rich aquifer at relatively reduced depth in most of the city.

Actually, ground source use with heat pump systems is not new in the city. Many landmark buildings such as the Portcuillis House, the Royal Festival Hall, The Queen's Gallery in Buckingham Palace, The Sadler's Wells Theatre, The Zetter Hotel and the City Hall by Norman Foster are already using groundwater for heating

and cooling, either from the aquifer or from the Thames.

Also the new under-construction US embassy, just awarded the 2013 new London Award in the Office Buildings category has been designed in a sustainable way using the groundwater to improve the total energy performances of the building.

The use of GSHP systems for heating or cooling is widespread in Germany, France, Switzerland and Sweden. In the UK, it is an emerging technology but at the moment is still far from the real potential, as the Milan case shows, where the aquifer is also particularly rich and accessible.

In this context a specific heat pump technology, Integra, may help to make a difference for a more effective, sustainable and profitable use of ground source resources. Developed by Climaveneta, a major European manufacturer, Integra heat pumps provide for simultaneous and independent heating and cooling production. By synergistically integrating heating and cooling production in one single unit, they offer very high efficiencies especially in the case of a

simultaneous heating and cooling request, where either heating or cooling is provided for free. This is a very common request in modern buildings with glass facades.

As this technology has been a flagship for the Italian manufacture for many years, and the usual choice in many prestigious projects, these solutions are available both as air source as well as water source.

Combining groundwater potential and Integra technology bring excellent results in Milan and could do the same in London. As evidence of that, a great energy savings has been achieved in the CIBSE Awards shortlisted Aporti Palace, a major regeneration project in Milan. Here Climaveneta's air source Integra system results in a 17% energy reduction in the early operating months. An even more stunning result has been achieved in the case of Porta Nuova in Milan, Italy's highest skyscraper developed by Hines which shows a 40% energy reduction compared to chillers and boilers. In this case the system uses the underground rivers that flow under the city.

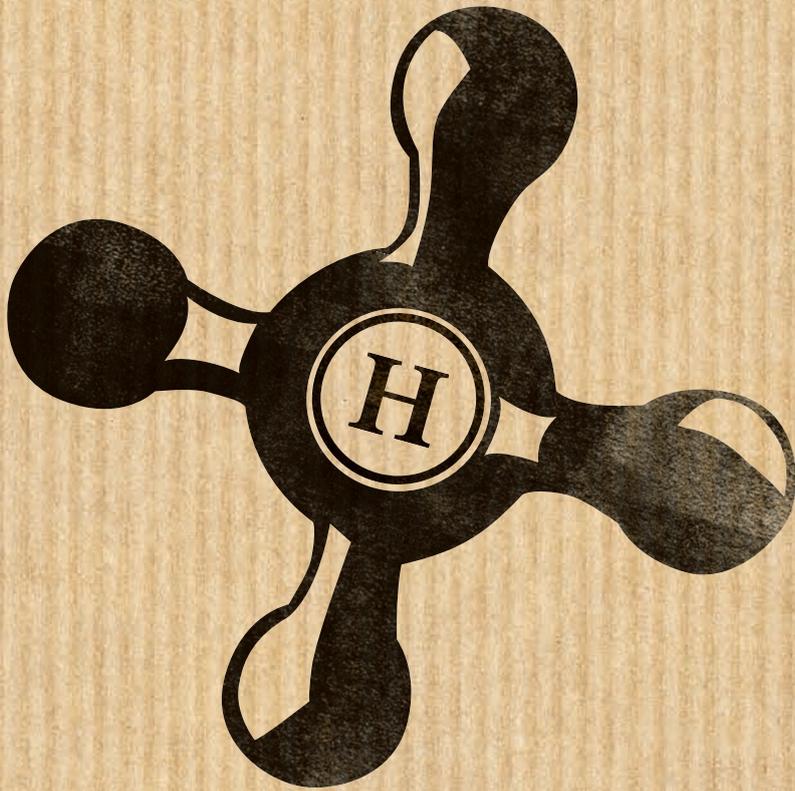
Coming back to the UK situation, a recent study developed by Climaveneta, British Land, Broadgate Estates, Studio Planning and the University of Padua on 350 Euston Road, a building in British Land's West End portfolio, demonstrates a 30% energy reduction by using Integra air source heat pumps instead of chillers and boilers.

Porta Nuova plant: water loop



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Applying integrated gas-fired absorption heat pumps to bridge the energy performance gap in non-domestic buildings

This module examines application of gas absorption heat pumps as the lead heating source in 'bivalent' heating and hot water systems

As technologies in the application of building services advance, it might be natural to assume this will bring an increase in building energy efficiency and a reduction in carbon emissions. Yet, measured building performance in new non-domestic buildings often reveals a significant gap between the energy usage predicted at the design stage and the actual energy consumption, often with consumption many times higher than predicted, according to recent assessments of real building performance by CarbonBuzz.¹ This performance gap also applies to refurbishment projects, where heating equipment frequently fails to achieve the headline efficiencies quoted by manufacturers.

This CPD will consider the application of gas absorption heat pumps (GAHP) as the lead heating source in 'bivalent' heating and hot water systems.

Renewable technologies are increasingly specified as the lead source of energy – often supported by gas-fired condensing boilers – for heating and hot water provision on new developments to meet the low carbon requirements of UK building regulations, and to help towards renewable energy generation targets. In refurbishment projects, 'low or zero carbon' (LZC) technologies, such as heat pumps, are increasingly specified alongside

replacement condensing boilers to maximise the opportunity for low-carbon operation and potential operational savings.

Bivalent applications

In new and refurbishment projects, these 'bivalent' systems – so called because they have two heat sources – can often fail to deliver the predicted energy and carbon savings. This can be due to poor design of the systems and failure to consider its operation as a whole, plus the specific control requirements. This can result in the two technologies competing against each other – producing unexpectedly high operating costs when the lower-carbon technology fails to perform as expected.

Modern condensing boilers are typically 105% (net) efficient,² and achieving a significantly higher efficiency (towards a potential maximum of 111%) in future developments is likely to be prohibitively expensive. By way of comparison, currently available gas-fired absorption heat pumps can provide efficiencies of up to 165%. Used as the main 'boiler' (in a cascade arrangement with condensing boilers), the GAHP may operate for long periods of time – so its high efficiency results in significant gas savings, with carbon emissions reduced proportionately.

Heat pumps

The principal technologies used in heat pumps are based on either vapour compression systems or absorption systems. Both vapour compression systems – that can be powered by electric motors or gas engines – and absorption systems – powered principally by heat from gas combustion – act to move heat from one location to another using 'work'.

The absorption process works by applying a pair of chemicals that have a strong affinity to dissolve in one another. In GAHP, this is normally a mix of ammonia and water, with the ammonia acting as a refrigerant (known as the 'solvent') being absorbed and transported through the 'thermal compression' process by the water (known as the 'solute'). Referring to the GAHP system in Figure 1 on page 44, heat is supplied to the generator (1) by the gas burner to vaporise the refrigerant (ammonia) from the water.

While the high-temperature ammonia vapour goes off to the condenser (4) to provide heat to the building system and condense into liquid ammonia, the water (now less diluted by ammonia) passes through a throttling valve (2) that reduces its pressure (and temperature) to enter the absorber. The ammonia – having rejected heat in the condenser, flowed as liquid through the throttling valve (5), been heated by

the outdoor air in the fan assisted evaporator, and reached the outlet of the evaporator (6) as a low pressure vapour – is then drawn into the water that is in the absorber (3). This part of the absorption process will reject heat (which can be usefully employed by the system) as the ammonia vapour is drawn into the water.

From there, the mixture is pumped (7) to the higher pressure of the generator (1), where the cycle starts again. The energy required to pump the liquid is small compared with the heat supplied to the generator, and so this process is thought of as ‘thermal compression’ as opposed to ‘mechanical compression’.

To ensure high performance, units will incorporate generator-absorber heat exchanger technology that boosts the efficiency of the unit by recovering the heat that is released when the ammonia is absorbed into the water. The gas burner is also arranged so that the water vapour in the flue gases can condense by exchanging heat with the cooler low-pressure ammonia.

Defining performance

The heat delivered by a heat pump is theoretically the sum of the heat extracted from the heat source plus the energy needed to drive the cycle. Practically, there will be losses from the system, and the performance of heat pumps is typically expressed as the coefficient of performance (COP). Because of Carnot³ efficiency limits, this will approach 1.0 as the outdoor-to-indoor temperature difference increases.

The COP of any heat pump is also related to the temperature lift – the difference between the temperature of the heat source and the output temperature of the heat pump. When there is a high temperature differential (for example, on a cold winter’s day), it takes more work to move the same amount of heat to meet the building load than when the temperature differential is smaller. Since the COP is dependent on the operational conditions, the more representative seasonal performance factor (SPF) is often used – which considers the sum of the annual heat produced divided by the annual energy supplied to power the heat pump.

The primary energy ratio (PER – see box) can provide a useful common baseline for comparing heat systems that are fuelled by different energy sources.

The seasonal performance factor and the carbon emission factor for the energy source will determine direct (and indirect) operational CO₂ emissions from the energy source used for powering the heat pump. Currently,⁴ UK grid-supplied electricity has an emission factor of 0.445 kgCO₂·kWh⁻¹, natural gas 0.184 kgCO₂·kWh⁻¹ and LPG 0.215 kgCO₂·kWh⁻¹.

So, for example, heat produced from an

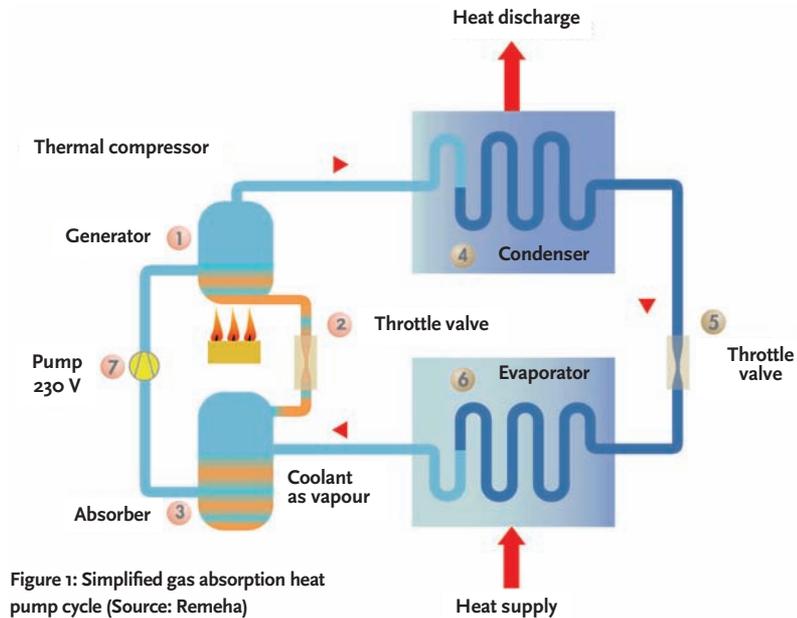


Figure 1: Simplified gas absorption heat pump cycle (Source: Remeha)

The primary energy ratio

This ratio is a measure of the overall efficiency of heating device, taking into account the energy losses related to the generation of electricity. A higher primary energy ratio (PER) corresponds to a more energy-efficient system.

PER = useful output energy/primary energy input

The average efficiency of European thermal power stations is approximately 50%,⁵ so two primary energy units are required for one unit of electrical energy.

An electrical vapour compression air-sourced heat pump is likely to have a seasonal performance factor (seasonal COP) of approximately 3 so, for this example, the PER = 3/2 = 1.5.

In the case of a GAHP (or any direct combustion product), the energy is supplied directly in the primary form of gas, so the PER is simply the seasonal performance factor for a particular GAHP.

(This excludes transmission losses in both gas and electrical distribution.)

electrically-powered vapour compression heat pump with an SPF of 3.0 would nominally produce 0.445/3 = 0.15kgCO₂·kWh⁻¹. Similarly, a GAHP with a SPF of 1.25 would have an emission rate of 0.184/1.25 = 0.15 kgCO₂·kWh⁻¹.

An application of GAHP

As an example, a GAHP (Figure 2) is fitted as part of a bivalent system in a building. The other source is a condensing boiler and – potentially for use at higher external temperatures – an optional electric heat pump. Considering data

from the example building (based on external conditions at a Dutch site) in Figure 3, the PER of the GAHP is consistently above 1. At outdoor temperatures below –3°C, the flow temperature of the weather-compensated heating circuit (shown by the red line) requires temperatures of greater than 65°C. At this point, the condensing boilers – which make up the other half of the bivalent system – would work in a ‘cascade’ arrangement to increase the flow temperature above 65°C. However, this would be for a limited number of hours per year (as indicated by the area shaded yellow).

For comparison, an indicative PER for a typical electrically-powered vapour compression air-source heat pump is also shown. The heavy blue dashed line illustrates the best PER of the two heat pumps. At 8°C and below, the GAHP is likely to outperform the air-source heat pump (in heating area shaded green) – the PER for the GAHP remains relatively constant across its operational range. Above 8°C, the electric heat pump PER is higher (the heating region in red).

The GAHP capacity would be selected to match the base thermal load of the building, with the condensing boilers modulating online when the load requires a flow water temperature higher than 65°C. Such GAHP installations can achieve seasonal COPs of around 1.25, with carbon reductions of up to 40% compared with traditional gas equipment.

Meeting heating loads of new and refurbished projects

GAHPs can be particularly effective for installation in heating systems with a traditional heating curve, as would be experienced in the northern Europe. During winter periods, when the heat is in most demand, GAHPs can operate efficiently at sub-



Figure 2: A 35 kW externally-mounted gas-fired absorption heat pump (Source: Remeha)

zero external temperatures, while still being able to deliver flow temperatures up to 65°C.

They can provide a particularly beneficial and energy-effective solution where a gas supply is present but significantly upgrading the electrical installation would be challenging. In renovation projects, this can be attractive – as GAHP consume relatively small amounts of electricity – and the outside air is used as the heat source (rather than the more expensive and potentially disruptive ground source).

Depending on the required heating load, heat pumps may also be suitable as a direct retrofit solution for systems using fan coil units. The design of such an existing system will likely be based on the cooling loads, so there will normally be an inherent heating overcapacity, enabling the GAHP 65°C flow temperature to be used to fully meet the heating load. Similarly, in all-air mechanical ventilation systems, heat pumps may help to reduce energy requirements for heating, particularly where fabric improvements have reduced the peak heating requirements.⁶

Heat pumps can be designed specifically for

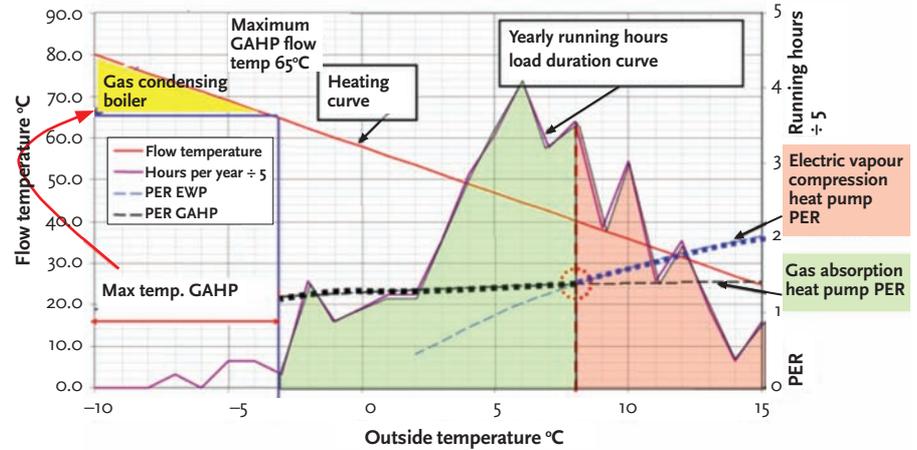


Figure 3: Example frequency of building heating load related to outdoor temperature, with comparative performance (PER) of electric vapour compression and gas absorption air sourced heat pumps (Source: Remeha)

the lower-grade heat loads (underfloor heating and hot water pre-heat), with the condensing boilers serving the higher temperature radiator circuits or main hot water calorifier. There are GAHPs available that are particularly optimised for low-temperature applications.

As with any other air-sourced heat pump technology, the GAHP requires frost protection to prevent the evaporator coils icing up when the outdoor air is cold and humid. Typically, the integral control system has two-stage frost protection, with the circulating pump being switched on for the first stage and, if necessary, the burner fired in conjunction with the circulating pump for the second stage. If the gas or electrical supplies cannot be guaranteed during colder weather, then a water/antifreeze mixture should be considered (as recommended by the manufacturer).

Maintaining control

Clearly, there is a need to control bivalent systems properly to ensure that they may run most effectively. As well as the normal requirements of safety, temperature

compensation and modulation (for comfort and efficiency), frost control and Legionella protection, in a bivalent system there is the integration of the two (or more) heating sources. This has been a challenge in some existing bivalent systems, leading to poor overall performance and loss of confidence. However, manufacturers have recognised this difficulty and some are leading the market by offering systems integration with control – and, in some cases, remote monitoring – that is bespoke to a particular application. Together with simplified control interfaces that allow ‘day-to-day’ building operators to understand and sensibly adjust operation, this should provide greater opportunity to apply GAHP in suitable projects.

The future growth of GAHP is predicted in the model produced for UK DECC’s *The Future of Heating: Meeting the challenge* report,⁷ which suggests that heat pumps and heat networks will be needed to achieve the UK’s overall emissions reduction target. The results (as shown in Figure 4) suggest the growing role for more efficient gas appliances, with GAHPs (shown in light blue), as part of bivalent systems, playing a significant part in the supply of heat to buildings.

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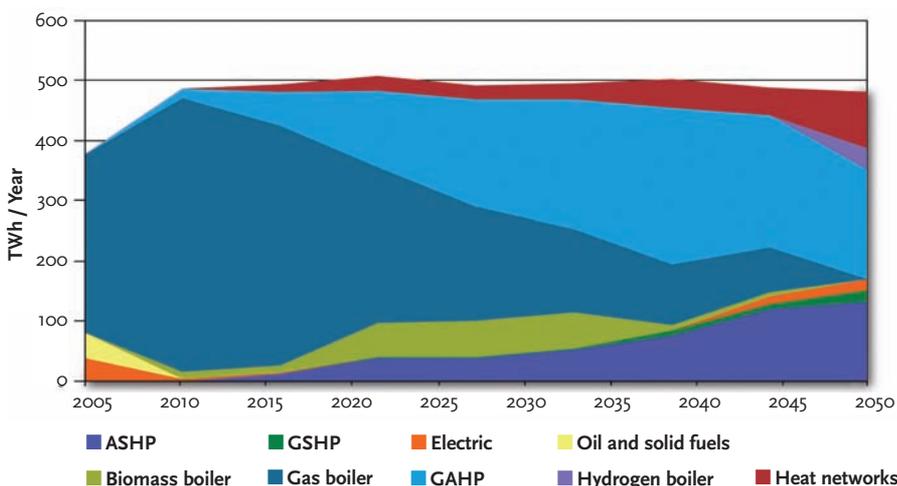


Figure 4: Predicted domestic and non-domestic buildings heat output by technology in 2050, as modelled for *The Future of Heating: Meeting the challenge* (Source: DECC⁷)

Turn over page to complete module ➤

Module 67

August 2014



1. What is the potential efficiency of a GAHP?

- A 100%
- B 105%
- C 111%
- D 125%
- E 165%

2. Which of these components is completely operating at the lowest pressure?

- A Absorber
- B Condenser
- C Generator
- D Pump
- E Throttle valve

3. Referring to the heating load graph in Figure 3, select the maximum outside temperature that is likely to require top-up heating from the condensing boiler

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

4. What typical seasonal performance factor would a properly selected, installed and controlled GAHP likely to reach in a bivalent system in northern Europe?

- A 0.75
- B 0.95
- C 1.25
- D 1.5
- E 1.75

5. In part of the modelling that was used for the DECC publication *The Future of Heating: Meeting the challenge*, approximately what proportion of heat output was attributed as coming from GAHP in 2025?

- A 5%
- B 15%
- C 35%
- D 75%
- E 95%

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Panasonic's new remote control for Aquarea range

Panasonic has launched a remote control for the Aquarea range for people looking to save on heating and cooling costs.

Its advanced settings improve performance, enhance comfort, and deliver maximum savings. The Aquarea displays the energy generated by the property's heat-pump system in real time, making it easy for homeowners to manage their energy use and expenditure.

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



CP introduces luminaire mount high bay PIR detector

New from CP Electronics is the EBDHS-MB luminaire mount high bay PIR presence detector range. It provides exceptionally high sensitivity and long-range detection, sensing movement up to 40 m at a 15 m mounting height. The detectors are ideal for high bay lighting control in areas with demanding spaces and increased mounting heights, such as warehouses and factories. The EBDHS-MB detects movement using its PIR sensor and automatically switches lighting on. When the area is no longer occupied, it switches lighting off after an easily adjustable time period.

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Klima-Therm picks up two national awards

Klima-Therm has won two national awards for pioneering developments in air conditioning and renewable energy systems.

The company's Virtual Power Plant initiative won the accolade of Best Commercial Project 2014 at the National ACR Awards, while its high-efficiency EXP system was highly commended in the Air Conditioning Product of the Year category.

Virtual Power Plants use high-efficiency heat pumps – running on virtually frictionless magnetic bearings – to generate and store reservoirs of thermal energy and 'coolth', which can be used to supply heating and cooling.

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Assa Abloy Security Solutions launches BIM hardware objects

Assa Abloy Security Solutions is to introduce the second phase of its building information modelling (BIM) offering, with the launch of hardware set objects. Its nine BIM doorset objects received more than 400 downloads in the first two months of being available, and now Assa Abloy has developed 20 hardware set objects. These are designed to meet the increasing demand for specifiers and contractors to use BIM, which is underpinned by the creation, collation and exchange of 3D models, with structured data attached.

● Visit www.assaabloy.co.uk/securitysolutions, www.facebook.com/ASSAABLOYUK or follow @ASSAABLOYUKLtd



Sontay releases second phase of Sonnet

Sontay is enhancing its wireless offering by launching the second phase of the SonNet system. Now incorporating a new CO₂ sensor and innovative I/O module, SonNet offers system integrators, building consultants and end users smarter measurement and control, without the need to install cabling. This, in turn, offers benefits in terms of occupant comfort and energy savings.

Sandy Damm, managing director at Sontay, said: 'The SonNet range is cost effective and easy to install, and the new additions broaden the range of applications it can be used for.'

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LG Titan Products expands TPZ-Net Zigbee wireless range

With the release of the TPZ-PIR occupancy sensor, Titan Products continues to develop its TPZ-Net range of wireless sensors. Designed to detect movement in a space, the battery-powered sensor transmits a wireless signal to the TPZ-Net coordinator when it senses movement. The coordinator then communicates this information over a BACnet network, which allows applications – such as lighting and HVAC equipment – to be controlled when occupants enter a room.

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Expansion continues at Harmer Drainage



Harmer Drainage has announced the expansion of its sales team across the UK, after extensive investment in client support services.

Nick Priest (left) brings more than 20 years' experience working in the drainage

industry and, in his latest role at Alumasc, will develop and manage new and existing client relationships across the Midlands, south Wales and the south-west.

Marc Turner will look after London and the south-east, after seven years in the construction industry building an in-depth knowledge of specification routes, distribution channels and main/sub-contractor requirements.

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Knauf Safeboard lightens the load in Harley Street

Workplace designer Cannon Davis has created a radiotherapy suite without using lead-lined boards by installing Safeboard, the X-ray shielding plasterboard from Knauf.

The suite – together with six consulting rooms and two operating theatres – forms The Whiteley Clinic, Harley Street, which specialises in the treatment of varicose veins. Cannon Davis masterminded the conversion of what was previously grade-A office space, and Safeboard was used to build the walls, ceiling and floor of the X-ray room to prevent any leakage of radiation.

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Making use of cellars and basements is an increasingly popular way to gain extra room in a property, because it



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Systemair has introduced a range of high-efficiency, low-noise Split and VRF systems, which will extend and reinforce its offering



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University of Warwick champions Dalkia CHP technology

Since 2001, the University of Warwick has worked in partnership with Cogenco – Dalkia's specialist combined heat and power (CHP) division – to develop its onsite co-generation energy centres. The most recent upgrade of the CHP plant has not only improved its performance, but also underpinned the university's continued commitment to CHP.

Since the installation of its first unit in 2001, the university has invested more than £4m in rolling out the technology and district heating.

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New tower of Tower Hamlets

More than 50 km of Prysmian's FP200 Gold and FP Plus have been installed as part of the emergency building service systems in East London's Aldgate Tower, a 317,000 ft² commercial quarter.

The steel frame structure offers 16 storeys of grade A office space and provides panoramic views of London. Prysmian's FP200 Gold 'standard' fire-resistant cable and FP Plus 'enhanced' fire-resistant cable have been installed to facilitate the building's fire alarm and emergency lighting circuits.

● Call 023 8029 5029, email cables.marketing.uk@prysmian.com or fax 023 8029 5437

End users and contractors attend Toshiba annual conference

Toshiba Air Conditioning, a division of Toshiba Carrier UK, hosted major end users and contractors at its recent annual conference at Twickenham Stadium. Toshiba gave an insight into its plans for developing its air conditioning range and related support services. It also invited feedback on how the company could improve its offering, and briefed delegates on the latest F-Gas changes.

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



Hospital chiller project marks launch of CRS in Northern Ireland

A major chiller replacement project at a

Londonderry hospital has been delivered with the help of Carrier Rental Systems (CRS). The company – which recently opened a branch in Lisburn, near Belfast – was asked by contractor R J Smyth Engineering to provide a temporary cooling solution while chillers at Altnagelvin Area Hospital were replaced with high-efficiency Carrier chillers. The Omagh-based contractor worked with CRS to coordinate delivery of the rental chiller to cover the six-week replacement project.

● Call 02892 670 431 or email info@carrierrentalsystems.ie

International award scheme launched to celebrate industry excellence



Panasonic, a leading brand in the heating and cooling sector, has announced the inaugural Panasonic PRO Awards. The initiative will celebrate excellence in the design, specification, installation and commissioning of Panasonic heating and cooling systems. Panasonic is inviting entries from architects, consultants, distributors,

engineers and installers, whose projects demonstrate flair and innovation, and showcase sustainable design, efficiency, cost effectiveness and aesthetics.

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Fläkt Woods helps ICE reach optimum capacity

When the Institution of Civil Engineers (ICE) needed to increase the capacity of the ducted air system at its Westminster headquarters within a five-day period, Fläkt Woods was up to the challenge. It replaced the



centrifugal supply fan with a 071 Centriflow Plus PM plug fan, complete with an inverter-driven 11 kW permanent magnet motor that generates 5.0 m³/s at 1,000 Pa. The inline extract axial fans were also replaced by a fan box with the same size plug fan and motor, designed to provide 5.5 m³/s and the correct negative pressure levels.

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Supporting sport in Scotland

Grundfos has proved itself all over the world as the pump supplier of choice when it comes to major sporting events – and the company is delighted to be providing solutions for the Commonwealth Games in Scotland. The company will deliver the HVAC needs of the Sir Chris Hoy Velodrome and the Emirates Arena – which will play host to all badminton events – at the Glasgow Games. Grundfos has also supplied the fire-suppression systems for these venues. Around 6,500 athletes and officials, from 71 countries, will take part in the event.

● Call 01525 850000, email grundfosuk@grundfos.com or visit www.grundfos.co.uk



Fourth-generation LG Multi V Water solution gives enhanced all-round performance

LG's latest innovation is the Multi V Water cooled IV HVAC system, which is available in heat pump (ARWN-LAS4) and heat recovery (ARWB-LAS4) versions, from 22.4 kW – 224 kW. LG continues to develop and manufacture high-performance, energy-efficient solutions for its growing customer base, as its LG Multi V Water IV advanced VRF geothermal-ready solution demonstrates. It combines intelligent functions with advanced inverter technology to boost energy efficiency and operational range.

● Visit <http://partner.lge.com/uk>



Rapid water heating at Olympic venue

Atlantic Boilers has played its part in the success of the £25m Lee Valley white-water centre by providing the space heating to warm up competitors and spectators. Built to host events at the London Olympics, the venue opened to the public after the Games – as part of the Olympic Legacy Works – providing a variety of water sports, including white-water rafting, canoeing and kayaking. The venue recently hosted the ICF Canoe Slalom World Cup.

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



Myson's iVector proving its worth in the public and commercial sectors

With its compact size and energy-efficient heating technology, the Myson iVector has become the natural choice for heating schools, universities, care homes, and showrooms across the country. Myson's iVector –



hailed as the first in a new generation of intelligent fan convectors – provides a rapid response to changes in temperature, delivering heat when required. It yields impressive heat outputs, even when operating at low water temperatures. With a solid one-piece casting, the iVector can be installed quickly and easily.

● Call 0845 4023434, email sales@myson.co.uk or visit www.myson.co.uk

New Hiline Flex pre-insulated PE-Xa

CPV has launched a flexible pre-insulated PE-Xa pipe system for heating applications. Suitable for temperatures up to 95°C, the system has an efficient bonded polyurethane foam insulation, and a tough outer casing of



green, corrugated LDPE, which enables it to be buried underground. Available in 25 mm to 160 mm OD – with single and twin PE-Xa service pipe configurations – the system has a range of secure and reliable joints, fittings and accessories that make installation quick and easy.

● Call 01794 322 884, email sales@cpv.co.uk or visit www.cpv.co.uk



Rinnai hot to trot with Ascot Hydra

Rinnai is helping to lead the field when it comes to equine hygiene, in the form of the newly developed Ascot Hydra horse washer. Colin Davies, managing director of Ascot Hygiene, had a 'light bulb moment' when he looked at a small electric dog-wash unit he had designed for sprucing up man's best friend (and the walker's muddy wellies). 'Why not make a bigger one for horses?' he thought. It didn't take him long to identify the Rinnai Infinity 17e LPG unit as the central component of what was to become the innovative Ascot Hydra horse washdown system.

● www.rinnaiuk.com



Mikrofill and the Mermaid

Mermaid Maternity Retreat, in Chelsea – which opened in July 2013 – required compact, efficient, hard-working plant, and Mikrofill equipment fitted the

bill. The installation – designed by Freddie Brown Associates – includes 2no Ethos 110 kW wall-mounted condensing boilers combined with a Mikrovent low loss header/air dirt separator and 2no Rapide Extreme HWS loading cylinders. The boilers' total modulation of 14 > 1 ensures efficient load matching on the LPHW system, plus indirect primary to the loading cylinders, which supply in excess of 5,000 litres per hour at 60°C.

● Call +44 (0) 3452 606020, fax +44 (0) 3452 606021 or visit www.mikrofill.com

PCM offers thermal solution

Phase change materials (PCMs) are ideal products for thermal management solutions. They store and release thermal energy during the melting and freezing process, in the exact same way an ice cube maintains a prolonged cooling effect in a glass of water. This simple concept bridges the gap between energy requirement and energy use. When applied correctly, PCMs can offer free cooling, increased efficiency and lower system running costs.

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



Toshiba develops BIM solution for designing air conditioning projects

Toshiba Air Conditioning – a division of Toshiba Carrier UK – has developed a complete building information modelling (BIM) support solution for consultants, contractors and designers. It covers the manufacturer's full range of SMMSi, SHRMi and Mini SMMSi VRF outdoor units, including flow selector boxes and the full range of indoor units. The BIM package provides an accurate and easy-to-use digital representation of Toshiba's air conditioning systems, that can be applied in standard BIM models of new and refurbished buildings.

● Visit www.toshiba-aircon.co.uk/business-lounge



EcoMESH adiabatic air inlet cooling

EcoMESH is a unique mesh-and-water spray system that improves performance,

reduces energy consumption, eliminates high ambient problems, is virtually maintenance free, and can pay back in one cooling season.

The EcoMESH concept is based on intermittently spraying water onto a mesh placed in front of the heat-reduction surface. It reduces power consumption by as much as 30 – 40% and improves the performance of air-cooled chillers, dry coolers and condensers, and refrigeration plants.

● Call +44 (0) 1733 244224 or visit www.ecomesh.eu



Bosch urges RHI recognition for gas absorption heat pumps

The Department of Energy and Climate Change has been urged not to miss the opportunity to recognise gas absorption heat pumps (GAHPs) within the non-domestic renewable heat incentive (RHI) when the scheme is formally reviewed later this year.

Geoff Hobbs, business development director at Bosch Commercial and Industrial Heating, argues that GAHP technology offers non-domestic investors the 'best of both worlds' when it comes to efficient use of the UK's gas infrastructure – a strength that could prove invaluable for years to come.

● Call 0330 123 3004 or visit www.bosch-industrial.co.uk

PEL Services installs conference systems for BMA

PEL Services has designed, supplied and installed advanced digital conference systems for the British Medical Association (BMA) at its Edinburgh, Belfast and London premises. The first major BMA project for PEL was at its Edinburgh offices, and the company skillfully upgraded and integrated with the organisation's existing audio-visual teleconferencing equipment where required. The debating chamber there is now home to a new state-of-the-art Bosch DCN Discussion System, which can readily accommodate the 72-delegate room capacity.

● Call 020 8839 2100, or visit www.pel.co.uk and www.pelav.co.uk





AMP Dream Team hits the road for London to Brighton charity cycle ride in Jubilee year

A team from Toshiba air conditioning distributor AMP hit the road for the London to Brighton charity cycle ride, and raised more than £7,000 for the British Heart Foundation. The 30-strong AMP Dream Team joined some 28,000 cyclists who took part in this year's event, getting on their saddles and riding the 54 miles from city to sea. The team, sponsored by Toshiba, included staff, family members, customers and representatives of suppliers.

● Call 01707 378 670

Major energy savings for council from Remeha replacement boilers

North Somerset Council has installed two Remeha Gas 610 six-section Eco Pro boilers at Castlewood – its new Clevedon civic 'hub' that brings together council teams for more efficient practice – to cut its energy use as part of its wider efficiency measures. Steve Hodges, M&E and energy manager at North Somerset Council, predicts that the sequenced Gas 610 Eco Pro boilers, which replace two 1 MW pressure jet boilers, will reduce energy consumption at Castlewood by at least half, a saving that will increase to as much as three quarters during the summer months.

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



Hethel engineering excellence extends to ventilation design

The £5.4m Hethel Advanced Manufacturing & Engineering Centre in Norfolk is using natural ventilation designed and supplied by independent manufacturer Gilberts of Blackpool to help air the 40,000 ft² low-carbon building, comprising 16 workshops with adjoining office space. Gilberts' natural ventilation strategy uses a combination of passive stack and cross-flow ventilation on the two floors of the building. Boost fans and acoustic splitters ensure air quality without noise transfer is maintained throughout the building.

● Visit www.gilbertsblackpool.com, email info@gilbertsblackpool.com or call 01253 766911

Knauf GIFAfloor helps London icon hit sustainability target

No 1 Embankment Place, the nine-storey post-modern office designed by Sir Terry Farrell, is being refurbished using Knauf GIFAfloor in a programme that will bring the 1980s building up to 21st century standards with a BREEAM Outstanding rating. Knauf GIFAfloor has been installed into the PwC headquarters to replace part of the existing raised access flooring. Non-combustible with an A1 fire rating, its high thermal conductivity makes the panels ideal in underfloor heating systems, and optimises the benefit of air and ground source heat pumps over timber or cement base floors.

● Visit www.knauf.co.uk, call 01795 424 499 or fax 01795 416 261



Vent-Axia's Lo-Carbon Response wins at Housebuilder Awards

British ventilation manufacturer Vent-Axia has won Best Brand New Product of the Year at the Housebuilder Product Awards 2014. The Sussex-based company scooped the award at a ceremony in Edgbaston Stadium, Birmingham, for its Lo-Carbon Response dMEV fan. The Response is a near silent, continuous running, constant volume solution, featuring a unique digital display that confirms airflow and system pressure of the installed product to help housebuilders ensure optimum performance.

● Visit www.vent-axia.com or call 0844 856 0590

Evinox launches web App for billing customers

Evinox has launched its Residential Billing Web App, for use with smart phones, tablets and other web enabled devices. The App allows Evinox billing customers to login to their account at anytime, anywhere with internet coverage. This enables them to check energy credit/debit balances, view latest meter readings, see tariff rate details, payment history and download documents. Residents can also make payments for energy using a credit or debit card with our simple and secure online payment facility, or set up a direct debit using an online form.

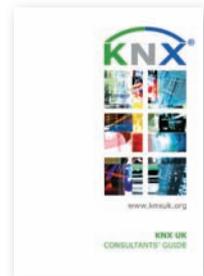
● Visit www.evinox.co.uk, email info@evinox.co.uk or call +44 (0)1372 722277



New KNX consultants guide

KNX UK has introduced its new *KNX Consultants Guide*. More in depth than the first edition, it is designed for building services consultants and specifiers – working within the electrical and mechanical industry – actively involved with the design of intelligent, sustainable low energy buildings. The *Consultants Guide* introduces the concept of KNX Open Protocol integrated building control, highlighting its advantages compared with the traditional approach of many stand-alone systems. It also discusses why life-cycle costing must be considered at the specification stage.

● Visit www.knxuk.org, email admin@knxuk.org or call 0845 869 5908



Airflow receives CIBSE CPD seal of approval

Airflow Developments is now offering a CIBSE approved CPD presentation to provide specifiers with a greater insight into the specification of mechanical

ventilation with heat recovery within non-residential buildings. The CPD explains, in detail, why ventilation is such an important component in the running of any commercial building, and looks closely at the varied methods of MVHR to enhance air quality. It also provides application examples, including classrooms and industrial plants, and reviews how legislation plays a vital role in any specification.

● Visit www.airflow.com, email info@airflow.com or call 01494525252



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Imax Xtra commercial boilers excel

Imax Xtra is a high efficiency floor standing condensing boiler range from Ideal Commercial Boilers, perfect for a wide range of commercial applications. Offering a total of 10 outputs, the Imax Xtra range is available, either as single modules from 80 kW to 280 kW, or as master-slave sequence modules 320 kW to 560 kW. All options offer very low NOx Class 5 performance for maximum points on the BREEAM scale, and extremely high nett efficiencies of 107.5% at part load, exceeding Part L of the updated Building Regulations for both new build and existing buildings. Xtra's high turndown ratio of 5:1 further minimises energy use by reducing inefficient on-off cycles.

● Visit www.idealcommercialheating.com, email commercial@idealheating.com or call 01482 492251

Remeha launches high-performance hot water cylinders

Remeha Commercial has launched a new extended range of British-manufactured hot water cylinders. The 24-model range offers options of unvented direct, indirect and solar cylinders with 400 l, 500 l, 800 l, 1,000 l, 1,250 l, 2,000 l and 2,500 l models available in each of the three categories. A range of optional immersion heater units is also available to provide boost and backup. The range delivers exceptional flow rates in excess of 100 litres per minute. Using high-performance coils, the cylinders recover from cold in less than 60 minutes in optimum conditions, making them particularly suitable for the hotel, leisure and housing sectors.

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



Saint-Gobain PAM UK launches new range of cast iron shower drain kits

Saint-Gobain PAM UK has launched a new range of complete cast iron shower drain kits, adding to its innovative range of VortX drainage products. Supplied boxed, each kit features a VortX shower drain body, bottle trap and stainless steel grating, which is available in a standard finish, or can be polished to order. The shower drain bodies are manufactured in cast iron and are grey epoxy coated. The shower gullies are available in 110 mm OD vertical spigot and 60 mm OD vertical and horizontal spigot options.

● Visit www.pam-vortx.co.uk



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Thermal Modeler | Various Locations | to £45K + Bens | ref: 5671

Following an exceptional start to 2014 our client is seeking a talented Thermal Modeler to join their thriving team. You will assist with low carbon design solutions in relation to new and existing residential buildings. This role would suit dynamic individuals with an understanding of thermal modeling software, including IES.

Mechanical Associate | London | to £65K + Bens | ref: 5665

This is a rare opportunity to join an award winning Building Services team as a Mechanical Associate, to assist in the management and growth of the business nationally and internationally. The successful candidate will lead the mechanical engineering section and provide support to the Technical Director. Exceptional career opportunity.

Electrical Associate | London | to £65K + Bens | ref: 5988

One of the leading multi-disciplinary engineering consultancies is seeking an Electrical Associate to lead the design on a number of major projects, including an international stadium. Generous package and benefits offered.

BIM Manager | London | to £50K + Car + Bens | ref: 5570

Due to controlled expansion and substantial project wins, there is an excellent opportunity to join one of the leading M+E specialist contractors in their South London office. This role will require you to assist in the development on 3D and Revit MEP into current designs and produce 3D Revit Models.

Public Health Engineer | Berkshire | up to £35 LTD | ref: 5729

A leading multi-disciplinary Building Services consultancy is looking for an experienced Public Health engineer. The successful candidate will be working on a major 60 story residential project.

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Please apply in the first instance to
 Jennifer Thain, HR Coordinator
 jennifer.thain@ies-ltd.co.uk



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Public Health Engineer

London, £41 p/h

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Senior Electrical Design Engineer

Central London, £30 - £35 p/h

We are working in partnership with an independent multi-disciplined consultancy in their search for a Senior Electrical Engineer for a minimum 12 month contract. To be considered for this role applicants must come from a building services background and have experience designing HV systems on large projects. BAR 1925/WS

Associate Mechanical Engineer

London, £60 - £65K + Car + Benefits

Reporting in to the Regional Director of a leading multi-disciplinary consultancy you will be leading a team in delivering high profile projects including new 5G development, CL2-4 labs and specialist higher education facilities. You will be a chartered engineer with solid technical knowledge in mechanical & sustainability engineering design, be proficient with IES and have a good understanding of the principles of BIM. Progression to AD/Director level is achievable in the near future for the right candidate. BAR2037/CB

Senior Mechanical Design Engineer

Central London, £36ph - £40ph

This is a fantastic opportunity for a Senior Mechanical Design Engineer to join an international consultancy with an outstanding reputation specialising in the mission critical, high end residential and commercial sectors for a long term rolling contract. With continuous project wins they need someone who is committed to run with projects until completion. BAR1985/NA

Senior Mechanical Design Engineer

Bangkok, 2,000,000 Baht p/annum

An exciting opportunity has arisen for a Mechanical Design Engineer to join an established UK consultancy with a global footprint. They are looking to further develop their existing team of design specialists within the Thailand office. Successful candidates must be Degree qualified (BSc or MSc), with a minimum of 8 years' experience within industrial and high-rise projects in the Middle East or Asia. BAR1843/PA

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**Principal Electrical Engineer
The Wirral**

£45,000 + Benefits
A pure building services consultancy who have a real passion for sustainability within the built environment are currently looking for a Principal Electrical Engineer to work on projects within the educational, residential and commercial sectors. This is a great opportunity to be promoted to a very senior level due to the expansion of the company.

**Associate Electrical Design
Engineer**

City of London
£60,000 + Benefits
A well-known sustainability focused Building services consultancy in Central London are looking for an Associate Electrical Engineer to work as a client facing project leader. This role will involve working on projects around the world in partnership with a large proportion of the top 20 architectural practices worldwide. This comes with a good opportunity for progression to Director due to the impending Retirement of the current Electrical Director.

**Public Health Team Leader
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£65,000 + Benefits
An MEP, Civil and Structural Engineering consultancy who have offices in Farringdon are currently looking for an Experienced Public Health Engineer to lead their team of 4 PH Engineers. Working on Hotels, Residential and Commercial projects in London and Internationally.

**Senior Electrical Engineer –
Critical Systems**

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A well-known and internationally recognised top 10 Property consultancy are looking for a Senior Electrical Engineer to work on projects within the banking, commercial and data centre industry. Due to this company recently relocating and expanding, it is an exciting time to join this practice. Candidates will gain exposure on some of the most renowned banking clients in the world.

**Senior Mechanical Design
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£35 per hour Ltd
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**Public Health Engineer –
Contract**

Birmingham
£36 per hour Ltd
A fast paced and rapidly expanding Building Services consultancy is looking to add a Senior Public Health Engineer to their team. Having worked on some of the most well-known commercial and residential projects known to the industry, you will be able to be part of their next big project working on an 18 month contract on various publicised projects.

**Senior Mechanical Engineer
Glasgow**

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A Senior Mechanical Design Engineer is required to join a consultancy in Glasgow operating at the forefront of modern building services engineering design. With a focus on sustainability projects within the commercial residential and leisure sectors you will lead developments across the UK ranging in size and value. With huge progression opportunities this is the ideal role for someone looking to further their career within the near future.

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KEEPING THE FAITH

From solar panels to a newly-built Passivhaus-standard building, St Faith's School in Cambridge – which recently won an Ashden Award – is taking sustainability into the classroom. Bursar **Richard Brent** explains



After making a commitment to cut its energy use, Cambridge-based independent prep school St Faith's has saved 70 tonnes of CO₂ and reduced its electricity use by 13% (2011-13).

The school comprises buildings constructed over a 200-year period, with the most recent built to Passivhaus standard. As well as a 50kW solar PV array and a solar thermal hot water system in the sports hall, the school also has a host of low-cost measures, including LED lighting, insulation of valves and pumps in its seven plant rooms, and improved boiler controls. This is backed up by a rigorous regime of monitoring energy use.

Why did you decide to tackle waste and carbon emissions?

St Faith's has always had a strong commitment to carbon reduction and has been a part of the Eco Schools awards scheme for seven years. Our Eco journey started with a simple reduce, reuse, recycle campaign, and now carbon reduction is embedded in everything we do.

Another feature of our approach is based on a moral responsibility to ensure maximum business efficiency and to keep our operating costs as low as possible.

How did you ring-fence the sustainability budget?

Our governors agreed a separate budget for sustainability a number of years ago. This budget has increased over the years and enables us to tackle a wide range of projects, including low-cost, short-term return and higher cost, longer-term return. We also use any savings we make on our utilities budget for carbon

The key is finding ways to stimulate the children's imagination by making the subject fun

reduction improvements, including upgraded building management systems and lighting, and improved insulation in older buildings.

How did you get buy-in from the governors, parents and pupils?

Making a difference is a key tenet at the heart of the St Faith's approach to every aspect of school life, and this has genuinely helped us embed sustainability without a sense of either forced habits or resistance. We managed to generate some fun projects – such as making radiator baffles or an award-winning eco film in Spanish – to stimulate sustainability issues in a lively and engaging way.

How did you specify technology and renewables that worked?

Success in specifying workable renewables and technology has been based on in-house research and the use of experts. We also contributed to a Technology Strategy Board project titled 'The design of buildings for future climate control', which helped us gain a much better understanding of this fairly complex area.

How does the energy strategy permeate into the teaching?

The energy monitoring tool we use can provide dashboard information, presented on digital information screens around the school and on our website. It also allows the pupils to question utility consumption across the site and produce various styles of output. The children are using real data they can relate to, allowing them to understand how our energy is used and how we might be able to influence this. The children also learn to understand and

interpret data in various ways, which extends beyond science and maths to geography and PSHCE.

How do you retain the 'cool factor' among the children?

The key to this is finding ways to stimulate the children's imagination by making the subject fun, and by listening to – and incorporating – their ideas into our general approach to sustainability.

Why did you decide to go for a Passivhaus extension?

We wanted to create a dynamic and innovative space for teaching and learning that had a low carbon footprint and which would serve as a vehicle for opening up the children's minds to some basic principles of building design. The building's green roof, big windows and a newspaper-based wall insulation are all things that excite the younger mind. Our specification was presented to a local architecture practice with Passivhaus experience, which took the ideas forward.

What has been the best carbon initiative?

From a strict carbon reduction perspective, the best initiative has been accurate control of our heating and ventilation systems, coupled with real time measurement of energy use. This combination has allowed us to run systems at optimum efficiency for the teaching and learning spaces, and has enabled us to identify issues and measure our progress. We firmly believe in the maxim that to measure is to manage.

Richard Brent is bursar at St Faith's School

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16 August, Adelaide

The latest monthly seminar arranged by the

SA chapter of the ANZ Region.

www.cibse.org/events

HCNW Region: Boilers – What About the Existing Stock?

28 August, London

Everything you need to consider when retrofitting new boilers onto existing systems, including how to get the best emissions and energy reduction, water treatment, integration with variable flow systems and controls.

www.cibse.org/events

YEN North West Region: Co-op Building Site Visit

28 August, Manchester

Sign up to be guided through the technologies involved in this venture, perceived by many to be the most environmentally friendly building in the world.

www.cibse.org/events

ANZ Region: Rage against the Machine – Retrofitting the Occupants

2 September, Sydney

The latest in a line of monthly seminars arranged by the NSW chapter of the ANZ Region.

www.cibse.org/events

Artificial Light at Night Conference (ALAN)

4 September, Leicester

ALAN14 Conference, supported by the Society of Light and Lighting, will examine the full use of artificial lighting at night as well as the spectrum of adverse effects that artificial outdoor light at night may cause.

WiBSE Peer to Peer Mentoring Programme.

What obstacles are holding you back right now?

10 September, London

Continuing the WiBSE mentoring programme.

Air Source AHUs Factory Visit

11 September, Manchester

A YEN NW event.

WiBSE London Role Model Series

16 September, London

Continuing the role model series for Women in Building Services Engineering, with Susie Diamond, partner at Inking LLP.

SoPHE Conservation & Control of Water in Commercial Installations

17 September, Manchester

SoPHE talk with Ross Rigby of Delabie.

Design Risk Management, Spotlight on CDM 2015

18 September, London

A Home Counties North West event, with Gillian Birkby, legal advisor to the Association of Project Safety, discussing the implications of the consultation on the new CDP regulations over a range of disciplines and clients.

ILEVE Information Day

23 September, London

www.cibse.org/ileve

CPD TRAINING

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

Energy Management Exhibition

19-20 November
ExCel, London

The Energy Management Exhibition (EMEX), which is supported by CIBSE, will explore the latest measures to reduce energy use through technology and training, as well as examining the latest regulations/grants and energy performance contracts.

Companies will also be given guidance in how they can migrate to become a low energy company (LEC) through training. CIBSE certification will be at Stand B55 – come and find out about becoming an energy assessor, air conditioning inspector, or low carbon consultant. www.emexlondon.com



Mechanical Services Explained (3 days)

9 September, London

Lighting & Energy Efficiency

16 September, Leeds

Earthing and Bonding

16 September, London

Emergency Lighting to Comply with Fire Safety

30 September, London

Rainwater Harvesting & Greywater Recycling

24 September, London

Part L Building Regulations

25 September, Manchester

Wiring Regulations for Electrical Installations: BS7671

26 September, London

Practical Controls for HVAC Systems

30 September, London

Electrical Services Explained

28 October, London

ENERGY ASSESSOR TRAINING

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

Part L Update for LCEAs
12 August, London

CIBSE TECHNICAL SYMPOSIUM 2015 ENTRIES NOW OPEN

For the whole building services community from academic to practitioner – it's time to share your knowledge.

The CIBSE Technical Symposium 2015 committee is seeking proposals for papers, posters and presentations on cutting-edge research, practical designs and case studies of real-world solutions from the broad spectrum of building services that provide enhanced lifetime performance. Any proposals that consider reduced system complexity will be particularly

welcomed by the committee.

The title of the symposium is: Simple buildings, better buildings? Delivering performance through engineered solutions.

All areas of the industry are encouraged to contribute – both young and experienced industry practitioners, researchers, academics and building users.

The Technical Symposium will take place on 16 and 17 April 2015 at University College, London.

Deadline for 250-word proposals is 8 September. For more details visit www.cibse.org/symposium



QEII, Westminster, London.

28-29 October 2014



www.cibse.org/conference

LEADERSHIP IN BUILDING PERFORMANCE CONFERENCE & EXHIBITION

Conference Programme Announced

The programme and speaker line up for the Leadership in Building Performance Conference has been announced. Featuring high profile industry speakers debating the issues faced by the building supply chain in delivering energy efficiency – topics being covered include:

- The future of power networks and supply
- The drive towards zero carbon
- Delivering future construction through collaboration and BIM
- Improving the operation and maintenance of existing stock
- Overheating and indoor air quality
- The Housing Standards Review and Code for Sustainable Homes
- How to deliver Level 2 BIM and the implications for the public sector
- New technologies for improved building performance

To view the full programme and book your place
visit www.cibse.org/conference

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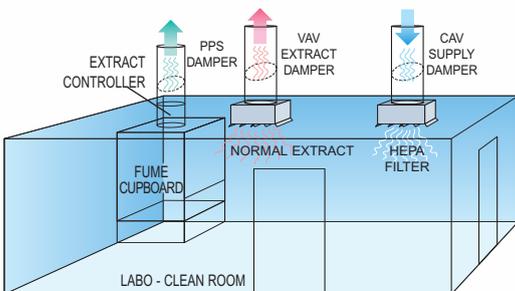


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