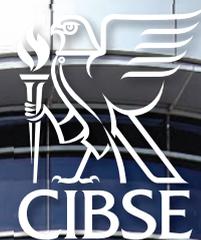


CIBSE

JOURNAL



The official magazine of the Chartered Institution of Building Services Engineers

January 2016

SIDEWAYS MOVE

Prototype takes elevator design in new direction

SUN GODS

PV pioneers offer bright future for self-powered buildings

AHEAD OF THE CURVE

Masdar points way forward for low energy office design in the Middle East

www.cibsejournal.com

**CIBSE Building
Performance Awards**
24 February 2016
Book your place now –
see page 6

If you control energy
efficiently and precisely, you create
the optimum working environment



SAUTER creates the best working environments in London

Exceptional architecture meets good environmental practice; exceptional energy efficiency meets good service.

We supply products, systems and services for integrated building Management, which ensures your investment is long term and which helps you reduce your operating costs.

If you wish, we will work with you from your initial idea to the day-to-day running of your building.

For further information contact:

Gary Williams on 0203 486 2045

or by email gary.williams@uk.sauter-bc.com

Systems
Components
Services
Facility Management

 **SAUTER**
Creating Sustainable Environments.

Contents

NEWS

8 News

Ex-minister brands energy policy a 'national disgrace'; landmark climate change deal struck; contractors avoid London projects as costs rise

12 CIBSE News

Bicycle power wins SoPHE Young Engineers Award; nominations for Institution officers, board and council members; building performance modelling guide launched

OPINION

14 Feedback

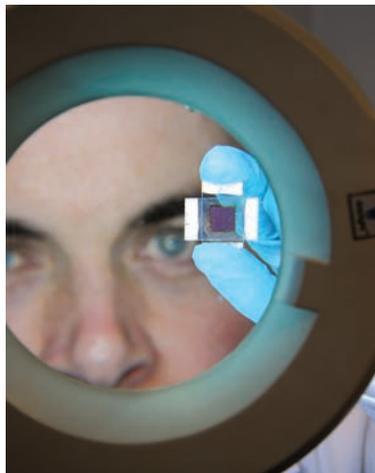
The return on smart meter investment is questioned, and the CIBSE LinkedIn Group debates BIM uptake

16 Making sense of the Heat Network Regulations

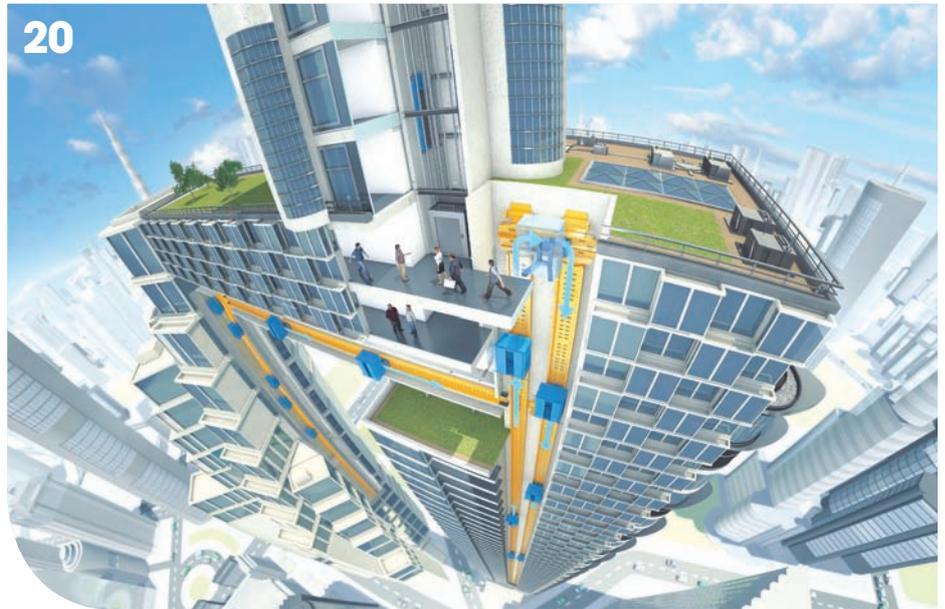
Hywel Davies offers guidance on compliance

18 Don't let regeneration wipe out our communities

The risks of parachuting sustainable communities into existing neighbourhoods



Why solar energy has the potential to fuel smart homes of the future – page 39



Features

20 Lift off!

Alex Smith finds out about an elevator that uses magnetic levitation to move passengers both horizontally and vertically

24 Risky business

Ewen Rose discovers why insurance broker CJ Coleman has joined the CIBSE Patrons

26 Cost model: Luxury urban apartment fit-out

Aecom's building services cost team examines the capital costs of installations for the fit-out of a typical high-end, two-bed, apartment

30 COVER FEATURE Light and shade

The 'passive first' approaches at the Middle Eastern headquarters of Siemens and the International Renewable Energy Agency, in Masdar City

SPECIAL FEATURES

● IT/renewables/software

39 Above and beyond

Liza Young explores Swansea University's pioneering research into building-integrated photovoltaics and seasonal heat storage

42 Simply smart

CIBSE Homes for the Future Group debates smart technologies. Liza Young reports

44 Down to zero

The net zero energy building that won the Best Energy Use award in a new ASHRAE simulation competition

LEARNING

47 CPD

Enhancing VRV/VRF systems to meet increasing loads in restricted and historic spaces

CLASSIFIED

51 Products

A round-up of systems and services for the industry

PEOPLE AND JOBS

55 Appointments

Jobs at jobs.cibsejournal.com

57 Q&A

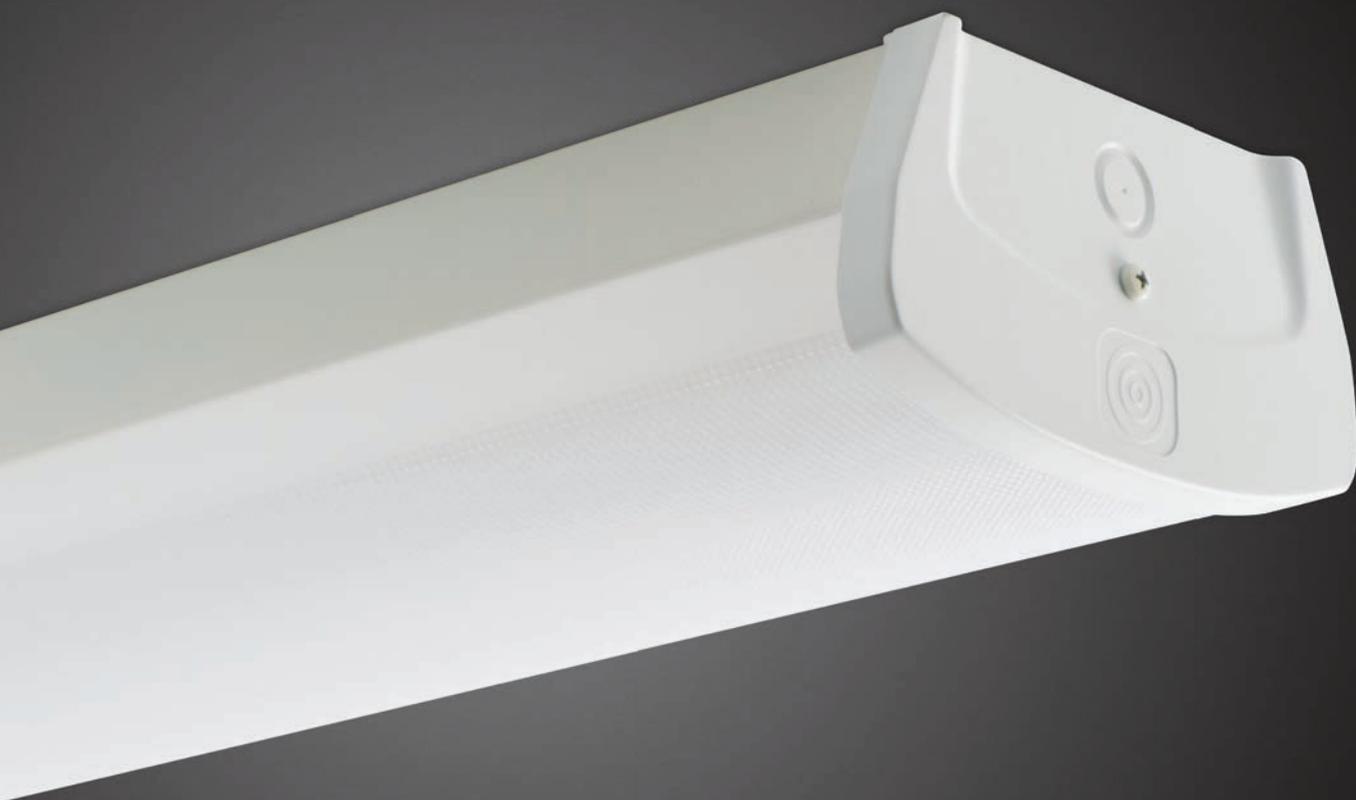
Mark Harris explains how – and why – Kingspan Insulated Panels has reduced its carbon emissions by almost 50%

58 Looking ahead

CIBSE Technical Symposium; Ecobuild; CPD training courses; CIBSE Groups, Regions and Societies

Luceco product installation guide:

- 1 Fit
- 2 Forget



Offering zero maintenance and over 50% energy & CO₂ savings; Luceco LED luminaires are the perfect cost saving replacement for linear fluorescent lighting.



Long life LED luminaires

www.luceco.uk

LUCECO
LIGHTING POSSIBILITIES



www.cibsejournal.com

Editorial

Editor: Alex Smith
Tel: 01223 477411
Email: asmith@cibsejournal.com
Deputy editor: Liza Young
Tel: 01223 477411
Email: lyoung@cibsejournal.com
Designer: James Baldwin
Technical editor: Tim Dwyer

Advertisement sales

Sales manager: Jim Folley
Tel: 020 7324 2786, jim.folley@redactive.co.uk
Sales executive: Darren Hale
Tel: 020 7880 6206,
darren.hale@redactive.co.uk
Sales executive: Patrick Lynn
Tel: 020 7880 7614,
patrick.lynn@redactive.co.uk
Senior sales executive: Paul Wade
Tel: 020 7880 6212
paul.wade@redactive.co.uk
Advertising production: Jane Easterman
Tel: 020 7880 6248
jane.easterman@redactive.co.uk

For CIBSE

Journal production manager: Nicola Hurley
Tel: 020 8772 3697, nhurley@cibse.org

Editorial advisory panel

George Adams, engineering director,
Spie Matthew Hall
Patrick Conaghan, partner, Hoare Lea
Consulting Engineers
Rowan Crowley, director, einsidetrack
Chris Jones, Flakt Woods
Philip King, director, Hilson Moran
Nick Mead, group technical director,
Imtech Technical Services
Jonathan Page, building services consultant
engineer, MLM
Geoffrey Palmer, director, Grontmij
Dave Pittman, director, Arup
Christopher Pountney, senior engineer,
Aecom
Paul Reeve, director, ECA
Alan Tulla, independent lighting consultant
Ged Tyrrell, managing director, Tyrrell Systems
Hannah Williams, mechanical engineer, Atkins
Ant Wilson, director, Aecom
Terry Wyatt, consultant to Hoare Lea

CIBSE Journal is written and produced by CPL (Cambridge Publishers Ltd) Tel: +44 (0)1223477411. www.cpl.co.uk
275 Newmarket Road, Cambridge CB5 8JE

Editorial copy deadline: First day of the month
preceding the publication month

Printed by: Warners Midlands PLC

The opinions expressed in editorial material do not necessarily represent the views of the Chartered Institution of Building Services Engineers (CIBSE). Unless specifically stated, goods or services mentioned in editorial or advertisements are not formally endorsed by CIBSE, which does not guarantee or endorse or accept any liability for any goods and/or services featured in this publication.

CIBSE, 222 Balham High Road, London SW12 9BS
Tel: +44 (0)20 8675 5211. www.cibse.org
© CIBSE Services Ltd. ISSN 1759-846X

Subscription enquiries

If you are not a CIBSE member but would like to receive *CIBSE Journal*, subscribe now! Costs are £80 (UK) and £100 (international). For subscription enquiries, and any change of address information, please contact Nicola Hurley at nhurley@cibse.org or telephone +44 (0) 20 8772 3697. Individual copies are also available at a cost of £7 per copy plus postage.

The 2016 US annual subscription price is £100. Airfreight and mailing in the US by Air Business. C/O Worldnet Shipping NY Inc, C/O Air Business Ltd / 155-11 146th Street, Jamaica, New York, NY 11434. Periodical postage pending at Jamaica NY 11431. US Postmaster: Send address changes to *CIBSE Journal*, C/O Air Business Ltd / 155-11 146th Street, Jamaica, New York, NY 11434.

Cover image: ©Phil Handforth - www.philhandforth.com



ABC audited circulation:
18,920 January to
December 2014



A long way to go

The Paris climate agreement could potentially save global environments from the worst consequences of man-made climate change. The COP21 convention saw 195 nations pledge to curb global warming to below 2°C by the end of the century and pursue efforts to keep it at 1.5°C.

But will the reality match up to the promise? Former energy minister Ed Davey has already criticised David Cameron for pursuing domestic policies that are not in line with commitments the UK made in Paris, saying that cutting renewable subsidies and closing the carbon-capture programme was ‘a national disgrace’.

Strong government action is necessary to reduce carbon emissions, because markets don’t often put a price on lower energy use. Evidence can be seen in Aecom’s cost model on luxury urban apartment fit-outs (page 26) – a topical subject given the number of residential towers being built in London. Depressingly, Aecom found that sustainability measures were not high on the list of requirements with many prime purchasers (with the notable exception of Americans); installing monitoring devices added to fit-out costs but did nothing to enhance sale prices.

The article highlights the latest costs for a wide range of services

including heating, ventilation and water installations. In a separate report (page 10) Aecom found that contractors were turning down work in London because of rising specialist costs. As a result of low margins, contractors’ ‘risk appetite’ was said to be low, which doesn’t bode well for the delivery of cutting-edge, innovative buildings.

Helping contractors to price risk is the role of insurance broker, CJ Coleman (page 24). It

employs engineers to help understand complex projects, and to price innovative services accordingly. It will no doubt be interested in two cutting-edge commercial projects in Masdar, Abu Dhabi, which use similar passive strategies, despite one building being the headquarters for the International Renewable Energy Agency (page 30).

Another essential read on innovation is Swansea University’s research into building-integrated photovoltaics, which includes the development of printable solar cells, and heat storage systems with the potential to provide all of a building’s space heating requirements. It is this sort of engineering ingenuity that will help give nations a fighting chance of meeting the climate change targets agreed in Paris.

Alex Smith, editor

asmith@cibsejournal.com



LAST CHANCE TO BOOK

WINNERS ANNOUNCED ON WEDNESDAY
24 FEBRUARY 2016 GROSVENOR HOUSE
HOTEL, LONDON

- » Celebrate excellence and achievements in building performance
- » Network with more than 700 awards dinner guests
- » Be entertained by our host Louise Minchin, Journalist and Presenter
- » Seats are selling fast so BOOK NOW to secure the best table

BOOK NOW
www.cibse.org/bpa



Awards host
Louise Minchin



PLUS THE
OVERALL WINNER
**BUILDING
PERFORMANCE
CHAMPION**
Sponsored by
Remeha
Commercial

 FOLLOW US:
@CIBSEAwards | #BPA2016
www.cibse.org/bpa

Headline sponsor



In association with:



CONGRATULATIONS TO OUR 2016 SHORTLIST

BUILDING SERVICES CONSULTANCY OF THE YEAR (UP TO 100 EMPLOYEES)

Sponsored by Beeby Anderson Recruitment

- » Beverley Clifton Morris (BCM)
- » Steven A Hunt & Associates
- » SVM Consulting Engineers

BUILDING SERVICES CONSULTANCY OF THE YEAR (MORE THAN 100 EMPLOYEES)

Sponsored by Andrews Water Heaters

- » AECOM
- » Arup
- » Atelier Ten
- » Hoare Lea

FACILITIES MANAGEMENT TEAM AWARD

Sponsored by Gratte Brothers

- » Aston Go Green, Birmingham – Aston University
- » Broadgate Estates London Portfolio – Broadgate Estates
- » International Commerce Centre (ICC), Hong Kong - Kai Shing Management Services
- » Sirius, Canberra, Australia – Mirvac Group

ENERGY SAVING PRODUCT OF THE YEAR

Sponsored by Spirotech

- » Emerald – R290 Refrigeration & Heating Plant – A1 Engineering Solutions
- » Totem by Asjagen Microcogenerator – Advenco
- » EW-HT heat pump – Climaveneta SpA
- » EndoTherm – Endo Enterprises (UK)
- » Hydromx® – PBA Energy Solutions

BUILDING PERFORMANCE TRAINING PROGRAMME AWARD

Sponsored by Vaillant

- » Refrigeration and Climate Control Centre of Excellence (RCCC) – Air Conditioning and Mechanical Contractors' Association (AMCA)
- » BIM Level 2 Fundamentals – BRE Academy
- » Soft Landings Training – BSRIA
- » Building Disclosure and Benchmarking Course – University of Nebraska (UNL) – Lincoln
- » Building Services Explained for VolkerFitzpatrick Site Teams – VolkerFitzpatrick

COLLABORATIVE WORKING PARTNERSHIP AWARD

Sponsored by RS Components

- » Bolton Market, Bolton – Beverley Clifton Morris (BCM)/Willmott Dixon
- » John Lewis, York – IES/John Lewis
- » Barclays CPMO – Realys (part of ISG)/Barclays

ENERGY MANAGEMENT INITIATIVE AWARD

Sponsored by Imtech

- » Energy Management and Optimisation Project – ALDI Stores
- » British Land Portfolio Energy Reduction Programme - British Land
- » Bupa Energy Saver Fund – Bupa UK
- » John Lewis, York – Lateral Technologies and Solutions
- » Project Graphite – Sainsbury's Supermarkets

LIGHTING FOR BUILDING PERFORMANCE AWARD

Sponsored by CMR Controls Ltd

- » The National Theatre – NT Future, London – Atelier Ten
- » WWF, Living Planet Centre, Woking – Atelier Ten
- » New Emergency Department and 24-bed ward, Antrim Hospital, Northern Ireland – Beattie Flanigan Consulting Engineers

PROJECT OF THE YEAR COMMERCIAL/INDUSTRIAL/RETAIL

Sponsored by Hitachi

- » One Embankment Place, London – Chapman BDSP
- » Foundry, London – Cullinan Studio
- » 101 Park Drive, Abingdon – Elementa Consulting (member of Integral Group)
- » 50 Shakespeare Street Refurbishment, Nottingham – Nottingham Trent University

PROJECT OF THE YEAR - LEISURE

Sponsored by Lochinvar

- » Splashpoint, Worthing – Aecom
- » Butlin's Firehouse Restaurant, Skegness, UK – CD International Building Services Engineers
- » Chichester Festival Theatre, Oaklands Park – Skelly & Couch

- » Everyman Theatre, Liverpool – Waterman Building Services

PROJECT OF THE YEAR - PUBLIC USE

Sponsored by Cooltherm

- » Wilkinson Primary School, Wolverhampton – Architype/E3 Consulting
- » Mayville Community Centre (renamed Mildmay Centre), London – Bere: architects
- » Manchester Town Hall Complex Transformation Project (MTHCTP), Manchester – Building Design Partnership (BDP)
- » Andrew Wiles Building (Mathematical Institute, University of Oxford), Oxford – Hoare Lea
- » Britten Pears Archive, Suffolk – Max Fordham

PROJECT OF THE YEAR - RESIDENTIAL

- » Clapham Retrofit, London – Arboreal Architecture
- » Girton College, Cambridge – Max Fordham
- » LILAC, Leeds – SSoA, Sheffield University/ Faculty of Architecture, Wroclaw University of Technology, Poland
- » Derwenthorpe Phase 1, York – Studio Partington

PROJECT OF THE YEAR - INTERNATIONAL

Sponsored by ABB

- » PROSPECT Shopping and Entertainment Centre, Kiev, Ukraine – CD International Building Services Engineers
- » American University of Sharjah (AUS), Campus Service Centre, Sharjah, United Arab Emirates – Cundall
- » David and Lucile Packard Foundation Headquarters, California, USA – Elementa Consulting (member of Integral Group)
- » Holiday Inn Express Singapore Orchard Road, Singapore – Intercontinental Hotels Group
- » Sirius, Canberra, Australia – Mirvac Group

Sponsored by



For sponsorship enquiries please contact jim.folley@redactive.co.uk or 020 7324 2786

BSRIA launches HIU guidance

BSRIA has released a guide to heat interface units (HIUs) for specifiers, designers and installers working with direct and indirect HIUs in district or communal heat networks.

HIUs can have 'significant economic and environmental benefits' depending on the source of heat and structure of the network, claims BSRIA. 'However, successful operation depends on appropriate system design and specification, followed by competent installation and maintenance.'

Marketing officer Catherine England added: 'There is increasing recognition that heat networks enabled by the use of HIUs... are a key element of a low carbon future.'

Copies of the guide are available from the BSRIA bookshop, priced £30 to BSRIA members (£60 to non-members). It can also be downloaded free of charge by BSRIA members.

RIBA president wants 'frank debate' on supply chain conflict

● Building services specialists not involved early enough

Engineers, architects and builders must have a 'frank debate' about why collaboration is still not happening across the supply chain, according to new RIBA president Jane Duncan.

She told the institute's Collaboration in Construction Forum that building information modelling (BIM) was creating an appetite for collaboration, but that 'pressure points and conflicts' were continuing to undermine building quality.

'Special forms of contract, where everyone involved is a stakeholder' are needed, added Duncan, who said building services specialists were still not



Jane Duncan

being involved early enough in the design process.

Jo Bacon, partner at Allies and Morrison, told the forum that current contracts and insurance arrangements did 'not reflect collaborative technology or a collaborative approach to work'.

'We need to get back to first principles and avoid dumping risk down the chain,' said Bacon.

Pressure points are created by 'time and cost restraints; lack of skilled resource; inadequate scoping; and poor allocation of risk', said Lyndsay Smith, director of education and national frameworks at Morgan Sindall, who urged 'mature procurement methods that lead to early specialist involvement and are not completely driven by price'.

However, if specialists are to be involved earlier, they need to be financially rewarded and treated fairly, according to Portakabin Group design and engineering director Andy Sneyd. 'Payment has to reflect the extra risk the contractor is expected to take,' he said, adding that the amount and complexity of new technology made coordination by specialist contractors more challenging.

FREE WEBINAR

CPD accredited

EFFICIENT PUMPING IN HEATING AND COOLING APPLICATIONS



Thursday 25
February at
13.00 GMT

Join us for a **CIBSE Journal** webinar,
sponsored by **Grundfos**.

Brought
to you by



Two-thirds hit ESOS registration deadline

About 70% of organisations that are subject to the Energy Savings Opportunity Scheme (ESOS) regulations registered in time to avoid stringent financial penalties, according to the Environment Agency (EA).

Some 4,000 of the 10,000 businesses subject to the regulations had complied by the December deadline and another 2,500 had notified the EA of their intention to comply by 29 January, after which non-registered firms face a fine of £50,000, plus a further £800 per day.

The ESOS legislation affects firms with more than 250 employees or a turnover of more than €50m and a balance sheet exceeding €43m.

The Energy Institute said more than 55% of respondents to its recent survey estimated an average potential saving of more than 11%, as a result of implementing the

recommendations from their ESOS assessments.

The scheme's 5 December registration deadline was set under the EU Energy Efficiency Directive and 2014 ESOS regulations so, legally, could not be extended. However, regulators are able to 'waive or modify enforcement action and penalties relating to non-compliance'. As a result, UK firms have until 29 January to indicate their intention to comply and until 30 June to achieve ISO 50001 certification as a form of compliance.

The EA, which is responsible for administering the scheme, will be writing to all the organisations who have not submitted an undertaking to comply. ESOS project manager Jo Scully said: 'Our focus remains on bringing organisations into compliance with ESOS to ensure it delivers the energy savings and financial and environmental benefits intended.'

Ex-minister brands energy policy 'a national disgrace'

● Government in danger of breaching Climate Change Act by cutting renewable subsidies, says Davey

The UK's energy policy is a 'national disgrace' and could even be illegal in light of the agreement reached by 195 countries at last month's COP21 climate change conference, in Paris, according to a former Energy Minister.

The talks ended with a deal committing signatories to limit global warming to 'well below' 2°C and pursue efforts to keep it at 1.5°C in a bid to cut the current 46bn tonnes of greenhouse gases emitted every year to close to zero by 2050. Prime Minister David Cameron said it was a 'huge step forward in helping to secure the future of our planet',

but he was widely accused of hypocrisy for pursuing domestic policies that are not in line with the UK's Paris commitments.

Ed Davey, who was Energy Minister in the coalition government, said the government was in danger of breaching its own Climate Change Act – which commits the country to cutting emissions by 80% by 2050 – and the EU's

Renewable Energy Directive. He said cutting renewable subsidies and closing the carbon-capture storage programme 'where the UK was one of the leaders in the world, is a national disgrace'.

He said the Chancellor, George Osborne, was at risk of 'breaching ministerial codes' by putting the government 'in an illegal position, in my view'.

Current Energy Minister, Amber Rudd, said the government was absolutely committed to the 2°C upper limit, but that the 1.5°C goal was aspirational, adding that the government was going to achieve its targets in a different way that provided better value for consumers. Expert commentators have said the UK would have to close all its coal and gas power stations by 2035 to achieve the 1.5°C target.



Ed Davey

LANDMARK CLIMATE CHANGE DEAL STRUCK

A new landmark deal was struck at the Paris climate change conference 2015 last month.

The Paris pact aims to curb global warming to less than 2°C by the end of the century. It was agreed by 195 nations, including the world's biggest polluter – China – and will come into force in 2020.

Other measures include: achieving a balance between sources and sinks of greenhouse gases in the second half of this century; reviewing progress every five years; and \$100bn a year in climate finance for developing countries by 2020.



Osborne backs RHI and heat networks

The government has committed £295m over the next five years to improve the energy efficiency of schools, hospitals and other public sector buildings, following George Osborne's autumn spending review.

The Chancellor also confirmed that funding for the Renewable Heat Incentive (RHI) would rise to £1.15bn in 2021 'to ensure that the

UK continues to make progress towards its climate goals, while reforming the scheme to improve value for money, delivering savings of almost £700m by 2020-21'.

Heat Pump Association president Mike Nankivell welcomed the safeguarding of the RHI and said he hoped 'this signals that government may take on board some of the suggestions

we, and others with interests in renewable heat technologies, have already made for future improvements to the scheme'.

The government has also set aside £300m for up to 200 heat networks that it says will generate enough heat to support the equivalent of more than 400,000 homes, and unlock a further £2bn of private capital investment.

In brief

VIEWES SOUGHT ON AIR QUALITY

The Department for the Environment, Food & Rural Affairs (Defra) is seeking views on proposed changes to local air quality management (LAQM) guidance and reporting. This is the final consultation in Defra's review of how to improve the LAQM framework in England. The closing date for responses at bit.ly/1m1AMQU is 21 January.

PRAISE FOR UK SMART CITIES

Peterborough and Milton Keynes were praised at the recent Smart Cities World Expo in Barcelona. Peterborough was judged 'Smart City of the Year 2015' – beating competition from around the world. It now hopes to become the UK's Environment Capital and its first Circular City. Its smart city programme, Peterborough DNA, has been running since 2013.

AECOM LEADS HEAT PROJECT

The Energy Technologies Institute has announced that AECOM will lead its Heat Infrastructure Development project. The 12-month, £500,000 project will examine the technical, process and system developments needed to deliver major reductions in the capital cost of heat network infrastructure, and accelerate its deployment.

SECURING FUTURE SUPPLY

The government has concluded its second Capacity Market auction to secure the UK's electricity generating capacity for 2019/20. It says buying energy four years in advance increases competition and, as a result, it was able to secure supplies at £18/kW, more than £1/kW cheaper than last year.

LAW AWARD FOR KLEIN

Professor Rudi Klein, chief executive of the Specialist Engineering Contractors' Group, has been presented with the Clare Edwards Award. The accolade is conferred jointly by the Technology and Construction Court Solicitors' Association and the Contractors' Legal Group 'for professional excellence and contribution to the legal profession serving the construction industry'.

CDM regs may face further cuts

The Department for Business Innovation & Skills is looking to make further changes to the Construction, Design and Management (CDM) Regulations as part of its strategy for cutting 'red tape'.

The CDM safety regulations were revised last April to place more responsibility on clients for health and safety. The CDM coordinator role was abolished, with clients now required to appoint a principal designer and principal contractor.

Business secretary Sajid Javid hopes to speed up construction projects as a result of the review, which he said would 'give housebuilders and smaller construction businesses a powerful voice as part of our £10bn deregulation drive'.

Constructors remain confident

The construction industry is upbeat about the future, thanks to the government's spending plans for major infrastructure work, a survey claims.

The Infrastructure Outlook Report, commissioned by Tarmac and conducted by Ipsos Mori, canvassed 300 senior decision-makers - 68% of whom said they were feeling confident about business prospects for 2016.

But many expressed reservations about the government's plans for the high-speed rail link HS2 and the opportunities created by the 'Northern Powerhouse'.

Contractors avoid London projects as costs rise

● Rising wages to blame, says Aecom survey

Construction costs in London rose by 10% last year because of skills shortages, which have also been blamed for contractors turning down opportunities to bid for projects.

A survey carried out by the engineering consultancy Aecom showed that labour costs in the capital are the main reason quoted by firms for declining invitations to bid. Some contractors are turning down 75% of new business opportunities as a direct result of rising wages among specialist workers.

Aecom's director of cost management, Brian Smith, said 'risk appetite' among contractors was low and their 'desire for certainty' was prompting them to take on projects at smaller margins, with guaranteed return.

'The industry is taking a far more strategic approach, targeting schemes that will deliver planned margins,' added Smith. 'Other considerations increasingly include the reputation of the developer,



Contractors are faced by high labour costs in the capital

or whether there is any successful prior relationship, as well as the visibility of reliable funding.'

As a result, developers should consider how to 'position their projects to best possible effect to attract and secure interest from the best-qualified contractors', Smith added.

Aecom said costs were expected to rise by a further 7% this year and by 5.5% in 2017.

See Aecom's apartment fit-out cost model, page 26.

Chancellor confirms apprenticeship levy

The industry has given a cautious welcome to the details of the apprenticeship levy, announced as part of the Chancellor's autumn spending review.

While some condemned it as a 'tax on employment', others welcomed the move to guarantee funding for the proposed three million new 'Trailblazer' apprenticeships, which are due to start operating in September 2017.

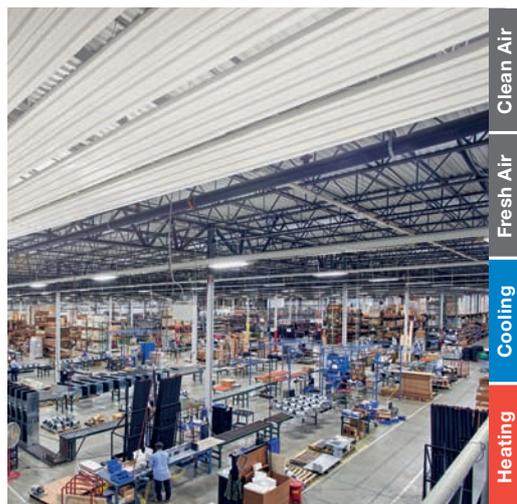
The government said 98% of employers would be exempt

from the levy because only companies with payrolls larger than £3m a year will contribute 0.5% of their wage bill. This is expected to create a fund worth £12bn by 2020.

The government is also establishing an independent institute for apprenticeships, which will be responsible for approving the standards behind the Trailblazer programme, and will advise on the level of funding each apprenticeship should receive.

'Apprenticeships are critical to business growth and higher technical standards, and it is hugely reassuring that the Chancellor has recognised this important fact,' said Jim Marnar, president of the Building Engineering Services Association.

According to Apprenticeships UK, just 12% of businesses currently employ an apprentice, despite 72% of businesses that employ apprentices reporting improved productivity as a result.



Zehnder ZIP – Raising the roof

Zehnder ZIP radiant ceiling panels offer many benefits which contribute to creating a comfortable, healthy and energy-efficient indoor climate.

Its lightweight construction makes Zehnder ZIP a perfect fit for refurbishment projects, facilitating ease of handling and installation. Proving both cost effective and responsive in operation; Zehnder ZIP radiant panels are ideally suited to rooms with high ceilings, such as production halls and warehouses, workshops, sports halls, garages, showrooms, maintenance halls and wet environments.

For full product information, download the Zehnder ZIP Planning document from: www.zehnder.co.uk

T: 01276 605 800
E: enquiries@zehnder.co.uk

always
around you

zehnder

RECONFIGURABLE FACTORY COMPLETED



The UK's first reconfigurable factory has been built at the University of Sheffield Advanced Manufacturing Campus. Factory 2050 can switch production rapidly between different high-value components and one-off parts. Bond Bryan Architects designed the circular

factory to demonstrate that 'form is no longer an inhibitor to functionality'. Its 360°, 8m-high glazed external elevation is free-spanning from ground to roof, using a Schuco steel curtain walling system. The open-plan space is designed to provide an uninterrupted research

floor area with the M&E plant centralised in the core, using perimeter-trenched services to deliver air, water, power and data to machines. The services engineer was RPS.

The brise soleil around the top one-third of the glazing reduces glare and overheating.

Consultation over VAT on energy-saving materials after low rate ruled illegal

● European Court says UK government incorrectly applied tax reduction

The government has launched a consultation into changes to the reduced rate of VAT for the installation of energy-saving materials (ESMs). It comes after a ruling by the European Court of Justice that the UK's special low rate of 5% was illegal.

The government intends to amend the VAT legislation as part of its Finance Bill and the consultation is looking at the best way to 'retain as much of the relief as possible, while ensuring that UK law is fully compliant with EU law'.

The court ruled that the UK had incorrectly

applied the VAT reduction as part of its social policy for providing tax relief to social housing, charity premises, care homes and children's homes. Insulation, draught stripping, central heating and hot water controls, solar panels, wind turbines, water turbines, heat pumps, micro CHP and biomass boilers were all subject to the lower rate in certain properties, and to help alleviate fuel poverty.

Under European legislation, the UK can have up to two different reduced rates of VAT. Currently, the UK has just the 5% rate, which is the lowest allowed; so the possibility remains that a higher – but still less than the standard 20% – rate could be used for ESMs.

The UK was accused of applying the relief

too widely by failing to restrict the benefit to certain social groups, or those with certain social needs. It was also said to have included, in the list of ESMs, items that did not constitute the 'provision, construction, renovation or alteration' of residential property.

The Association for Public Service Excellence, which works with local authorities on renewable energy projects, said it was 'perplexed' by the court's stance. Its director of energy, Mark Bramah, said: 'This will further damage the ability of many local authorities to improve their housing stock and reduce fuel poverty in an effective, low carbon way.'

To contribute to the government's consultation, visit bit.ly/1IGpiwr

Philips and Cisco form lighting alliance

Lighting manufacturer Philips, and IT giant Cisco, have formed a global alliance to focus on energy savings, building efficiency and employee productivity in office buildings.

The partnership brings together Philips' LED-based connected lighting system with Cisco's IT network to address a global office market estimated to be worth €1bn, accessed through the Internet of Things (IoT).

Light points in the Philips system, equipped with sensors and software applications, can be connected using Cisco technologies. This lighting network 'creates a pathway for information and helps enable new services', a joint statement said.

'Lighting that is connected to highly secure, reliable IT infrastructure will form the backbone of the smart office of the future,' said Philips' head of strategy and marketing, Bill Bien.

Peck is Lux Person of the Year

Liz Peck was named the Lux Person of the Year at the Lux Awards 2015 in London.

Peck, president of the Society of Light and Lighting (SLL), was congratulated on her 'enormous contribution to the lighting family and the wider community' in her role running an independent design



consultancy. She initiated the high-profile Night of Heritage Light, which resulted in nine Unesco World Heritage Sites being lit by lighting designers to highlight usually unlit elements of their fabric.

Peck said she gives her time to industry initiatives 'simply because I love what I do'.

Membership application closes 1 February

The next closing date for applications for the Associate (ACIBSE) and Member (MCIBSE) grades for members based in the UK is 1 February 2016.

The criteria for ACIBSE and MCIBSE now has an additional competence: E5 - Exercise responsibilities in an ethical manner. For those applying, please ensure Engineering Practice Reports include this additional competence.

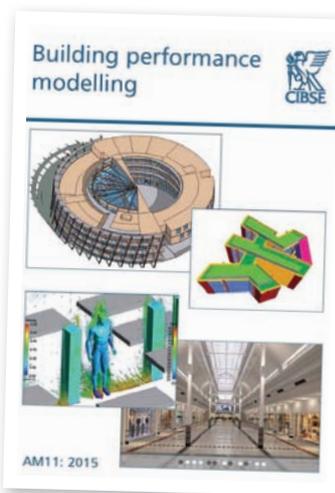
Help pages can be found on the CIBSE website at www.cibse.org/applicanthelp. There are examples of engineering practice reports and development action plans, as well as interview guidance and presentation samples. For full details visit: www.cibse.org/membership or contact us via membership@cibse.org or +44 (0)20 8772 3650

CIBSE launches building performance modelling guide

● AM11 focuses on building simulation software

The new *AM11 Building performance modelling (BPM)* manual is now available. This publication replaces the Applications Manual *Building Energy Environment Modelling*, and has been completely rewritten to extend the application of building modelling to many areas that currently need to be properly addressed in building and system design.

AM11:2015 has taken into consideration many of the real issues of simulating buildings and their systems while still focusing on compliance with Building Regulations and quality assurance



issues. *BPM* covers the general concepts of energy and environmental modelling and, in particular, focuses on: quality assurance procedures; compliance with UK and some international building energy efficiency codes; thermal environment; and energy, ventilation, lighting and plant modelling.

This comprehensive manual will provide building design professionals with the knowledge and confidence to effectively apply different types of

modelling software in their designs.

AM11 is available free to members as a member benefit at www.cibse.org/knowledge, and for £80 for non-members.

Nominations for Institution officers, board members and council members



New Institution officers and board and council members are elected each year to take office from the AGM in May. Officers and elected board members serve on the board, the Institution's governing body, comprising seven officers (President, president-elect, three vice-presidents, honorary treasurer and immediate past president) and five elected members.

The council of the Institution is a larger consultative body that exists to advise the board on Institution policy. It is composed mainly of representatives of the regions, societies, groups and standing committees, but also has a number of places for elected

members who serve a three-year term. Two corporate members and one non-corporate member can be elected each year.

Members of the Institution can nominate candidates for vacancies arising in May 2016 in accordance with rules set out below. The board is required to nominate candidates for all officer and board member vacancies, and this year the board's nominations are as follows:

- **President-elect:** Peter Wong CEng FCIBSE
- **Vice-presidents:** Paddy Conaghan CEng FCIBSE, Stephen Lisk FCIBSE FSLL, Tadj Oreszczyzn CEng FCIBSE
- **Honorary treasurer:** Stuart MacPherson CEng FCIBSE
- **Member of the board:** Lynne Jack CEng FCIBSE FSoPHE

Further details on the nominations process, including biographical notes for the above candidates and the duties, responsibilities and qualifying criteria for each position, will be found in the Members section of the CIBSE website at www.cibse.org

Rules for nominating candidates, set out in Royal Charter, By-Laws and Regulations, are:

- Fellows, Members, Associates and Licentiatees may submit nominations for the offices of president-elect, vice-president and honorary treasurer, and for elected members of the board. The candidates must meet the qualifying criteria, and must be supported by ten nominations from Fellows, Members, Associates and Licentiatees.
- Fellows, Members, Associates and Licentiatees may nominate individuals from those grades for membership of council. Graduates, companions and affiliates (including students) may nominate individuals from those grades for council membership. Candidates for council must meet qualifying criteria and be supported by five nominations from members in the appropriate grades.

Nominations must be made in writing to the chief executive, to be received at CIBSE HQ by 31 January 2016 together with written consent of the nominee to accept office if elected.

The names of those making nominations will follow the name of the candidate on the ballot paper should a ballot be required.

Bicycle power wins SoPHE Young Engineers Award

● Arup scoops SoPHE prize with innovative water-treatment scheme

A team of young engineers from Arup have won the Society of Public Health Engineers' (SoPHE) Young Engineers Award 2015.

The proposal by Alexa Bruce, Anna Cesenni and Anokhee Shah was created in answer to the challenge set by the judges to assess how local Moringa or cactus plants could be used for household-water treatment in poor communities of Liberia or Sierra Leone.

Their presentation focused on the potential of the Moringa plant to act as a natural aid in existing water-filtration methods such as the biosand filter.

The winning idea involved the commercial growth of Moringa plants in conjunction with the establishment of water-treatment facilities, powered by bicycle and requiring little to no electricity to run. Each of these facilities could supply the water needs of 150 people per day, as well as jobs for local people.

As a by-product, plants produce goods such as fertiliser, seed cake for livestock, and oils used in cosmetics, which would allow the treatment facilities to be run at a profit.

A second benefit of the plan relates to its ability to empower

women, who would gain from this system as they are responsible for water collection in more than three-quarters of west African households.

Steve Vaughan, SoPHE chair, said 'This year's Young Engineers Award has seen another successful partnership with Water Aid, resulting in a winning proposal of immense value in west Africa, where drinking water resources are continually stressed.'

The winning team will carry out a field trip with Water Aid

to the affected area.

The annual Young Engineers Award was presented at the 12th annual SoPHE dinner in November. Mike Darvill, SoPHE Industrial Associates chair, presented Water Aid with a £1,000 charitable donation.

The event, hosted by the SoPHE Industry Group, attracted more than 300 engineers. Vaughan called upon members to support the newly formed Public Health Engineers sub-group of the CIBSE Young Engineers Network.



The winning Arup team (from left): Anokhee Shah, Anna Cesenni and Alexa Bruce

Annual SoPHE dinner supporters

The awards dinner was kindly supported by ACO Building Drainage, ACV, Alumasc, Andrews Water Heaters, AO Smith, Blücher, Emmeti, EVDS, Geberit, Girpi, Goodwater, GRAF, Heatrae Sadia, Horne Engineering, Hydrotec, Kylemore, Lochinvar, Marley, Pegler Yorkshire, Pipex, Polypipe, Project Fire, Reliance Water Controls, Roth, Saint Gobain Pam UK, Sentinel, Wavin, Wilo UK and Zip Heaters.

Lighting masterclass



The Society of Light and Lighting Masterclass series is to visit Manchester, York, Belfast, Edinburgh and London. The CPD series 'Inside Out: Light & Architecture' looks at collaboration in lighting and architecture. The 2016 dates are:

- 21 January, Manchester
- 18 February, York
- 31 March, Belfast
- 13 April, Edinburgh
- 26 May, London

To book visit www.cibse.org/sll

Lifts Group call for papers

The University of Northampton, CIBSE Lifts Group and LEIA are pleased to announce that the Sixth Symposium on Lift and Escalator Technologies will be held on 21-22 September 2016.

This symposium offers an opportunity for industry experts, academics and postgraduates to present peer-reviewed papers. For more information, and to submit an abstract, visit www.liftsymposium.org

Youmna Abdallah wins Young Lighter of the Year



SLL president Liz Peck (left) and Youmna Abdallah

Youmna Abdallah, from MBLD, has been named Young Lighter of the Year by the Society of Light and Lighting (SLL).

Abdallah, who received her accolade at the Lux Awards in November, impressed judges with her presentation and paper *Light Poverty in Precarious Environments within Developing Countries*.

The awards, now in their 21st

year, allow young lighters to demonstrate knowledge, hone their presentation skills, and raise their industry profile.

Other finalists included Inessa Demidova (GIA Equation), who won the Best Presentation Award for *Practical Implementation of Circadian Lighting in Office Environments*, Christina Hébert (Nulty+) with her paper *A Symbol of Urban Identity*, and Zeynep

Keskin with her paper *Daylight and Seating Preference in Open-Plan Spaces*. Youmna also won the Best Written Paper. These categories were judged by the Lighting Education Trust (LET), which provided the cash prizes.

Also recognised at the awards was Liz Peck, SLL president, who was named Lux Person of the Year. Finalists' presentations are at www.cibse.org/sll

Feedback

This month, a reader questions the return on investment of smart meters, and the CIBSE LinkedIn Group debates slow BIM uptake



The cost of going smart

Our government suggests that its offensive against renewables – despite generous guarantees for uneconomic nuclear power – is driven by its concern about energy costs. However, the smart-meter programme isn't justified by the return on investment.

Of course, the smart-meter programme has a 'wow' factor for engineers, but it seems to me that we should be asking: 'What if we are wrong?'

The Germans – who regard energy efficiency programmes as social and, therefore, economic benefits that work well and are cost-effective – concluded that German dwellings simply don't justify smart metering.

The UK narrative to consumers seems to revolve around the sheer inconvenience of meter readings. On the technical side, we know smart meters are about demand reduction.

Yet domestic consumers aren't being told that the smart meters they are funding (£400 per household) could bring variable (punitive) tariffs, restrictions on demand, household security risks from hacking, remote isolation of domestic supplies –

with various applications – and the resale of highly personal data for commercial purposes. Those are quite apart from the health impacts of saturating neighbourhoods with wi-fi transmissions, which some experts are concerned about.

There are better ways of spending consumers' £12bn. Just imagine what that sum could do for: energy efficiency; slowing the flow of increasingly imported gas; the UK's deteriorating balance of payments; our social benefits; and helping to alleviate fuel poverty.

Chris Jones MCIBSE

CIBSE LinkedIn Group debates the news that fewer than one in six firms is BIM ready

Matt Snowden

Fewer than one in six firms (16%) in the building services sector is 'fully ready' to use building information modelling (BIM) on projects, according to survey findings from the Electrical Contractors' Association (ECA). What does this mean for the industry going forward?

Damian Keeley

I haven't yet met a services engineer who routinely works with BIM. Structures, yes, but not as many as architects.

Seems like it's mostly architects who have embraced the emerging technology and standards so far... but, even then, many architects are not yet on board.

Paul Sowerby MCIBSE

BIM is an excellent tool, but it still relies on quality training and understanding of engineering teams and basic engineering concepts. Sadly, because of a lack of proper training, we still have massive skill gaps.

Adam Middleton

When it comes to BIM, I feel many companies bury their heads in the sand and hope it will just blow over. For BIM to be fully effective, everyone needs to be singing from the same hymn sheet.

Tony Johnstone

Speaking as a rather disillusioned 'low carbon consultant', why should a services engineer spend time on a government initiative that will probably be cancelled when the Treasury understands it will cost money?

Architects like it because it's an extension of their 3D CAD; for contractors and facilities managers, it is a discipline they do not apply routinely to jobs because the client usually has a smaller budget in mind. I wish it were different; we could do a much better job of keeping buildings running efficiently if it were – but I suspect only the prestige projects will attempt it and only very few enlightened property groups will carry it on long term.

● See more on smart metering on page 42.

CIBSE Journal welcomes readers' letters, opinions, news stories, events listings, and proposals for articles.

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



It's true.
There's no smoke
without fire.

There are rumours going round that the company you probably know best for smoke control systems also makes Fire Curtains.

At Colt, we would like to make it clear that these rumours are absolutely true. In fact, Colt makes a full range of highly effective Fire Curtains.

DISCREET APPEARANCE

Colt Fire Curtains are lightweight and compact, allowing easy installation in tight spaces, such as false ceilings. With no visible fixings and guide rails that can be easily recessed into the structure of the building, they are far less obtrusive than roller shutter alternatives. The head box, bottom bar and side guides can be powder coated in one of a range of RAL colours to suit your project.

CONTROLS AND SAFEGUARDS

Colt Fire Curtains benefit from our nearly 85 years of experience in smoke and climate control. Our Fire Curtains have been tested for reliability, response time and rate of descent in accordance with EN 1634-1.

Importantly, Colt Fire Curtains unwind to their operational position in a 'gravity fail-safe' manner and are unaffected by potential power failure, whatever the cause. Where more sophisticated control is required, to meet BS 8524 for example, the Colt SKC-SC control system offers multiple programmable options.

BESPOKE DESIGN SERVICE

Colt will provide complete project management throughout your project, taking full responsibility for ensuring the system is up and running perfectly. For added peace of mind, we also offer a pre-order design service.

SHARE OUR KNOWLEDGE

Colt offers a range of informative CPDs, seminars, webinars and supporting documents, including whitepapers. To find out more, call us on the number below or visit our website www.coltinfo.co.uk

Twitter: @Colt_UK Tel: 02392 451111 email: info@coltinfo.co.uk

MAKING SENSE OF THE HEAT NETWORK REGULATIONS



The Heat Network (Metering and Billing) Regulations 2014 are still causing confusion and concern among building operators and managers. **Hywel Davies** offers some guidance on what they mean and who needs to comply

Last March, this column reported confusion around the introduction of the Heat Network (Metering and Billing) Regulations 2014. These have since been amended and, in October, the National Measurement and Regulation Office (NMRO) issued updated guidance on their scope – so a review of the requirements seems timely.

Articles 9-12 of the EU Energy Efficiency Directive 2012/27/EU (the EED) address the supply of distributed heat, cooling and hot water. Article 9 requires that ‘member states shall ensure, in so far as it is technically possible, financially reasonable and proportionate in relation to the potential energy savings, that final customers for electricity, natural gas, district heating, district cooling and domestic hot water are provided with competitively priced individual meters that accurately reflect the final customer’s actual energy consumption, and that provide information on actual time of use’.

Article 9 requires ‘competitively priced individual meters’ to be installed when an existing meter is replaced, a new connection made in a new building, or when a building undergoes major renovation – unless it is not technically possible – or cost-effective relative to the estimated potential savings. This provision must be made from 31 December 2016.

Heat suppliers must also notify the relevant ministers¹ of the location of heat networks, their extent, total installed capacity, heat generated and supplied, number of meters and final customers of the network. Frequency and content of billing information, and details of any analysis of cost-effectiveness or technical feasibility carried out in relation to the

regulations, must also be supplied. The April 2015 deadline was changed to 31 December 2015.

The first important question is: who is a heat supplier? According to the NMRO, the term describes a person who supplies and charges for the supply of heating, cooling or hot water to a final customer, through communal heating or a district heat network.

The guidance says: ‘This includes the supply of heat as part of a package, paid for indirectly, perhaps through ground rent, a service contract or other means. Such a payment does not need explicitly to mention the supply of heat, but there will be a reasonable expectation by the final customer that heat supply is part of the service. Heat suppliers are not just local authorities and owners of energy service companies; many smaller suppliers are identified within

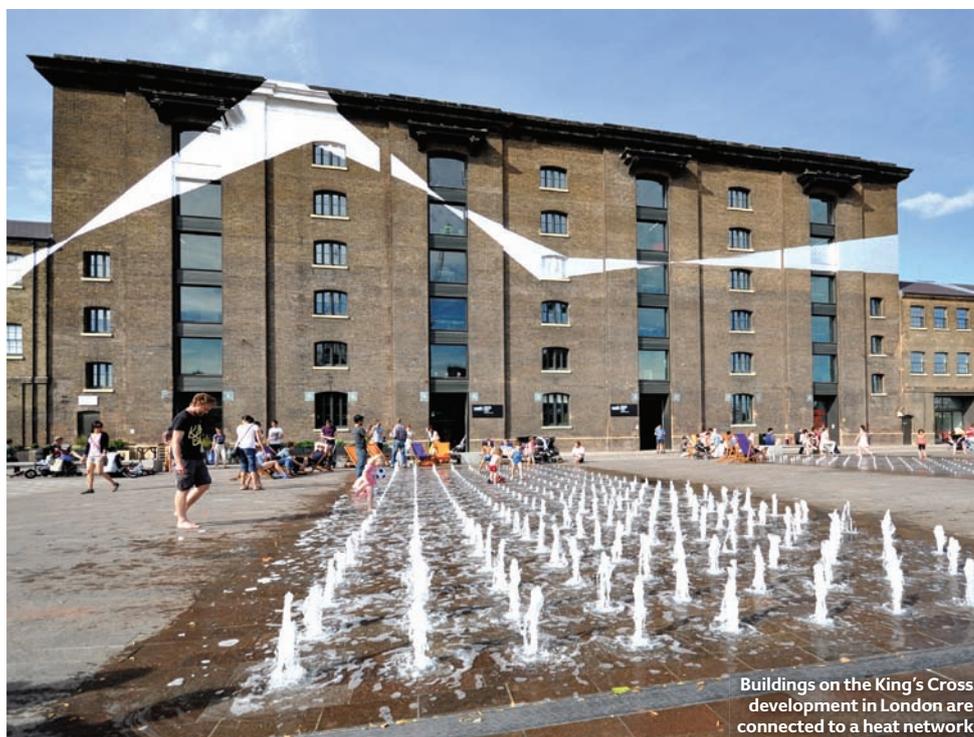
the regulations as a heat supplier.’ In other words, if you furnish someone with some space, and it is heated or cooled – or you provide hot water as part of the deal – you are a heat supplier, and may now have a duty to notify.

A final customer is ‘a person who purchases heating, cooling or hot water for their own end consumption from a heat supplier’. So what is a district heating network?

According to the NMRO – which is enforcing the regulations – it is a means of ‘distribution of thermal energy in the form of steam, hot water or chilled liquids from a central source of production through a network to multiple buildings or sites for the use of space heating or process heating, cooling or hot water’. This would seem to mean that space that is heated or cooled by a liquid-based system – such as radiators or fan coil units – or that receives domestic hot water from a central source, is served by a heat network. But a concession in a store heated by warm air is not, unless it also gets hot water.

The NMRO states ‘the minimum

Suppliers are not just local authorities and owners of energy service firms



Buildings on the King’s Cross development in London are connected to a heat network

RON ELLIS / SHUTTERSTOCK

criteria for an installation to be considered a district heat network are two buildings supplied with heat, and at least one final customer. A heat supplier cannot be their own final customer.' But if 'a heat supplier is using the heat for their own use and is also supplying heat to a second party in another building, then this is sufficient to meet the criteria of a district heat network'. A remote source supplying multiple buildings, each with multiple occupants, is also a heat network.

Communal heating is limited to a single building, and is 'the distribution of thermal energy in the form of steam, hot water or chilled liquids from a central source in a building, which is occupied by more than one final customer, for the use of space heating, process heating, cooling or hot water. It is not necessary for the heat supply to be within the building.'

For domestic purposes, a user is considered a final customer when they occupy a partitioned private space intended to be used as a domestic

dwelling, and they have a living and sleeping space, and private washing and toilet facilities, as well as cooking and food-preparation facilities. This excludes university halls of residence and multiple-occupation houses.

A non-domestic user is a final customer if they have access to a partitioned private space, though some services – such as sanitary facilities or reception – may be shared. Wholly open-plan areas serving multiple tenants, or where only communal areas are heated, are not considered part of a network. It is likely that the retail sector will look carefully at its concessions in light of this guidance.

There is, possibly, an unforeseen consequence of the inclusion of cooling in the regulations. Chilled liquids supplying multiple heat exchangers to deliver cooling to more than one final customer are also covered. Air conditioned systems using local compressors, purely ducted air or variable refrigerant volume/flow (VRV/ VRF) are not.

The latest NMRO guidance clarifies and refines some earlier indications, including the column in last March's *CIBSE Journal*. However, there is no substitute for checking your own circumstances at the start of a deregulatory new year.

References:

- 1 Secretary of State for Energy and Climate Change or, in Scotland, Scottish ministers
- For more information see the NMRO guidance at bit.ly/1T3o13l
The relevant UK legislation can be found online, see bit.ly/191rcas for Heat Network (Metering and Billing) Regulations 2014 (November 2014), and bit.ly/1CTphkd for Heat Network (Metering and Billing) (Amendment) Regulations 2015 (March 2015), which contains significant clarifications. The Energy Efficiency Directive is available at bit.ly/1wWnU3m and the European Commission has produced a guidance document at bit.ly/1NwJvBG for heat networks legislation.

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

The Renewable Solutions Provider
Making a World of Difference



Air Conditioning | Heating
Ventilation | Controls

Follow us @meuk_Jes
Follow us @green_gateway

in Mitsubishi Electric
Living Environmental Systems UK

youtube.com/mitsubishielectric2

*Terms and conditions apply. Please see website for details.



The entire range of Ecodan heat pumps has been awarded an A++ ErP rating – the new standard for energy efficiency. Ecodan clearly offers a viable, low maintenance, cost effective alternative to traditional heating systems, so there's never been a better time to choose a proven heating solution that also qualifies for the Renewable Heat Incentive.

Ecodan. Clearly efficient, clearly renewable.

For further information call **01707 282880**
or visit ecodanerp.co.uk/commercial



DON'T LET REGENERATION WIPE OUT OUR COMMUNITIES



We are in danger of losing cherished local amenities when parachuting shiny new sustainable communities into our cities, says KLH Sustainability's **Kirsten Henson**

Last January, I went back to the University of Cambridge to attend the Cambridge Forum for Sustainability and the Environment's review of its 2014 Sustainable Cities programme.

I had contributed to the forum as an expert witness, and was invited to return to hear the panel discuss the outcome of its year-long programme. As one might expect, the sustainable cities discussions threw up more questions than answers and were considered invaluable for directing future PhD and Master's research within the university.

Diverse topics, from design to governance, were discussed. Of particular interest was the suggestion that we had a lot to learn from developing countries; a degree of elasticity and disorder was deemed critical for resilience. The developed world tends to have more fixed and structured cities, so – when barriers are breached – the consequences tend to be catastrophic. It was surmised that the resilient city lies somewhere between the regimented system of the developed world and the organised chaos of cities in developing countries.

The panel warned against a sole focus on climate change. Working in silos and optimising a single element of a city's challenges is likely to lead to detrimental, and often unintended, consequences elsewhere. This is an area that I have written about before, following on from an EU Knowledge Share programme between east London and Gothenburg, in Sweden. A sole focus on the provision of exceptional new services in a deprived area of Gothenburg had no impact on the health and wellbeing of the local population, largely because of a lack of engagement, employment and social networks throughout the process.

Adaptable, flexible design that gives due consideration to the many trade-offs and balances, acceptance of soft failure, and consideration of 'good enough' are essential for creating sustainable cities.

Fundamentally, we should not be over-engineering our cities, whether from a hard engineering or social-governance perspective. We should take pleasure in the murky corners and nurture the informal networks; celebrate the diverse space – from

formal squares to a forgotten leafy corner with a tired-looking bench.

We must give due consideration to – but not try to engineer out – the social deprivation that lives alongside the shiny new development and 'regeneration' projects. These juxtapositions found across our cities make them vibrant and exciting places to live, and provide an element of resilience.

I have been involved in the Olympic Programme since 2006 and, during this time, my belief of what success would look like for the Olympic regeneration programme has changed. When I first started, I believed we could only claim success if we created a vast improvement in the social deprivation indices in the host boroughs, and changed the very fabric of the surrounding area.

But, as one Newham councillor told me, the people of Stratford want to shop in the Stratford Mall. They like it. It offers a place of strong social identity and cohesion, unlike the polished floors and bright lights of Westfield. It isn't so much 'them' and 'us' – perhaps it is simply people not easily engaging with change, particularly when they feel they have a community on their doorstep.

Provided the opportunities are there for those who want to take them, and services and facilities are affordable to all, let us celebrate the different cultures, lifestyles and environments we find in our city. How foolish of me to think that everyone would aspire to live in a new zero-carbon home on the edge of the Queen Elizabeth Park. Inevitably, new people will be drawn to this area, and the challenge is to ensure that this new London quarter develops its own identity, its own community, and is one that sits well between the already strong identities of Hackney Wick and Stratford.

We should take pleasure in the murky corners and not engineer out the social deprivation that lives alongside the shiny new development



Stratford Mall offers locals a place of strong social identity and cohesion

DAVID BURROWS / SHUTTERSTOCK

This article first appeared on the CIBSE Resilient Cities Group blog at <http://resilientcitiesgroup.blogspot.co.uk/>

KIRSTEN HENSON is a director at KLH Sustainability

Watching paint dry isn't something we always enjoy.

However it is something we are rather good at.



No one has a keener eye for perfection than Vaillant Commercial.

You'd be amazed at how much time we spend inspecting the finish of our boiler panels. Checking for the tiniest imperfection or impediment. Ensuring the colour-matching is flawless. It's not just the paint job we take a long hard look at. Every part, inside and out, is closely scrutinised to achieve the perfect result - something that never gets boring.

To see our attention to detail in action call 0845 602 2922 or visit vaillantcommercial.co.uk



LIFT OFF!

A revolutionary elevator that uses magnetic levitation to move horizontally and vertically is set to transform the design of tall buildings. **Alex Smith** reports on the technology, and Grontmij's **Adam Scott** looks at the implications for designers

Cities are expanding upwards. Global urbanisation is pushing workers and communities further into the clouds as developers and planners build ever-higher skyscrapers to maximise every square inch of land in our congested cities.

The number of buildings in the world higher than 200m has tripled since 2000. There are now more than 180 buildings above 250m and the average height is increasing. In 2000, it was 315m for the world's 50 tallest buildings – by 2013 this had jumped to 390m.

The upward push makes financial sense – more homes and offices can be built on the same footprint – but it poses challenges for the designers tasked with creating fully functioning vertical cities.

One of the biggest issues is the movement of people. Lift technology has not changed fundamentally for 160 years and is creaking under the requirements of taller skyscrapers.

Part of the problem is that the height of lift shafts is limited by the weight of the steel rope and cabins in a traditional elevator system. At a distance of 600m – the maximum height a lift can travel – the cable weighs a staggering 14 tonnes. To travel higher, residents have to catch another lift.

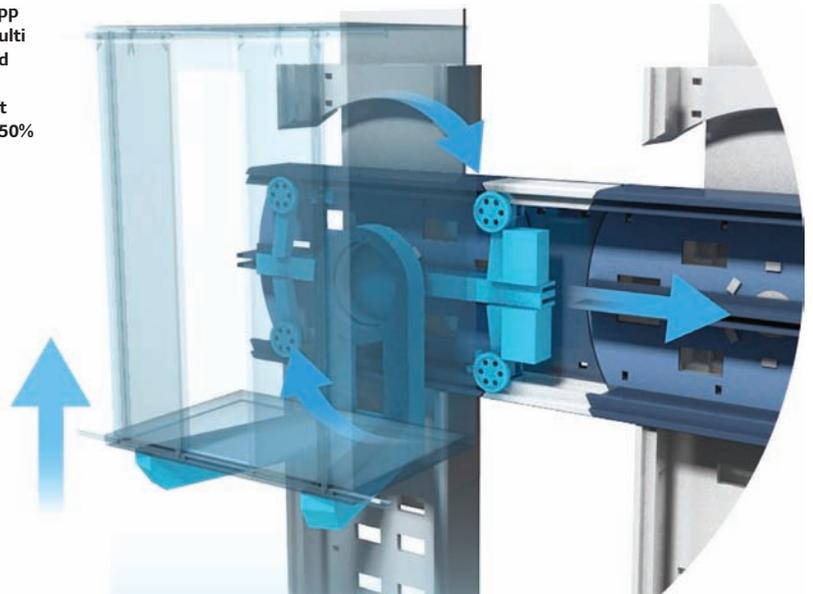
The issue is exacerbated by the fact that only two cabins can operate in a lift shaft at any one time. In taller buildings, this means long waits for lifts. For example, it has been calculated that New York office workers, in total, wait for lifts for 16.6 years over the course of one year, while only travelling in them for 5.9 years.

To bring down waiting times, designers can increase capacity by installing more lift shafts, which means taking up valuable floor space that could otherwise be used for homes, offices and retail. Clearly there is a compromise; if it takes too long to transport people to the top of a tower, those spaces will attract lower rents, no matter how spectacular the views.

In a bid to increase capacity and reduce the number of lift shafts, elevator company ThyssenKrupp went back to the drawing board and looked at alternatives to the traditional cable system. In October, it revealed a new prototype based on magnetic linear propulsion – the same technology the company uses to power the Shanghai Transrapid magnetic levitation railway – also known as the Maglev train – which opened in China in 2004.

The 1:3 scale model, revealed to the lift industry at an innovation centre in Gijón, Spain, was revolutionary (see panel for

ThyssenKrupp claims its Multi system could increase a building's lift capacity by 50%



CIBSE Lifts Group past chair Adam Scott's verdict on the prototype). The cable was gone and replaced by a vertical loop carrying four lightweight carbon cabins propelled by the linear motor.

ThyssenKrupp Elevator believes the cable is the limiting factor in lift development. In conventional elevators, only two cabins can be linked to a cable – the firm likens it to having a long-distance railway with only two trains operating on the line. By using a linear motor and lightweight cabins, the shaft can accommodate multiple cars in a system known as Multi – which, claims ThyssenKrupp, has the potential to boost capacity by 50%.

There is a precedent – paternoster lifts work on a similar loop system, but they never stop when in operation, making embarking and disembarking dangerous, and impossible for those with limited mobility.

‘The idea is to put multiple lifts in one

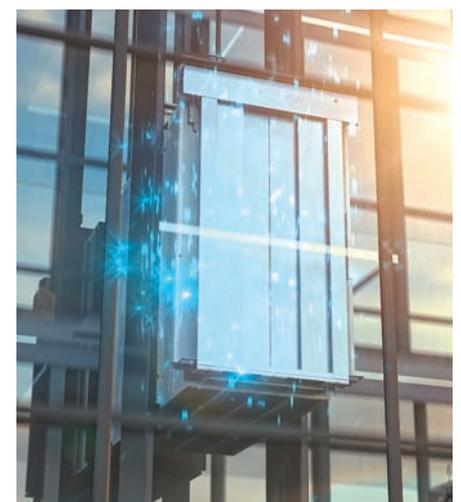


Future of maintenance

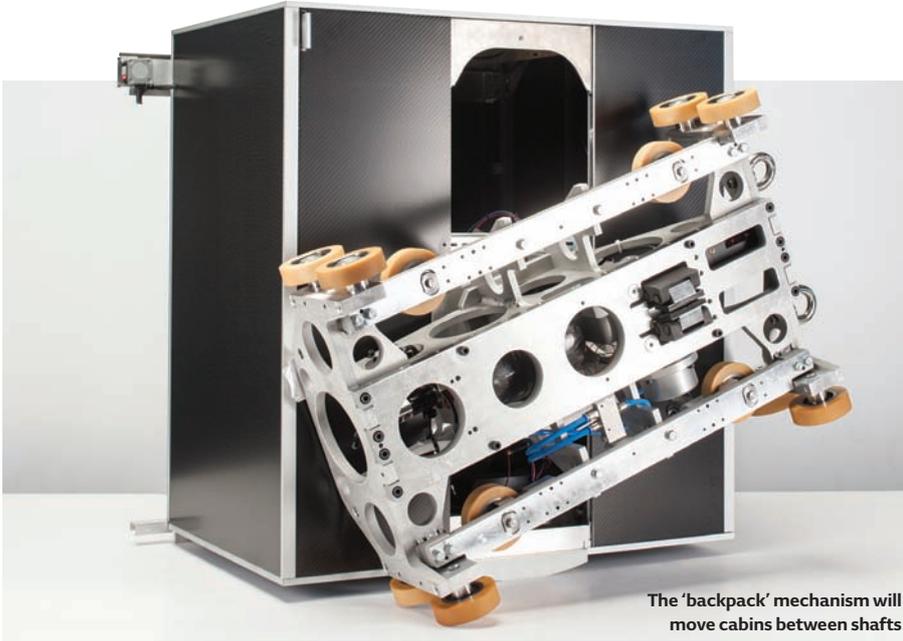
ThyssenKrupp has taken a leaf out of the airline industry when it comes to maintaining its lifts. It is carrying out pre-emptive maintenance before they break down. Its predictive system uses real-time diagnostics over the internet to monitor critical lift parts, and algorithms to predict the remaining lifetime of each elevator's key components and systems. For instance, sensors can measure if doors are getting slower over time and so predict when they will no longer work effectively. The company worked with Microsoft data scientists and software programmers to develop the system.



The height of lift shafts is limited by the weight of the steel rope and cabins in a traditional elevator system. At a distance of 600m – the maximum a lift can travel – the cable weighs 14 tonnes



➤ The Multi system will have several cabins in one shaft



The 'backpack' mechanism will move cabins between shafts

using linear motors – they are fully scalable. There's no load issue and no tension issue.'

There may be no weight restriction, but the cabins have been redesigned using lighter carbon materials, which means less energy is required to move them. This is key, because, without a cable system, there is no counterweight balance taking the load off the lift motor. The manufacturer also claims energy use is minimised because the linear motor is only activated where the cars are located. It also says an energy recovery system could, in future, convert the kinetic energy of descending carriages into electrical power for the upward trip.

ThyssenKrupp Elevator's head of research, Markus Jetter, likens the system to a metro. 'It's like the Circle Line in London, put on a wall. The train becomes carriages travelling on vertical tracks in the elevator shafts.'

While having multiple cars allows greater passenger capacities, the engineers have another great trick up their sleeves. The system allows cabins to move horizontally, as well as vertically. When a cabin reaches a horizontal shaft, a 'backpack' on the lift rotates through 90°, allowing the cabin to move along a horizontal 'track' using the same linear motor technology. This enables the cabin to travel up one shaft and down another (see diagram below). Schierenbeck says this opens up possibilities for passengers across large buildings and, potentially, from car parks to buildings, although the speed will only be 5m/s.

► shaft,' says ThyssenKrupp Elevator executive chair Andreas Schierenbeck. 'It's not a new idea. The trick is to combine the linear motor technology, which already exists, with the IT, which has to control the distance between the cabins.' The company estimates that the multiple lifts will mean passengers only have to wait 15 to 30 seconds for a cabin.

The capacity boost could cut the number of lift shafts required in a building, says ThyssenKrupp, which estimates the elevator footprint could be reduced by 50% – in part because the system only requires 6m² shafts compared with 9m² in traditional systems.

Schierenbeck says the technology can serve taller buildings: 'There are no limits on height

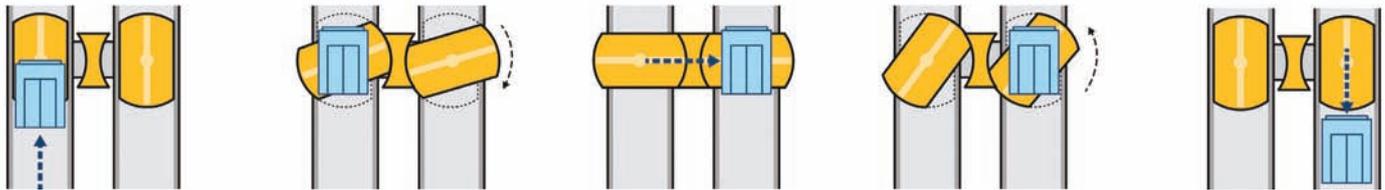


Diagram showing how cabins in the Multi lift system can travel up one shaft and down another through use of a rotating 'backpack'

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



VELOGRID
Velocity Averaging Sensor



P-Sensor

CMR are the inventors and manufacturers of both the P-Sensor and the Velogrid. The Velogrids are made to measure to fit any ductsize up to 3m x 3m and the P-Sensor has a keyboard to easily enter : duct height - width - density - magnification factor and the scaling in m/s - m³/s - m³/h - l/s. It can even work out the Air Change rate. And the BMS gets three linear volume signal outputs of 0..10V 4..20mA and an addressable Modbus rtu bus.

CMR CONTROLS Ltd

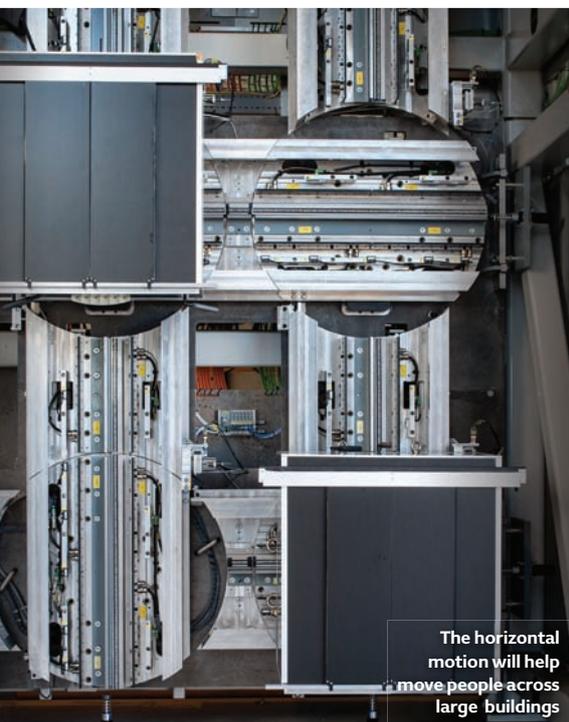
22 Repton Court Repton Close
Basildon Essex SS13 1LN GB
www.cmr-controls.com

Tel +44 (0) 1268 287222
Fax +44 (0) 1268 287099
sales@cmr-controls.com



ThyssenKrupp is talking to 30 designers, investors and planners about the system, in part to give regulatory bodies and designers the chance to work with his engineers on the requirements of the system. 'We want to give partners confidence, so we can shorten the timeline to the market,' says Schierenbeck. He predicts the systems' economies of scale will work particularly for buildings of more than 300m, which means targeting the Middle East and Chinese markets where the majority of very tall buildings are planned.

A full-scale prototype will be built within the next two years at an elevator test tower in Rottweil, Germany. Here, the serious business of certification and inspection will take place, which will ultimately determine how quickly the 'Willy Wonka' elevator will become a reality. **CJ**



The horizontal motion will help move people across large buildings

The next generation?

Vertical transportation expert Adam Scott is excited by Multi, but says significant challenges lie ahead in getting the ropeless lift to market

ThyssenKrupp's technology has the potential to change the fundamental form and function of our future buildings and connected world. A bold statement, but one I believe is true, provided one notes my careful use of the word 'potential'. For the challenges ahead are significant, though ThyssenKrupp's appetite and drive to deliver are clear to see.

Last month I was one of 400 people invited to the launch of the Multi prototype in Gijón, Spain. This marked the first of ThyssenKrupp's milestones, which will culminate in a customer installation in the real world by the end of 2019.

The scale of the challenges ahead are brought into focus when one considers such fundamentals as design standards. When I asked one of the engineers which code they are designing Multi to, his response was illuminating. 'We don't know yet. We're not yet even sure what Multi is? Is it a lift, a train, a machine? Perhaps it needs a new standard?'

Taking established horizontal linear motor technology and rotating it through 90° is a simple idea, and many successful innovations of the past have been founded on simple ideas.

One of the biggest challenges is gravity and its implications for energy consumption; for while Multi dispenses with the limitations of heavy suspension ropes, it also loses its friend, the balancing counterweight. So minimising the moving mass is vital to success; the heavier the lift car and its duty load, the more energy required to move it vertically. We can see the initial consequence of this in the carbon-fibre construction of the prototype lift cars – and

indeed, in the modest car-size aspirations of the initial design studies.

Commercial challenges also lie ahead. ThyssenKrupp's last big innovation was the Twin, the running of two independent lift cars in one lift well. This is a great piece of engineering, but its success and market penetration have – in my opinion – been muted by the fact that the technology remains available from only one supplier, and clients typically don't like that kind of procurement and ongoing maintenance legacy. Perhaps some form of carefully licensed joint-venture approach may serve Multi better.

One thing I didn't hear discussed much in Spain was cost. This is understandable given the early design stage of the product, but it was clear to see that cost will be a challenge. Weight-saving, carbon-fibre car slings, metres upon metres of linear magnets, and complex exchanger mechanisms all look expensive.

That said, if the technology can deliver on its potential, it could rewrite the efficiency benchmarks for buildings, saving lots of very valuable space, which could justify significant additional cost in the transportation system.

While initial aspirations are focused on small cars running in circular shuttle trains, the real goal should be seamless horizontal and vertical movement where passengers could, conceivably, travel from their metro train station to the base of a building, up the building and across a floorplate to their destination, without leaving the transport pod. Whether it is me or my son who will experience a Multi world is yet to be seen, but from what I saw in Spain, I suspect it may be me.

ADAM SCOTT is operations director at Grontmij UK (part of Sweco)

We are confident our app based apartment controls solution – RESIDE – will become the norm in all high-end residential developments.

For further information contact:

Gary Williams on 0203 786 2045
or email gary.williams@uk.sauter-bc.com

Systems
Components
Services
Facility Management

SAUTER
Creating Sustainable Environments.

Insurance broker CJ Coleman has recently joined the CIBSE Patrons – the Institution’s group of ‘corporate supporters’. **Ewen Rose** ventured into the City of London to meet account executive Christine Shrimpton and director Mark Aspinall to find out why

RISKY BUSINESS

Engineers have, traditionally, looked on financial professions such as accountancy and insurance with some suspicion. Technical people like to think they don’t really need to rub shoulders with ‘City types’. Yet, in reality, very few buildings or major infrastructure projects would have got very far without somebody willing to handle the finances or underwrite the considerable commercial and legal risks.

Yet it is still rare to see engineers and City dwellers sitting at the same table or attending the same meetings. However, Christine Shrimpton, who has already represented CJ Coleman at a number of CIBSE Patrons meetings, is an exception – as she is both.

CJ Coleman was founded in 1973, is located in the bustling heart of the City of London, and has close links to the world’s most famous insurance market Lloyd’s. As an account executive, Shrimpton specialises in insurance and risk management for architecture and engineering firms, covering projects and contracted liquidated damages.

She has a degree in building services engineering from London South Bank University and was a practicing engineer for almost a decade with various industry luminaries – she was latterly based in Doha as a principal engineer.

Why insurance?

‘Brokers like us have a key role to play in improving the cost performance of engineering clients,’ she says. ‘Contracts are getting bigger and bigger, which means companies are exposed to ever higher levels of risk. Managing that risk is a huge part of engineering these days and it is comforting for clients to have someone involved who



understands what they are trying to achieve. ‘[Because of my background in engineering] I can demystify the insurance business for engineers and help them with their contracts, pointing out the key sections that impact on their risk.’

Shrimpton is a regular visitor to the Lloyd’s Building – a short walk from CJ Coleman’s headquarters in The Minories – where she negotiates with the insurance underwriters, many of whom also focus on the engineering, construction and energy projects that have become a CJ Coleman speciality. Although she has been in the insurance business for less than two years, she already knows which underwriters are most likely to help her spread the risk on behalf of clients.

Sitting across from the famous Lloyd’s ‘boxes’, and negotiating multi-million pound risk placements is a worthwhile and stimulating occupation for an engineer, Shrimpton believes, because it means ‘complex and important’ projects can be built.

She encouraged her employer to become

6 Engineering presents particular risks from an insurance perspective because people do make mistakes and things go wrong

–Mark Aspinall



The Lloyd's and Willis Buildings – the heart of the insurance business in London.

ALBERTO STIOCCO / SHUTTERSTOCK

ultimately, 'nobody wants insurance claims'.

'It is commercial suicide to take on projects with people who are intent on taking advantage at the end of the project, but we know people still do it,' says Aspinall. 'You must aim for collaborative relationships and we have a role in helping people make the right choices. However, if you are a bad contractor you are going to suffer insurance claims.'

Technology risks

The nature of construction is changing as technology plays an increasingly influential role. CJ Coleman is keen to provide 'bespoke insurance solutions', based on its engineering knowledge, which reflect the growing use of methods such as BIM and off-site fabrication, because these are gradually shifting the industry's risk profile.

For example, cyber criminals are a threat to BIM models because a hacker can access information in the model – a message that came through all too clearly at the CIBSE Building Performance Conference. If data gets corrupted as a result, that could have serious implications for the project and, ultimately, result in an insurance claim.

So, as well as engineers, the insurance industry is recruiting IT specialists to give them a technical edge. The ability to understand the way insurance works and the technical aspects of risk will prove increasingly valuable, Shrimpton believes.

'We have already seen instances where HVAC controls have been used by hackers to access sensitive and valuable commercial data,' she says. 'Cyber terrorists have made repeated attempts to interrupt power supplies – it is a big worry. We need people who can see where the threats are coming from so we can set up proper protection.'

The specialist in the insurance field is going to become increasingly common. As Shrimpton puts it: 'I am not losing my engineering skills; I am applying them in a different way and sharing knowledge between different parts of the supply chain. I think my biggest contribution is being able to discuss the 'what if' scenarios with clients so they are prepared if things go wrong.'

- CJ Coleman and legal firm Simmons & Simmons will be hosting a special session on the management of risks related to BIM, for CIBSE Patrons members and guests, on 20 January in the City of London.

Issues covered include: ownership of BIM; data management concerns; and cyber security. Email cbrown@cibse.org



Christine Shrimpton

a CIBSE Patron because she saw it as an opportunity to spread the word about the importance of insurance in construction and to improve 'collaboration and knowledge sharing' between engineering and finance.

'Engineering presents particular risks from an insurance perspective because people do make mistakes and things go wrong,' says the man who recruited her to the business, director Mark Aspinall. 'Relationships are terribly important and we wanted someone with practical experience – we already knew Christine and realised she would be ideal.'

'It's very useful to have an engineer on the team because they understand the nuances of a project and how contracts work in the field,' adds the insurance market veteran.

Infrastructure projects are notoriously complex, with many parties involved, so settling claims can take some unravelling. However, one thing Aspinall and Shrimpton stress is that a big part of their job is to steer clients away from the 'pitfalls' before entering into contracts because,

COST MODEL

LUXURY URBAN APARTMENT FIT-OUT

In this cost model covering mechanical, electrical and public health services, Aecom examines the capital costs of installations for the fit-out of a typical high-end, two-bed apartment of around 800ft², with en suite and family bathroom, and open-plan living area. The cost model features underfloor low temperature hot water heating, comfort cooling via two-pipe fan coil units, whole-house ventilation with heat recovery, lighting control and home automation

Background to the model

Demand for high-end apartments has become a significant component of the London construction market, with many properties sold 'off plan' years before the projects are completed. Although cost per square foot sales values are determined mostly by location in London, specification and offering must also be tailored to meet market needs and requirements, and the desire of the developer to provide a differentiator from the competition.

Purchasers are becoming more tech savvy and increasingly demanding not only the highest of quality, but also the ability to control the entire apartment from a smart device, whether they are in the country or not. This desire and increased knowledge

of potential purchasers has resulted in the acceptable minimum standard increasing over a number of years.

In terms of audiovisual design and specification, how far do you go with technology that advances so quickly from year to year? The level of home automation required differs from one buyer to the next. There is definitely a push for fibre optics throughout to improve broadband performance, and this is a key consideration for many purchasers.

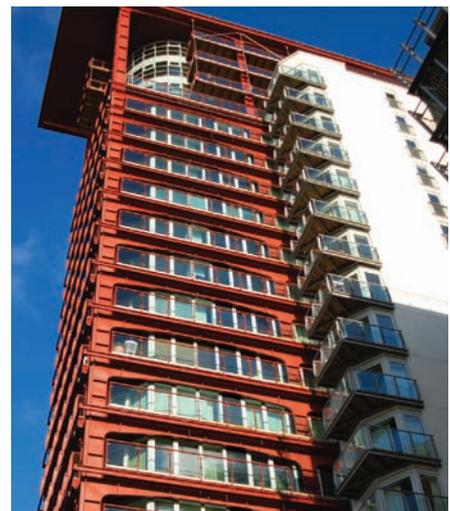
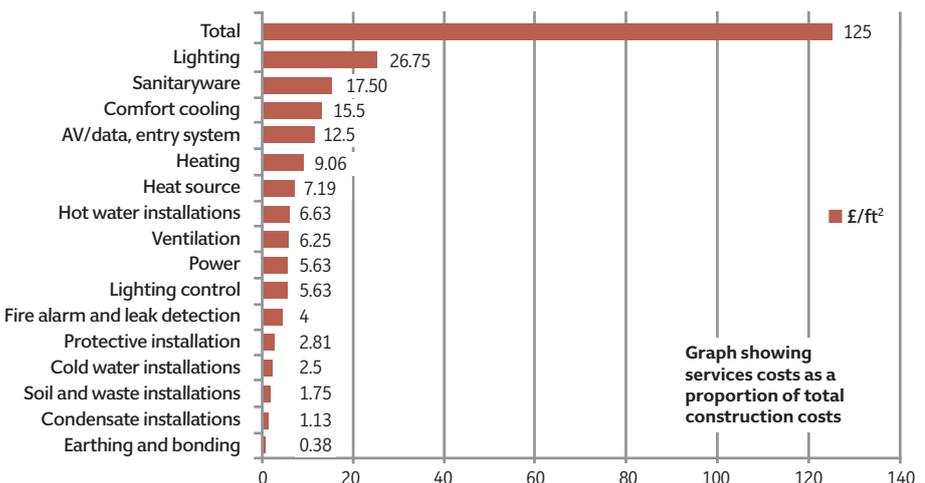
The design of the heating and cooling systems needs to take into account overseas purchasers' lifestyles. These properties may be left vacant for several months in a year, so boost functions should be designed into services for when the occupier returns.



In terms of sustainability, there has been a drive to place monitoring points on each of the services to measure consumption. Where the services are centralised, this is linked back to the service charge. Where the services are not centralised, however, there does not appear to be a need among many ultra-high net worth individuals to monitor consumption beyond payment of the bill. Installing these monitoring points adds to fit-out costs, but is not reflected in any enhancement to the sales premium. Sustainability measures are not high on the list of requirements with many prime purchasers, with the exception of those from the United States.

The sums included within this model are for subcontractors costs, testing

Luxury apartments – Summary of costs



ANGELINA DIMITRIOVA / SHUTTERSTOCK



YAMPI / SHUTTERSTOCK

and commissioning, preliminaries and overheads, and profit. The costs do not cover any main contractor additions or on costs.

Costs

- **Sanitaryware** – Branded sanitary and brassware, includes an en suite with a bath, shower, WC, and his and hers wash hand basins, and a family bathroom containing a bath with shower over screen, WC and wash hand basin
£17.50/ft² = £14,000 total
- **Soil and waste installations** – Soil and waste to two kitchen sinks, dishwasher, washing machine and sanitaryware via plastic solvent welded pipework
£1.75/ft² = £1,400 total
- **Condensate installations** – Condensate drainage from fan coil units and whole-house ventilation, via copper pipework, including discharge connections to the buildings infrastructure
£1.13/ft² = £900 total
- **Cold water installations** – cold water pipework to sanitaryware and kitchen appliances via copper pipework
£2.50/ft² = £2,000 total
- **Hot water installations** – Hot water pipework to sanitaryware and kitchen appliances via copper pipework with temperature maintenance. Local hot water ➤



ABOUT THE AUTHORS

The engineering services cost management group of Aecom specialises in the cost estimating, procurement and cost management of building services installations. It is producing a series of cost models for *CIBSE Journal* in 2016 on areas such as data centres and London's commercial buildings.



GORDON BELL / SHUTTERSTOCK

~~Combined~~ Optimised Heat and Power



- Modulating electrical output
- High grade heat at all times
- Sophisticated heat storage
- Low NO_x / low noise / low maintenance
- Optimised heat and power to match site demand



To find out more call: **+44 (0)1483 771910**,
 email: info@sav-systems.com or visit: www.sav-systems.com



- storage provided to accommodate rain showers to bathrooms
£6.63/ft² = £5,300 total
- **Heat source** – Plate heat exchangers for low temperature hot water and chilled water, with connections to shell and core services, complete with integral heat meters and insulated hood covers
£7.19/ft² = £5,750 total
- **Heating** – Supplied by low temperature hot water underfloor heating throughout the apartment, complete with intuitive controls. Also includes electric towel rails to bathrooms **£9.06/ft² = £7,250**
- **Comfort cooling** – two pipe fan coil units mounted in ceiling voids, complete with intuitive controls, providing cooling to living areas and bedrooms
£15.50/ft² = £12,400
- **Ventilation** – Mechanical ventilation with heat recovery (MVHR) unit enabling whole-house ventilation with heat recovery and boost function, with an allowance for kitchen and bathroom extract discharging to building façade, including fans, ductwork, louvres and controls
£6.25/ft² = £5,000
- **Power** – Includes consumer unit with meter to supply subsidiary circuits. Antique brass-finish, metal-faced sockets, cooker hobs, fused connection units, shaver outlets and kitchen grid plates, including wiring and installation to all of the above **£5.63/ft² = £4,500**
- **Lighting** – To living areas and bedrooms supplied by LED downlighter, with bathrooms containing LED accent strip lighting and mirror light, complete

with demister pads to complement downlighters. LED accent strip lighting is also within wardrobes. Costing includes all 5-amp lighting sockets, dimmable and non-dimmable metal-plate light switches, including wiring and installation to all of the above **£26.75/ft² = £21,400 total**

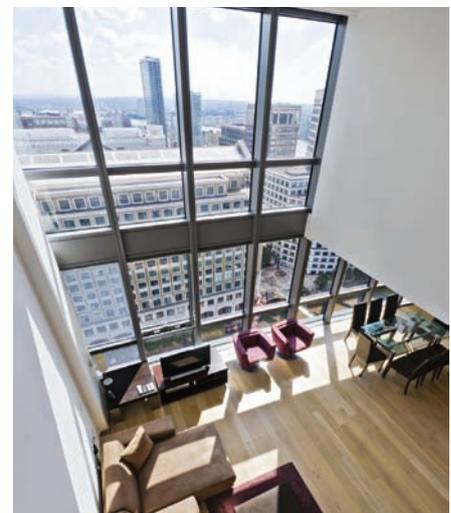
- **Lighting** – scene set controls
£5.63/ft² = £4,500 total
- **Earthing and bonding** **£0.38/ft² = £300**
- **Protective installation** – Sprinklers throughout the apartment with connections to shell and core system, and monitored flow switch **£2.81/ft² = £2,250**
- **Fire alarm and leak detection** – Includes smoke/heat detectors throughout and a leak-detection system, giving coverage of all wet areas **£4.00/ft² = £3,200**
- **AV/data, entry system and home automation** – Includes antique brass-finish metal-face data and TV/satellite outlets. A full-colour touch-screen entry system and home automation system that includes blind control **£12.50/ft² = £10,000 total**
- **Total construction cost** – Fit-out only
£125/ft² = £100,150 total CJ

Exclusions

1. Builders’ work in connection
2. Inflation beyond 4th quarter 2015
3. Main contractor’s on costs
4. Fees
5. VAT

● **GARRY BURDETT**, director, engineering services, and **ANDREW FREEMAN**, trainee quantity surveyor, engineering services

There does not appear to be a need among ultra-high net worth individuals to monitor consumption beyond payment of the bill



YAMP / SHUTTERSTOCK





WITH A CLEARER VIEW OF YOUR MRO COSTS

**WE CAN HELP YOU
SAVE UP TO 35%**

MRO procurement is costing you twice as much as you think. Through data insights we can reveal the hidden MRO process costs that invariably outweigh product costs, and deploy proven strategies across product, inventory, sourcing and purchasing that can help you save up to 35%.



Find out more

We should be talking.

RS lets-talkmro.com

in RS MRO Procurement



Envirofresh 70 Quiet

Low Energy, Air Source Heat Pump System,
Silenced with Acoustic Treatment as used
in Hundreds of Projects

Benefits

- Meets TM52 for Schools
- Meets BB93 Feb 2015
- Renewable Energy Source
- BMS Controls Installed in Unit
- Factory Pre-Commissioned
- Heating and Cooling from One Source
- 50% Less CO² Production than a Gas Boiler
- Low Energy Consumption
- Reduced Site Installation Cost
- No External Condensing Units, Pipework or wiring
- Low Noise Emissions with Silenced Compressors
- High Specification UKAS Certified Low Breakout Casework
- No Loss of Heating Capacity at Low Temperatures
- Room Heating and Cooling available at Reduced Air Volumes
- Tempered Air Supply without Defrosting
- No Increase in Footprint over Standard AHUs
- More Pleasant External Appearance than Condensing Unit or Chiller Installations



Air Source Renewable Energy

University of
Salford
MANCHESTER



Air Handlers Northern Ltd.
Alfred Procter House
Bute Street, Salford
Manchester M50 1DU

Tel: 0161 745 8888
Fax: 0161 725 9900
Email: sales@airhandlers.net
Web: www.airhandlers.net

The square atria allow light to flood in and occupants to see out



Masdar City, in Abu Dhabi, is designed to showcase green technologies and sustainable construction in the Middle East. Now it has two large, state-of-the-art commercial schemes using the latest low-energy design principles. **Andy Pearson** looks at the Middle Eastern headquarters of Siemens and the International Renewable Energy Agency, and finds the engineering teams adopted similar ‘passive first’ approaches



LIGHT AND SHADE

SIEMENS MIDDLE EASTERN HEADQUARTERS

The brief from Siemens was that it wanted a building with a great LEED rating,’ says Robert Murphy, associate director at engineer Aecom. He’s talking about the engineering and technology company’s new Middle Eastern headquarters in Masdar City, a giant demonstration project slowly being developed in Abu Dhabi to show how clean technologies can work in practice. Siemens wanted to use its new building to help promote the organisation’s low-energy values and philosophy to the region.

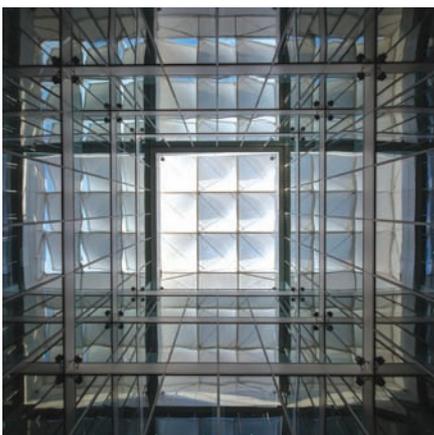
Aecom and its partner Sheppard Robson won the competition to design the low-energy HQ. The organisations had been working together to use parametric modelling to integrate low-energy features effectively into building design. So – after winning the competition – the obvious starting point was to focus on what might be possible with this building, using parametric modelling.

The site for the new office building was

defined by the Masdar masterplan. This was based on emulating an old Arab city, with buildings clustered closely together to provide shade from the relentless Middle Eastern sun. The Siemens building plot was unusual in the scheme, in that it overlooked an open square – a feature the design team were keen to exploit.

Their solution was to raise the four-storey building above a new public plaza, which was conceived as an extension to the existing public realm. Each of the building’s 4,500m² floorplates is pierced by nine square atria; these act as ventilation chimneys to draw air across the plaza to keep it cool, while allowing daylight to enter – and the occupants to see out from – the giant floorplates.

Minimising heat gains from exposed façade was critical in ensuring the building achieved its low-energy aspirations. ‘Resolving the shading to the office façade overlooking the square was the first crucial element in developing a low energy solution,’



The atria draw air across the plaza to keep it cool

CREDIT: NICOLE LUETTICH

The Siemens' HQ plot is unusual in that it overlooks an open square

CREDIT: PAUL MCMULLIN



“The shading solution does not have to move to track the sun, which means it does not have a mechanism that will get clogged with sand

says Sasha Krstanovic, director at Aecom. The challenge for the designers was to establish what form this shading should take. ‘We didn’t know what shape to make the shading,’ Murphy explains, ‘so we developed a parametric model based on defining: the amount of area occupants could look out of; the amount of indirect daylight that could penetrate the floors; and the amount of sun blocked out as it moves across the sky. Then we pressed go.’

Krstanovic describes the resulting solution – a series of distinctive, folded, angular aluminium fins – as ‘looking like origami’. The form of the shading varies in response to the orientation of the façade on which it is mounted.

The outcome of modelling scores of potential design solutions is a technological response to the challenging brief, which ultimately informed the building’s aesthetic. ‘We extracted all the design ideas found by the computer, put them into words and gave them to the architect, who developed them into a design that met the functional requirement for shading, but was beautiful at the same time,’ says Murphy.

In addition to providing an architectural statement, the external aluminium shading

is also very practical. ‘The clever thing about the solution developed by the modelling is that it does not have to move to track the sun, which means it does not have a mechanism that will get clogged with sand – which is important for a building in the desert,’ explains Krstanovic.

To further minimise solar gains, the aluminium fins have been given a reflective

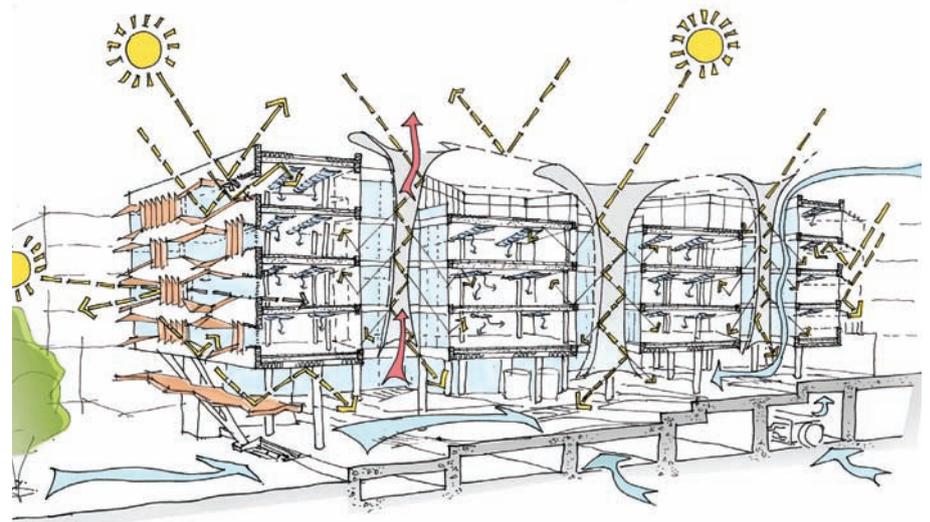
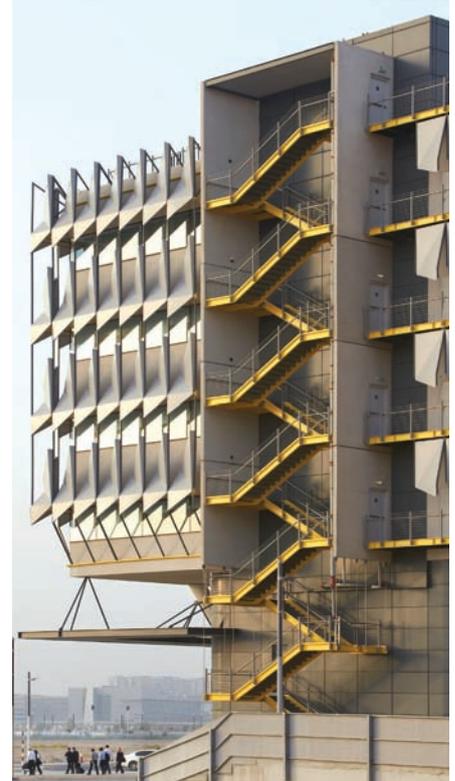
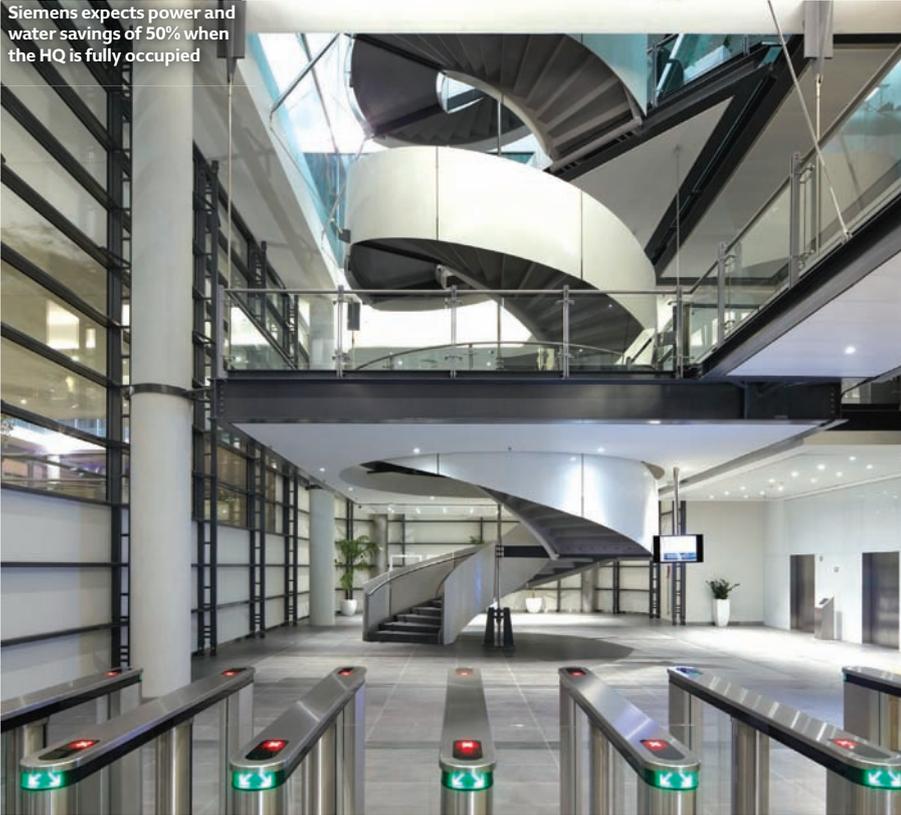


Diagram showing air flow through the building and hot air being exhausted

Siemens expects power and water savings of 50% when the HQ is fully occupied



CREDIT: HULTON AND GROW

The building is raised above a new public plaza



shading solution. The design includes using demand-led, variable speed fan coil units (FCUs) to cool the offices and desiccant thermal wheels in the air handling units 'to squeeze the moisture out of the fresh air supply', says Murphy.

Again, the engineering has been kept deliberately simple by using the building's exhaust air to recharge the desiccant. 'If we hadn't modelled the building in quite so much detail, we wouldn't have realised how important the desiccant wheel was in maintaining comfort,' he explains.

Needless to say, the building uses Siemens controls for the building services and to optimise energy use – and, again, simplicity is the rule. The building management system senses which rooms are occupied and adjusts lighting and temperature levels accordingly; taps in the toilets are fitted with sensors to minimise water usage; the FCUs turn on and off when needed; and fresh air is only delivered where needed.

Perhaps the most surprising aspect of the building's low-energy design is that the only renewable technology included in the scheme is a roof-mounted solar thermal system, which generates hot water for the occupants. The design team would have liked to have incorporated more renewables, but were prevented from doing so by a lack of funds. 'While the building works incredibly well, it would work even better

The solution appears to be performing in line with expectations. In its first year, it used 63% less electricity and 52% less water than a typical Abu Dhabi office

coating, while the building's façades behind the shading are also highly insulated and airtight, to further minimise heat gains inside the offices.

In addition to parametric modelling, Aecom used thermal modelling to develop the design. 'By looking closely at where energy is needed in the building, we were able to maximise the benefits of fairly conventional technologies,' says Krstanovic. The resulting building services solution is as simple and robust as that of the fixed-

with the addition of renewables,' explains Krstanovic. 'For example, if we'd had a big enough budget, we would have put PVs on the roof to drive down the building's energy consumption still further.'

Even without the additional renewables, the scheme achieved LEED Platinum in accordance with the client's brief, making it one of the most sustainable office buildings in the Middle East, at a cost per square metre similar to that of more conventional head office buildings in the United Arab Emirates.

Equally impressive, the robust solution appears to be performing in line with expectations. In its first year of operation – between February 2014 and January 2015, although the building was only partly occupied – it used 63% less electricity and 52% less water than a typical Abu Dhabi office building. Even when it is fully occupied, Siemens expects power and water savings to be closer to the designers' estimate of 50%.

'Because we all worked together from the outset, we were able to develop an optimised design that responded to the brief,' says Krstanovic. **CJ**



CREDIT: NICOLE LUETTKE

The sweeping curves of the central stairwell

“The most surprising aspect of the building's low-energy design is that the only renewable technology in the scheme is a roof-mounted solar thermal system



+ OUR CONDENSING RANGE JUST GOT BIGGER.

INTRODUCING THE **IMAX XTRA EL**

- 320 - 620kW OUTPUTS
- CONDENSING AND FLOOR STANDING



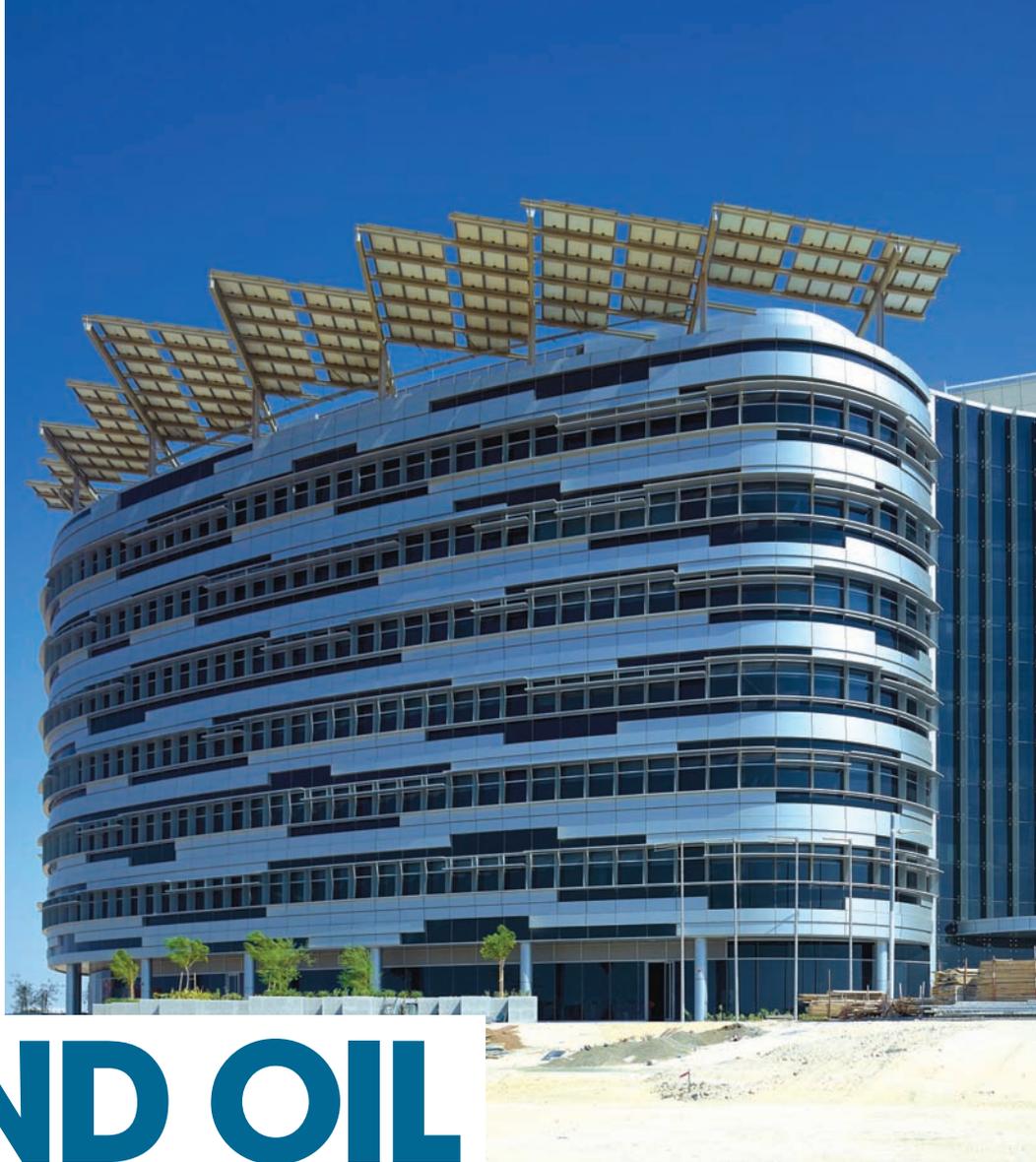
GET A QUOTE.

W: IDEALCOMMERCIALBOILERS.COM
E: commercial@idealboilers.com
T: 0844 5436060

IDEALCOMMERCIALBOILERS.COM

@idealboilers

The headquarters for the International Renewable Energy Agency boasts a 1,000m² PV array – but the real talking point is the 50% reduction in energy demand achieved after extensive modelling from the outset



BEYOND OIL

IRENA HEADQUARTERS

It is fitting that the new headquarters of the International Renewable Energy Agency (Irena) in Masdar City, Abu Dhabi, should be an exemplar of sustainability. So when it set the brief for the project, client Masdar gave the design team a list of sustainability key performance indicators (KPIs) that the scheme was expected to meet.

The most challenging KPI was to deliver the first building to achieve a four Pearl Rating under Abu Dhabi's Estidama sustainability rating system. Others included: an energy demand reduction of 50%; renewable energy to provide 20% of the total energy demand; and a reduction of 30% in water consumption compared to a typical Abu Dhabi building.

Building services engineers Buro Happold, working with architect Woods Bagot, had the task of designing the exemplar scheme for Masdar, the organisation responsible for delivering Masdar City. To their credit, the design team has succeeded magnificently, with a building that looks part-spaceship, part-



corporate office, and that requires 50% less water than typical buildings in Abu Dhabi, and 64% less energy.

The success of their solution is down to extensive modelling from the outset. To start to develop a form for the giant building, Buro Happold and Woods Bagot used a parametric model with parameters input from the briefing information and the KPIs.

'We had a total floor area of 32,000m² and a series of KPIs that we had to achieve, so we set about developing the initial design using parametric modelling through a series of workshops,' says Jamie Low, associate engineer at Buro Happold.

From the start, the team set about developing a holistic solution. 'It was all about passive measures and how the building form could be designed to reduce energy consumption,' Low explains. 'Only later did we do a detailed analysis using computational software.'

Extensive modelling produced a design based on a triangular-shaped building formed from three, seven-storey, oval-shaped office towers, interconnected by three atria. The atria house the main entrances to each of the towers, plus the stair and lift cores.



Irena's HQ is the first building to achieve a four Pearl Rating

CREDIT: ©PHIL HANDFORTH - www.philhandforth.com



The glazing has been optimised to minimise heat gains and maximise daylight

The office towers and atria surround a giant, seven-storey, triangular-shaped atrium covered by a large, flat triangular roof. This space has been designed to be shared by all three offices; it includes ground-floor cafes and shops. 'The building's triangular form evolved from testing multiple thermal modelling options to optimise the buildings shape and façade performance, while ensuring the office floor plates remained efficient,' says Low.

In the final building, one of the office towers has been occupied by Irena, while the remaining two form a speculative office space.

Low describes the approach to the design as 'lean, mean and green', by developing passive solutions first to reduce energy consumption to meet the KPIs. 'Initially, we developed the design to reduce demand, then we set about supporting the design using renewables,' he says.

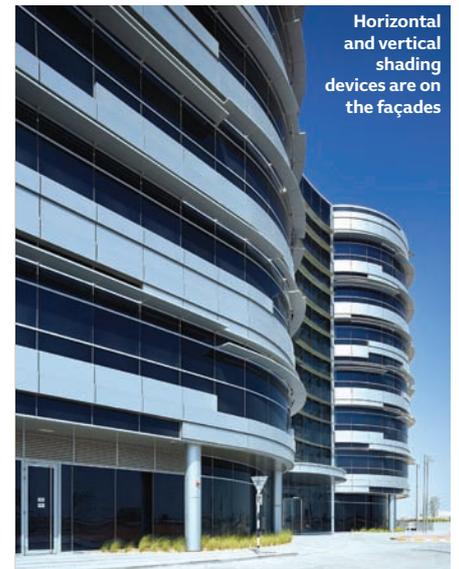
As the design evolved, the proposed solutions were reviewed. 'Our decisions were audited and the life-cycle cost evaluated as we developed the design to ensure we were making the right decisions,' Low explains. 'This process was the key to the energy reduction strategy – once we had

reduced the demand, we could select the most appropriate engineering system.'

Evidence of the success of the cooling energy reduction strategy is provided by the building's façades, which have been gently curved to minimise the impact of solar gains at any particular time. Similarly, the amount of glazing in the façades has been optimised at 30% to minimise heat gains on the office floorplates, while maximising the amount of daylight that can enter the floorplates.

The façades incorporate high-performance tinted glass and high-efficiency insulation to enhance their performance further. 'The proportion of glazing to solid material has been optimised to reconcile energy efficiency with maximising daylight and views,' says Low.

To minimise heat gains from direct sunlight, the façades incorporate both horizontal and vertical shading devices. The orientation and positioning of the shading varies depending on the façade to which they have been fitted. Beneath it, the façades have been designed to be airtight, with a leakage rate of less than $5\text{m}^3 \cdot \text{m}^{-2} \cdot \text{h}^{-1}$ at 50Pa, which is important in minimising cooling loads because the air is so hot and



Horizontal and vertical shading devices are on the façades



The design approach to Irena's HQ has been described as 'lean, mean and green'

► humid. In total, the building is claimed to have a 55% reduction in cooling demand compared to the baseline ASHRAE 90.1 energy model through the incorporation of passive design strategies.

Behind the highly insulated façade, the building's servicing strategy is remarkably conventional, with each office tower serviced independently. Services to the office floors include variable speed fan coil units (FCUs) to provide cooling. These incorporate a condensate recovery system to collect precious water for reuse in the building. As is common in the region, chilled water is supplied from an off-site energy centre, which has been designed and constructed to serve several buildings. 'The energy centre allowed us to diversify a lot of our load associated with cooling, which is significant,' Low explains.

Fresh air is delivered to the office spaces on a demand-control basis, using CO₂ monitoring to reduce energy demand. The air handling units are fitted with high-efficiency rotary thermal wheels for sensible and latent heat recovery. Up to 75% of the energy in the exhaust air is recovered and used to help cool the incoming fresh air.

The scheme also incorporates a low-energy artificial lighting scheme, which includes passive infrared detection, mood lighting and daylight sensors to keep energy consumption down to 5W·m².

Low says it was 'a client aspiration to showcase renewables'. As such, the scheme



incorporates a solar thermal system, which supplies 75% of the building's hot water demand; it also includes a huge 1,000m² rooftop PV installation, which can generate up to 305,000kWh of electricity annually – approximately 8.5% of the building's total energy requirement. Together, the two systems will supply more than 10% of the building's energy demand. 'The building also has the flexibility to feed into the grid, but that was not one of the KPIs,' says Low.

The scheme achieved the Estidama four Pearl Rating for design. Brookfield Multiplex, which constructed the building under a design and build, and shell and core contract, was the first contractor in the region to achieve such a rating for construction. **CJ**

Services to the office floors include variable speed FCUs to provide cooling. These incorporate a condensate to collect precious water

INTEGRATED RENEWABLE SOLUTIONS FUTUREPROOF



Optimus Gas Absorption Heat Pump | EcoCharger Hybrid Water Heater

An integrated heating or hot water system using renewable energy and Gas-fired condensing Boilers and Water Heaters can reduce carbon emissions and energy consumption. Such packages can often provide a significant saving on capital cost, compared with a completely renewable installation. Lochinvar can offer such packages by integrating technologies such as Solar Thermal, Gas Absorption Heat Pumps and Air Source Heat Pumps, with our Gas-fired condensing Boilers and Water heaters.

To find out more about Lochinvar's Integrated Renewable Solutions visit www.lochinvar.ltd.uk and get in touch with one of our territory-based Area Sales Managers near you.



www.lochinvar.ltd.uk

Email: info@lochinvar.ltd.uk

Tel: +44 (0) 1295 269981

 @LochinvarLtd
 Lochinvar Ltd



eCO PREMIUM™ – the QUIETLY BRILLIANT ENERGY RECOVERY UNIT

When investing in a new ventilation unit with heat recovery you could – and should – go for the best-in-class choice. Clean air with optimum **efficiency** and extremely **low noise** is only the beginning. That is why we have developed our new eCO PREMIUM™.



>90% Wet/
85% Dry



<20 dBA
@ 3 m



Building
Bulletin 93
Compliant



Lowest Specific
Fan Power (SFP)
in its class

>> Learn more at our new website www.flaktwoods.co.uk

Future features in CIBSE Journal



February 2016	Industrial & commercial heating & cooling Careers supplement	July 2016	Air conditioning Fire and smoke design/management/ ventilation
March 2016	Air conditioning Chilled beam Refurbishment Special supplement	August 2016	Heat pumps Healthcare
April 2016	Water heating Data centres Schools & education facilities supplement	September 2016	Air conditioning, air movement & ventilation Heat recovery systems
May 2016	Air conditioning, air movement & ventilation Commercial heating supplement	October 2016	Pipework, pumps & valves Hotel & leisure facilities supplement
June 2016	Chillers Air handling units BIM supplement	November 2016	Industrial and commercial heating & cooling CPD supplement
		December 2016	BMS, smart metering & control Lighting supplement

Editorial submission: Please send editorial proposals/ideas three months before publication date, eg, 1st November for February publication.

Send to: editor@cibsejournal.com.

The final editorial copy deadline is one month before publication date.

For advertising opportunities contact:

Jim Folley – 020 7324 2786
or email jim.folley@redactive.co.uk

This month: Solar power generation and storage; smart technologies for the home and IES' win at the ASHRAE Energy Modelling Conference

GO ABOVE & BEYOND

As the 2020 'nearly zero' energy buildings target approaches, **Liza Young** explores Swansea University's pioneering research into building-integrated photovoltaics, as well as its unique ways of storing heat for use all year round

Enough solar energy falls on Earth every day to power the planet for 27 years – yet we are failing to use it to our advantage.

That's the view of Dave Worsley, research director at the Sustainable Product Engineering Centre for Innovative Functional Industrial Coatings (Specific), at Swansea University. He believes this abundant, renewable energy source has the potential to fuel smart homes of the future.

With photovoltaics (PVs) becoming more mainstream, the centre aims to develop coated glass and steel products that capture, store and release solar energy – effectively turning buildings into power stations.

Worsley says the best way to ease the increasing strain on our electrical grid and achieve 'nearly zero' energy buildings by 2020 is to functionalise buildings' façades. This means using their large surface areas to generate power through building integrated photovoltaics (BIPV) and solar air collectors, before storing it in batteries or heat stores

for later use. In this interview, he explains the centre's pioneering work with PVs and the emerging technologies that could help transform our power infrastructure.

Buildings as power stations

Space heating is one of the biggest challenges in the drive to provide affordable, secure and low carbon energy. It accounts for nearly half of the energy consumed in the UK and about a third of our carbon emissions.

But as long as gas remains the primary energy source for heating, delivering UK carbon reduction targets would be impossible, says Worsley.

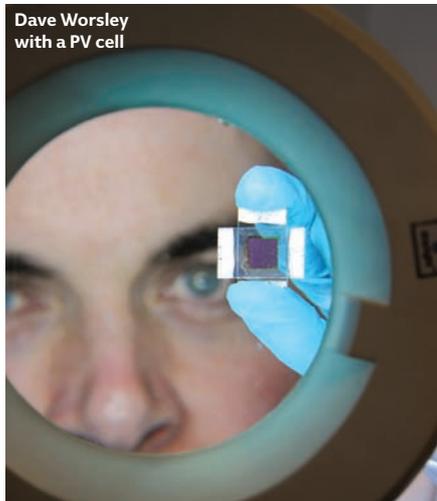
Huge fluctuations in UK gas requirements are driven by space heating – at peak demand in winter, we use five times more gas than electricity. Worsley says: 'There is not enough capacity in our electrical grid to meet the demand for heating, so we must find alternative solutions.'

'Buildings have large surface areas – glass, metal and tiling – just sitting there at the

The solar air collector is fully integrated into the design of the Solcer house



With effective storage methods, our aim is for solar air collectors to deliver 100% of a building's space heating requirements all year round



Dave Worsley with a PV cell

moment, getting rained on. They are actually a dumb product – just keeping the weather out. We know the sun doesn't shine every day, so we have developed ways to store solar energy in batteries or heat stores in the summer, and use it in the winter.'

Instead of being net users, Worsley argues, buildings should become net producers of electricity, akin to small power stations.

The Specific centre – together with many academic and commercial partners – is developing a range of solar-cell technologies and processing techniques that will allow high-efficiency thin-film PVs to be manufactured at scale, using earth-abundant, low-cost materials. The team is also

investigating inter-seasonal solar heat storage using thermochemical materials.

Perovskite and near-infrared heating

The glazed solar PV panels at Specific's demonstrator house (see panel, 'Solcer house') have been created by embedding PV cells between two layers of glass.

The technology is already being taken to the next level, however, after the development of perovskite thin-film solar cells, which are lightweight, flexible and can be printed directly onto glass or metal.

Widely hailed as the next big thing in solar technology, perovskites – pioneered by the University of Oxford and Imperial College London – work well in low-light conditions, such as those in the UK. One of the main benefits of this technology will be low-cost energy generation, targeting a 50% reduction in current solar costs.

Printing perovskites onto glass makes a semi-transparent coating that is ideal for BIPV applications, capable of generating a significant percentage of the building's electrical energy requirements directly from sunlight. But to be commercially viable, perovskite cells must be quick and cheap to manufacture at scale, says Worsley. One of the biggest manufacturing bottlenecks is the annealing of the active perovskite layer, which takes up to 90 minutes in an oven at 100°C.

Over the past four years, Specific has developed near-infrared heating for a range of drying and curing processes in solar cell manufacture. This has reduced the perovskite annealing step from 90 minutes to



Solcer house

Specific and Cardiff University have created a prototype, low-cost energy smart house, capable of exporting more energy to the national electricity grid than it uses.

The Solcer house, in Bridgend, follows the 'buildings as power stations' concept, using renewable energy systems as building elements. Its upper, first-floor wall incorporates a transpired solar air collector (TSC) and a 4.3kWp photovoltaic (PV) panel system on the south-facing roof.

The glazed solar photovoltaic panels are fully integrated into the design of the building, allowing the roof space below to be naturally lit. This has been designed to reduce the cost of bolting on solar panels to the roof.

The energy systems combine solar generation

and battery storage to power its combined heating, ventilation, hot-water and electrical power systems.

Heating is supplied by passing external air through the solar air collector and a mechanical ventilation heat recovery (MVHR) unit. Exhaust air is passed through the MVHR and then an exhaust air heat pump, which heats the thermal water store, heating domestic hot water. The heat pump is powered by the PV and battery-storage system.

The three-bedroom house, which combines the best off-the-shelf technologies in a unique way, uses grid electricity supply only when the PV-battery system is exhausted. The predicted energy performance is 70% autonomous, with a 1.75 grid export-to-input energy ratio.



Near-infrared heating



Specific's pilot manufacturing plant

less than three seconds, with little impact on performance. 'Importantly, the annealing step can be done as part of a continuous reel-to-reel manufacturing process, supporting rapid entry into the market,' adds Worsley.

Solar thermal heat generation and storage

Worsley says the development of heat storage systems for use with solar air collectors is a big focus point for Specific. 'With effective storage methods, our aim is to enable solar air collectors to deliver 100% of a building's space heating requirements all year round.'

As well as generating electricity, the sun's energy can be used to heat air for space heating or ventilation. Solar air collectors are installed as an additional micro-perforated steel skin onto a wall or roof, creating a cavity of heated air between the building and the



Building integrated PVs on the Solcer house roof

CREDIT / B&S



The Solcer house's first-floor wall incorporates a transpired solar air collector

metal. The heated air is drawn from the cavity and put through a low-energy 0.5kW heat pump that converts the air to a much higher-grade heat, which can be used immediately or stored in a large water tank for later use. Day-to-day (diurnal) heat stores collect the excess heat generated during the day for use the next morning.

This technology has been trialled by Specific at the solar heat energy demonstrator (Shed), a 1990s industrial unit, in Port Talbot. Here, a 590m² solar air collector – combined with a 20m³ thermal store, heat-exchange system, with heat-pump boost – have led to the decommissioning of the gas-fired boiler. Now, 40% of the building's heating comes directly from the collector and 60% via the solar store.

Inter-seasonal heat storage

Specific is developing ways to store low-grade heat generated during the summer months and release it, on demand, during the winter. The team is working with thermochemical materials that use completely reversible chemical reactions to store and release heat.

Worsley says Specific, in partnership with the University of Nottingham and the British Iron and Steel Federation (BISF), developed a cheap vermiculite material – a type of hygroscopic salt that takes on, or loses, water – to create a seasonal heat store.

'The salt is dried out during summer and then, when it's exposed to cold damp air in winter, the moisture goes back into the salt, releasing hot air,' explains Worsley.

Specific is completing a large-scale

demonstration of the inter-seasonal heat storage system at the Shed. It consists of a roof-based solar thermal collector, with a dry vermiculite mix that stores summer heat for use in the winter.

Worsley says: 'Offsetting our limited electricity generation capacity by using stored heat during winter is game-changing. This system could have a substantial impact on the UK's power infrastructure if implemented in several hundred thousand new homes that the government wants built over the next two years.'

'We believe using an active building concept will create a more pleasant environment for people to live in, rather than a passive framework building that can be stifling in terms of the number of air changes.'

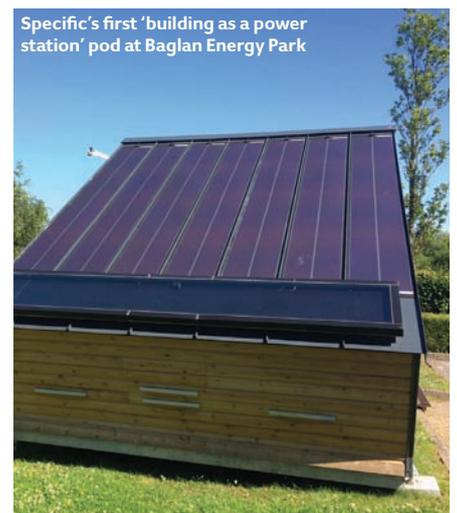
To the future

Worsley says this renewable energy solution is perfect for large industrial buildings and supermarkets because it's less disruptive to occupants, and cheaper than insulation.

'Our three-bed Solcer house cost £125,000 to build,' he says. 'It was a one-off, but when the tech can be made at a mass-produced rate, it will knock a further 25-30% off the cost.'

Worsley says Specific plans to install its renewable systems into 108 new and existing buildings over the next few years to test the technology and collect data. The centre has big ambitions for its solar installations. By generating 10GW peak electricity from BIPV (equivalent to five coal-fired power stations), Worsley says the technologies will reduce carbon emissions by six million tonnes per year within the next 10 years.

'We have done 26 buildings so far, and it has been a steep learning curve,' he adds. 'The application of smart solar technologies has the potential to be transformative. The future of solar really is exciting.' CJ



Specific's first 'building as a power station' pod at Baglan Energy Park

SIMPLY SMART

Smart technologies should be simple and intuitive, and used to build citizen-centric cities. **Liza Young** reports from a CIBSE Homes for the Future Group debate

What makes a 'smart home' smart? Comfort, ease and simplicity, according to a panel of experts at a recent 'Smart homes for resilient cities' debate.

The panel – at the CIBSE Homes for the Future Group and the Resilient Cities Group event, at Hoare Lea in December – said smart metering and monitoring would play a big role in creating homes for the future.

But it raised concerns about data ownership, privacy, control and democracy.

Smart sensors

'Smart monitoring can improve building modelling because it allows us to see when occupants are using their properties – which is pretty revolutionary in our industry,' said Robbie Thompson, product leader for monitoring and diagnostics at BRE.

However, neither modern buildings nor those constructed 90 years ago have been designed for wi-fi, he said.

By 2020, the government wants every dwelling to have a smart meter that will communicate using radio technology. But modern buildings are covered in low-emissivity glass, foil-backed plasterboard and multiboard, which have great thermal characteristics, plus moisture and fire resistance, but will cause interference with the radio frequency – so 'all your fancy wi-fi gadgets stop working'.

'This is a big problem if you're trying to get radio signals into 27 million homes in the country,' said Thompson.

BRE modelled this in a project to find out what impact building components will have on how radio signal attenuates. 'This issue needs to be addressed very quickly by people building properties of the future, because we're expecting trillions of devices, and they must all be able to communicate into – and out of – the home,' said Thompson.

BRE has encountered other problems after monitoring a tower block of 45 social housing properties, each with 11 sensors, collecting 260 million data points across the year – including temperature, humidity,



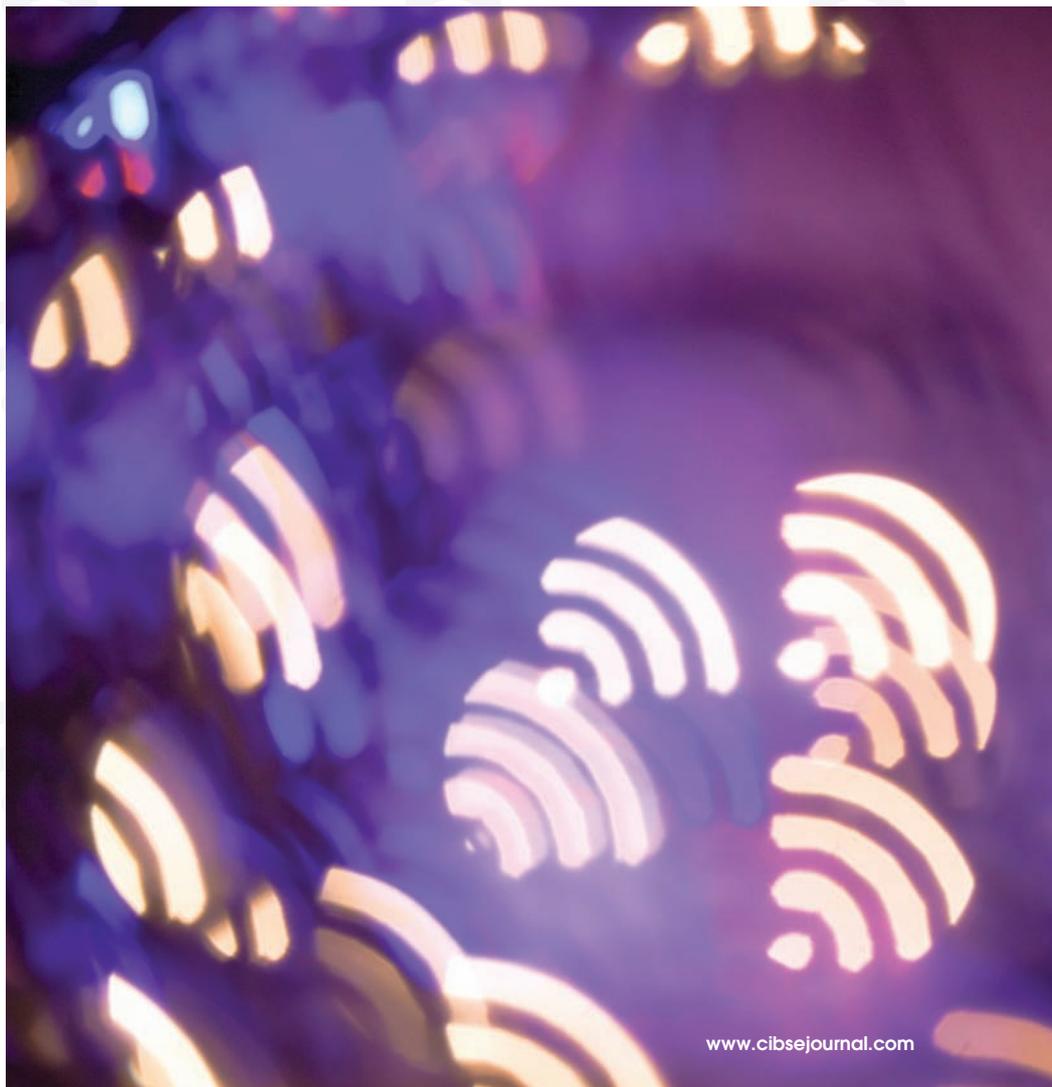
Pini believes Google is spending money on the Nest thermostat to obtain data from customers

CO₂, electricity, external temperature and occupancy information. For one thing, the occupants kept stealing the sensors' AA batteries for their TV remote controls.

To connect its sensors to a central hub, BRE used a protocol called ZigBee, which works on the same frequency as wi-fi. 'People would move our hubs on top of their broadband routers, which caused interference, and all our sensors stopped working.'

He added: 'We were also relying on occupants' home internet, so if they stopped paying their internet bill, we stopped getting their data.'

'If you are going to undertake these sorts of monitoring projects, you've got to consider every single step – and remember you are relying on the technology of others.'



Smart metering

A huge proportion of energy in the UK is used by power stations in stand-by mode and spinning reserves. 'By having smart meters, you can turn off everyone's immersion heaters in the ad break of the FA Cup final, when they go to make a cup of tea, so you don't have to turn on several power stations,' said Thompson.

Diana Sanchez, Hoare Lea executive consultant, said this was an example of technology driving behaviour. 'There should be a new social contract around this issue in terms of data ownership, privacy and setting the rules in a transparent way, so we can trust companies and be in control of the type of information we give up.'

She added: 'If you give something, you expect to get something back. Residents will not accept someone taking over their smart meters and controlling their system unless they get something for it.'

'We want technology to influence and drive behaviour, not make the decisions for us.'

Ben Croxford, senior lecturer at University College London, said smart metering was not about the consumer. 'Smart meters are one way – all the information goes back to the utility, and no cost data goes back to you.'

Modern buildings are covered in low-emissivity glass, foil-backed plasterboard and multiboard, which will cause interference with the radio frequency, so fancy wi-fi gadgets stop working



The same can be said of smart heating systems, such as Hive and Nest, which plug into the broadband router and connect to the boiler, giving it on and off commands.

Phillip Pini, of control systems manufacturer Crestron, warned: 'Why would Google spend all that money on a thermostat for the wall of your house? It's very clear – to obtain data from you.'

It could be a dangerous precedent, he added. 'Imagine what would happen if Facebook and Amazon combined forces. Facebook has all the users and holds our details, and Amazon wants to sell you products. If those got together and shared each other's data, you might buy something without knowing it.'

Keep it simple

Pini said Crestron was heavily invested in lifestyle electronics – things that can present a simplified way of doing something.

'We do not invent the next remote control or pair of speakers,' he said, 'but try to make different subsystems talk to each other and then present them on one display device, whether a tablet or iOS.'

The building management system (BMS) is like a centralised brain that lets a user push a button for up, down, warm or cool. 'But what actually goes on behind the scenes is quite complex,' said Pini. To create smart buildings, he added, you have to take the complicated and un-complicate it, making that journey simpler for somebody. 'A smart building is simple, effective, easy to use and something that will enhance your life.'

Citizen-centric technology

Sanchez said the increased use of smart devices has changed our lives, but a pressing

issue remains: 'We have seen lots of new technologies coming out, overwhelming our life, but what is the thing we're trying to solve? As architect Cedric Price once said: "Technology is the answer, but what was the question?"'

Technology should be for people, Sanchez said, not merely for the sake of technology. Good practice in smart cities has acknowledged this and puts people at the heart of planning and development.

They use technology and smart tools in collaboration with city leaders – urban planners, policy-makers, engineers, citizens and architects – to create the most appropriate responses to the city's problems, creating a citizen-centric design.

Sanchez added: 'Traditionally, we made decisions by thinking about what citizens want and proving that – but now technology allows us to learn what people actually want.'

She said a past experiment used citizens in different cities as sensors, drawing from their social feeds to understand their priorities. 'Cities are different because people are different, and this needs to be acknowledged when introducing technologies.' The real smart technology revolution is not just the device itself, Sanchez added, but what we do with it. 'The challenge is transforming data into knowledge for meaningful analysis.'

'Software should be something that is able to learn, adapt and be flexible. Technology should help us construct buildings as living systems that learn from their occupants in an individual way – similar to Netflix, which understands your preferences and filters films according to what you have seen before.'

Billions of pounds have been invested in highly technological solutions to make cities intelligent, but most of these projects are yet to be proved successful, she said.

The smart way

To make something smart, you need to demystify it and make it useful. 'I once borrowed my dad's car in the rain,' Croxford said. 'After driving for a while, I realised I hadn't touched the windscreen wiper for a while. It was an automatic one that had been designed right, because I didn't need to operate it at all. That's closer to what smart is for me – getting on and not making a fuss.'

Sanchez agreed: 'If you provide something that can respond to an urgent question, it will be used.' She said trust and work across disciplines was key to this. 'Innovation happens in collaboration. The real genius is one that combines the expertise of the arts, science, technology and engineering.' **CJ**

The 2015 ASHRAE Energy Modelling Conference featured the launch of a new competition aimed at highlighting best practice in building modelling.

Eight project teams, led by rival software vendors, competed in the ASHRAE LowDown Showdown to model an exemplar net zero energy (NZE) – or below – building. The competition, sponsored by the US Department of Energy (DOE) and the National Renewable Energy Laboratory (NREL), aimed to explore how BIM and energy-modelling tools could assist in the early design stages.

Delegates signed up to play a position on a team – such as mechanical engineer, architect, designer and energy modeller – and teams were given three months to model entries based on a common set of requirements. These included storey height, building use, minimum window-to-wall ratio, IT loads and number of occupants.

The awards were for energy-use results, innovative workflow, team work, and most creative – and were given out at the conference after the teams' presentations.

The energy use prize was won by a team led by IES, using IESVE 2015 modelling software and a suite of other simulation tools. The team collaborated via bi-weekly web meetings and used the cloud to make updates to the model.

Our brief was to design a three-storey, 53,600ft² office building that included details of the annual energy use, and a breakdown of energy by HVAC, lighting, plug loads, and service water heating. The team located the building in central Boulder, Colorado, in the US, where there are extreme variations in climate, including annual external conditions ranging from -20°C to 34°C, 6% to 100%

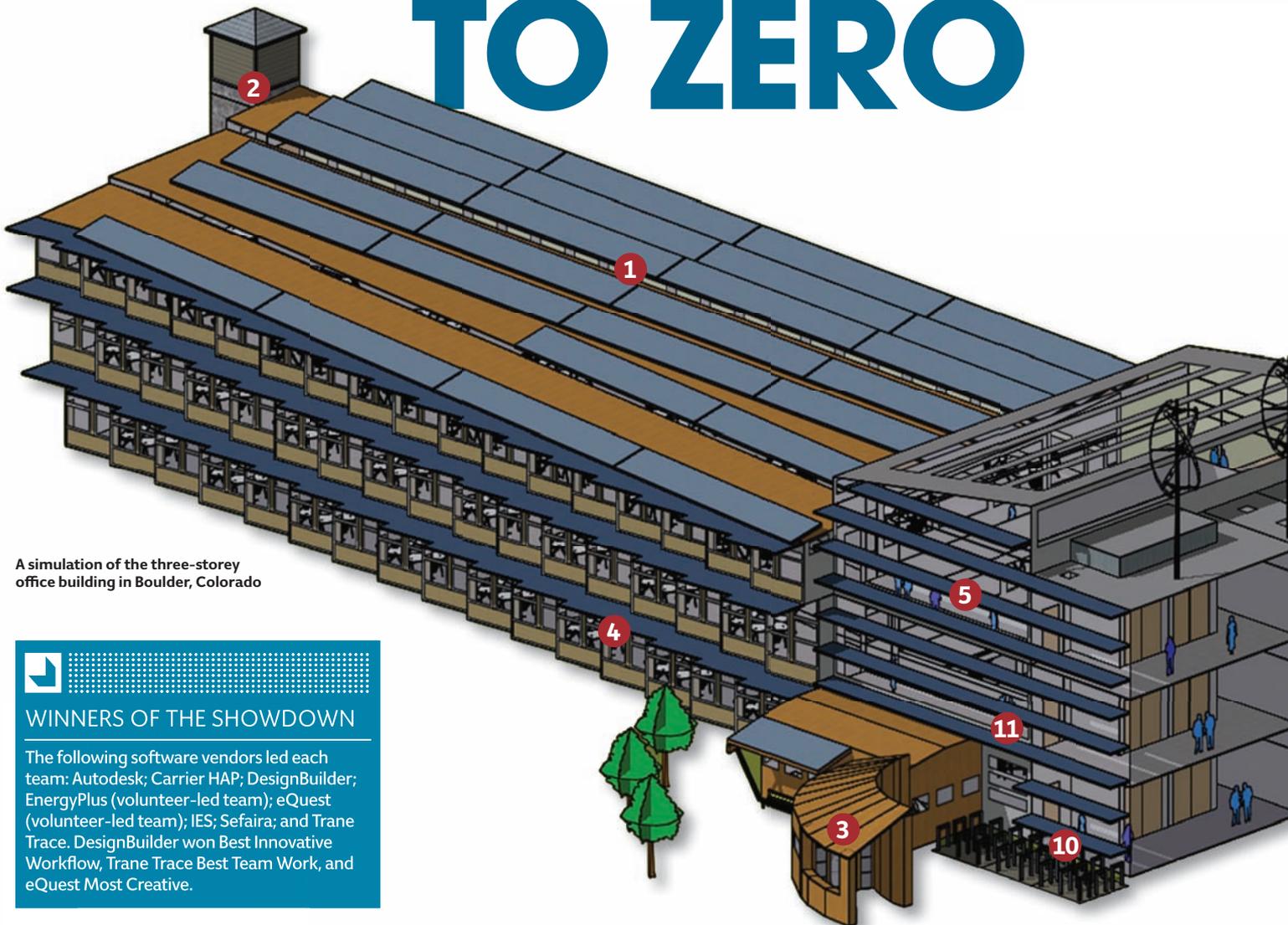
relative humidity, and commonly occurring day-to-night-time temperature swings of 19°C.

The team chose 30 low-energy measures that focused on load reduction and optimising HVAC. The envelope performance had the biggest impact on energy consumption, so the team included low-energy measures such as R-50 insulated panels, mirror glazing and solar shading. Passive louvres in a saw-tooth façade also captured predominant westerly wind for natural cross-ventilation.

Plug loads and electric lighting were identified as the next largest energy end-uses. Daylight harvesting controls were used in

An ASHRAE competition pitched software vendors against each other to come up with the best model of a net zero energy building. IES won Best Energy Use and the firm's **Liam Buckley** describes the winning project

DOWN TO ZERO

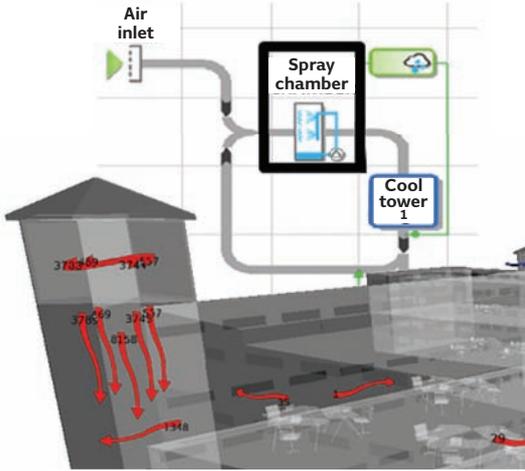


A simulation of the three-storey office building in Boulder, Colorado



WINNERS OF THE SHOWDOWN

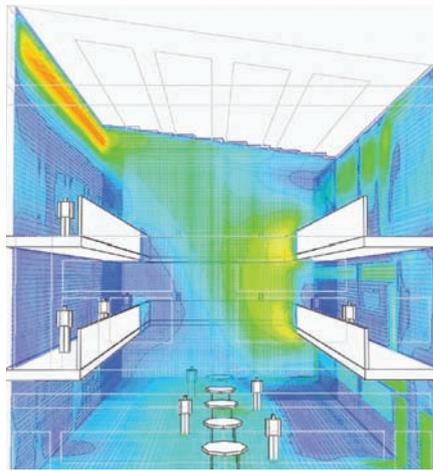
The following software vendors led each team: Autodesk; Carrier HAP; DesignBuilder; EnergyPlus (volunteer-led team); eQuest (volunteer-led team); IES; Sefaira; and Trane Trace. DesignBuilder won Best Innovative Workflow, Trane Trace Best Team Work, and eQuest Most Creative.



The spray chamber cools air in the cool tower

the shallow plan, and designers included the minimum amount of task lighting that met Illuminating Engineering Society of North America standards. Energy-conservation measures included: natural ventilation with exposed thermal mass and automated night-purge control – specified after the large temperature swing was identified; an air-to-water heat pump; airside heat-recovery wheel; IT server virtualisation; radiant floors; and a passive negatively airflow-integrated atrium.

We wanted to ensure that the design would not only meet net zero standards in 2016, but also in 50 years' time. They used Arup's

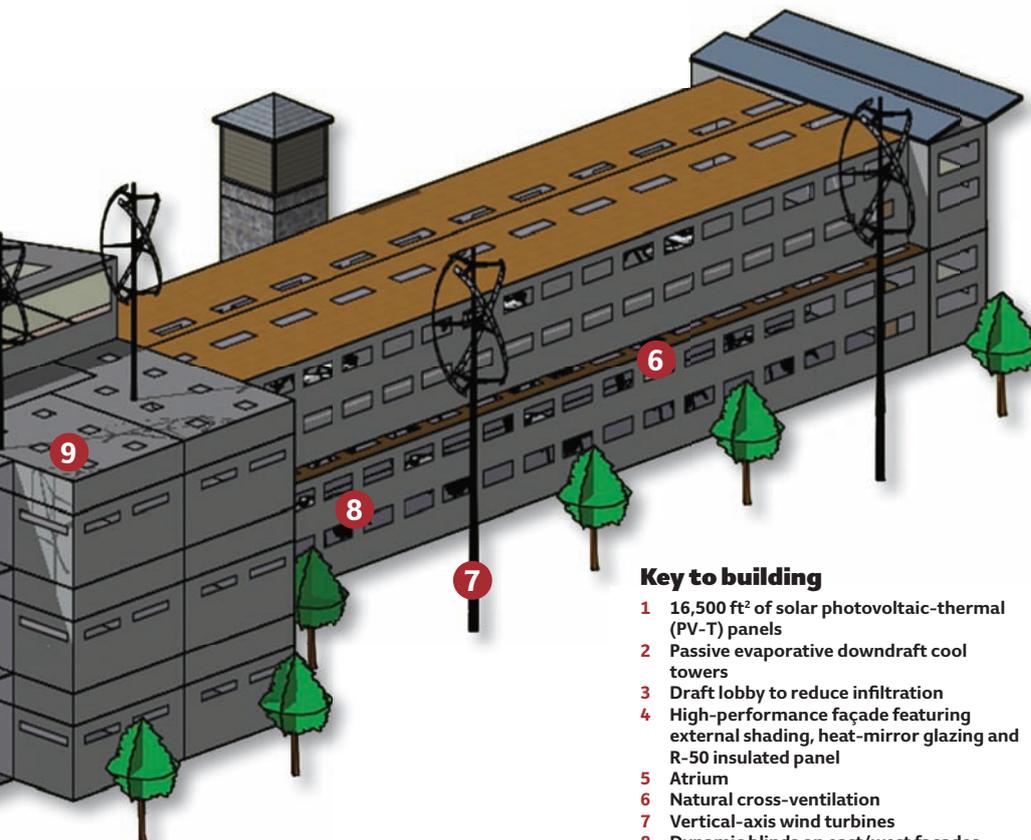


Atrium showing warm air exhausting from vent



TEAM MEMBERS

The team members were: Anna Osborne, energy modeller at Integral Group; Ben Brannon, mechanical engineer/energy modeller at Arup; Shona O'Dea, building performance Analyst at DLR Group; Megan Gunther, mechanical engineer and sustainable systems analyst at Affiliated Engineers; Cory Duggin, energy engineer at TLC Engineering for Architecture; Greg Romanczyk, mechanical engineer at exp; and Scott West, sustainability engineer at HKS.



Key to building

- 1 16,500 ft² of solar photovoltaic-thermal (PV-T) panels
- 2 Passive evaporative downdraft cool towers
- 3 Draft lobby to reduce infiltration
- 4 High-performance façade featuring external shading, heat-mirror glazing and R-50 insulated panel
- 5 Atrium
- 6 Natural cross-ventilation
- 7 Vertical-axis wind turbines
- 8 Dynamic blinds on east/west façades
- 9 Skylights assist with daylight harvesting
- 10 Bike racks

WeatherShift, which makes future predictions for temperature and rainfall, in conjunction with the local TMY15 weather file – showing the past 15 years of data – to make predictions about Boulder's weather from 2050-2064.

The data revealed higher temperatures, which we were able to account for in the model – in part by incorporating two passive downdraft cool towers (not cooling towers) into the design. These use evaporative cooling to bring the ambient hot and dry air (37°C/6% RH) to a comfortable supply condition. A spray chamber helps to cool the incoming air. One interesting benefit of the evaporative cooling is that the air naturally begins to move downwards. With the atrium being negatively pressurised, we were able to induce the cool air into the office spaces without any fans.

The atrium design was critical to the NZE project. It funnelled external air towards the wind turbines for added renewable energy generation, and its south façade was shaded externally with photovoltaic-thermal (PV-T) panels. These combine the functionality of solar thermal collectors and PVs in one panel.

Negative air pressure in the atrium was necessary to achieve adaptive thermal comfort conditions in the office spaces. The atrium was heated with a radiant floor and the hot water for this was pre-heated from the PV-T panels. Additional heating was met by a high-efficiency condensing boiler.

To understand user behaviour, we monitored hourly plug loads in an existing office building occupied by ZNE building evangelists Integral Group. The IES team used a tool called Ergon to turn actual recorded data into energy-simulation input data. This was then fed into the energy model so we could fine-tune the energy prediction. Using actual data allowed us to consider occupier behaviour, and took into account any oversizing of plant.

The DOE praised our innovative atrium and was also impressed with the use of future weather data, saying: 'The team projected their design 50 years into a presumably warmer future and planned for the addition of ventilation towers that would keep the building operating at zero net energy.' CJ



Solar shading on the façade



Invisible Comfort



Daikin UK now offers two new VRV IV design solutions that minimise both visual and sound impact, to meet aesthetic and regulatory demands.

VRV IV s-series: Keep a low profile

Perfect for sensitive urban environments, the compact VRV IV s-series stands less than 1m high including feet. Easy to hide on a balcony or parapet, it offers all the power of a VRV, in the smallest of spaces. The low height 4&5HP units join our extended VRV IV s-series range, now available up to 12HP.

VRV IV S-series

Find out more at www.daikin.co.uk/vrviv or complete our CPD module opposite or online at www.cibsejournal.com/cpd

VRV IV i-series: The city secret

Introducing a truly unique, award-winning solution: an invisible VRV system! The 'outdoor' unit is split into a separate compressor and heat exchanger unit for indoor installation, so no planning permission is required. So now your customers can enjoy all the power of a fully invisible VRV system.

VRV IV i-series



Professional development

The CIBSE Journal CPD Programme

Members of the Chartered Institution of Building Services Engineers (CIBSE) and other professional bodies are required to maintain their professional competence throughout their careers.

Continuing professional development (CPD) means the systematic maintenance, improvement and broadening of your knowledge and skills, and is therefore a long-term commitment to enhancing your competence. CPD is a requirement of both CIBSE and the Register of the Engineering Council (UK).

CIBSE Journal is pleased to offer this module in its CPD programme. The programme is free and can be used by any reader. This module will help you to meet CIBSE's requirement for CPD. Equally, it will assist members of other institutions, who should record CPD activities in accordance with their institution's guidance.

Simply study the module and complete the questionnaire on the final page, following the instructions for its submission. Modules will be available online at www.cibsejournal.com/cpd while the information they contain remains current.

You can also complete the questionnaire online, and receive your results by return email.

Enhancing VRV/VRF systems to meet increasing loads in restricted and historic spaces

This module explores the increasing use of variable refrigerant volume/flow systems in refurbished and repurposed buildings

Increasingly, the expectation for commercial and urban residential¹ buildings is that the spaces will be 'air conditioned'. In many cases, not only is there increased value if the spaces are climate-controlled, but they are also likely to be more productive. However, there are often challenges when incorporating systems in refurbishments and repurposed historic properties. This article will consider why the demand for systems is increasing, and how modular variable refrigerant volume/variable refrigerant flow

(VRV/VRF) systems are being developed to meet this need. This includes the application of water as a heat source – a technique that was much heralded at last month's Paris UN climate conference, COP21.

Controlling the upper and lower limit of temperature in commercial applications, such as in call centres² and offices³, has been shown to be beneficial to productivity⁴, as well as – and as a result of – providing a more comfortable environment. The values used for the upper limit for UK offices was

recently explored⁵ and, although there are opportunities for increased temperatures – above current operational norms of, typically, 22°C – it was found that 24°C was the likely acceptable maximum for a conditioned space before there was unacceptable discomfort and a resulting reduction in productivity. So in cases where natural and passive means are not sufficient – or are inappropriate – there are often good reasons to apply active cooling systems.

As post-industrial/commercial buildings are being repurposed to meet the needs of new occupants – often as offices, shops, restaurants and hotels – there is a growing demand for more compact systems. These internal environments are also being designed, as a warmer climate increases cooling needs.^{6,7} Building refurbishment activity has been accelerated by the April 2018 deadline in England and Wales that will require commercial properties to have an Energy Performance Certificate (EPC) rating of at least 'E'. This can be delivered not only by improving the fabric, but also using environmental control systems.

Moreover, the restoration of historic and sensitive buildings presents challenges of maintaining comfort conditions, often where the building use is quite different from the

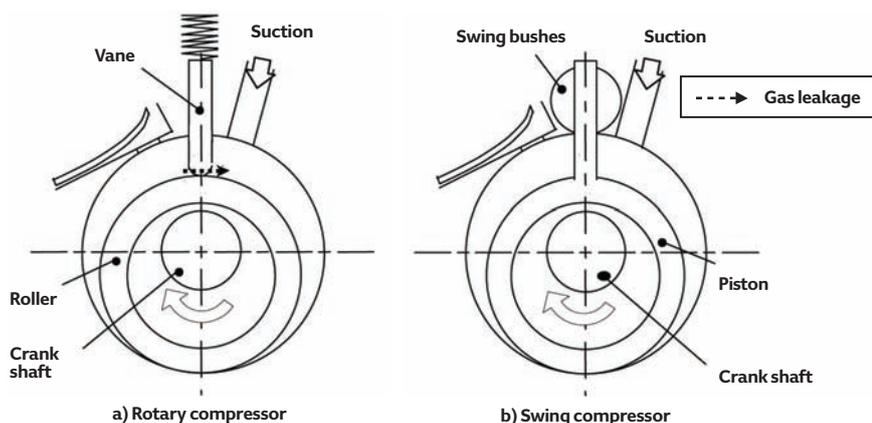


Figure 1: Comparison of a rotary and a swing compressor – the swing compressor uses a single component (the 'piston') to replace the roller and the vane on a rotary compressor. It reduces leakage between the high- and low-pressure sides of the compressor, as well as decreasing noise (from the vane chattering on the roller). It also removes a lubrication need and a point of friction (between the vane and roller), so reducing lubricant temperature degradation (Source: *Development of High Efficiency Swing Compressor for R32 Refrigerant*)

original purpose, with limited opportunity for fabric adaptation and little space for environmental services.

The installation and integration of environmental systems must be able to provide appropriate conditions within restricted spaces, while minimising the impact on the fabric and appearance of historic interiors and exteriors. It must also deliver this without excessive noise or vibration.

The application of VRV/VRF systems

Modular VRV/VRF systems are widely applied because – when designed and operated properly – their installation and operating costs are likely to be competitive, compared with most modular and centralised air conditioning systems used to provide comfort control in commercial buildings.⁹ In commercial applications, they are normally installed as part of an integrated environmental control system, alongside a ventilation system – sometimes referred to as a dedicated outdoor air system (Doas). The Doas will supply outdoor air to satisfy fresh-air requirements.

Some of the key aspects of development and application of VRV/VRF systems have been discussed in previous CPD articles (including January 2015 and March 2014, available at www.cibsejournal.com/cpd/modules). The system is based around a heat-pump arrangement that allows heat to be directed to where it can be most effectively used. This will allow, for example, the shifting of heat from a room that requires cooling to one that demands heating or – when there is no need for any space heating – usefully to preheat the domestic hot water store. Through the effective redirection of heat, as well as making use of the heat pump to move heat to and from the external space, installed systems can operate with high values of seasonal energy efficiency ratio (Seer – for cooling) and seasonal coefficient of performance (Scop – for heating). This can make a positive contribution to the environmental ‘rating’ of the building, compared to systems that do not recover – and redirect – the thermal energy. Not only does this reduce operating costs but, by improving the building’s certificated environmental performance, it can also improve the opportunity to lease a building and increase its value in the sales and rental markets.¹⁰

Enhancing the component performance of VRV/VRF

The VRV/VRF system is driven by the

compressor, which is typically housed – together with a heat exchange coil and controls – in what’s traditionally termed the ‘condensing unit’, although it may well provide an evaporating function when the overall system requires heating. This is normally sited adjacent to – and outside – a building. In existing (as well as some new) buildings, locating the condensing unit can be difficult practically, for either aesthetic or noise reasons, so it is beneficial to reduce the size and noise output of these units. A major VRV/VRF manufacturer¹¹ reports that one of the most frequently requested developments is that the height of ‘condensing units’ be lowered so that they can be more easily obscured – while, of course, maintaining appropriate space around the unit to maintain effectiveness.

Manufacturers continuously develop their products to improve performance and give them a competitive edge. For example, changing the compressor from a simple rotary compressor to a more efficient swing rotary type, as shown in Figure 1, can improve efficiency with no exterior change to the unit – effectively providing increased capacity with no increase in size.

The fabrication method of the compressor can also affect its size. For example, by using injection moulding with a semi-molten metal, which is then rapidly cooled, the compressor material can be made significantly stronger – and thinner – than a traditionally cast compressor casing. The resulting compressor will be smaller for a given load, and the external ‘condensing’ unit may be more compact, as shown in Figure 2.

As discussed in the January 2015 CPD, the control regime for such systems has been

developed to allow for modulation of the evaporating and condensing pressures (and temperatures), to maintain design conditions while reducing input energy. This has evolved further to optimise refrigerant flow rates and pressure drops, so that the compressor work is reduced. These combine to allow systems to satisfy a greater diversity of load without increasing the size of the unit.

In some cases, it is more convenient, practically, to separate the traditional components of the external unit so that the compressor may be housed at a position where, for example, it can be acoustically shielded or positioned in a less sensitive plantroom. The external coils and fans can then be located remotely where they have proper access to the external air, either directly or via ductwork. Using this arrangement, a manufacturer has developed its system¹² so that the compressor and ‘external’ heat exchanger modules can, typically, be up to 30m apart. The manufacturer’s choice of fan for moving the outdoor air through the heat exchanger will determine how far – and how efficiently – the air can be ducted, realistically. Traditionally, a forward curve fan has been used in such systems. The forward-curve fan is generally less efficient (typically around 70%) than its backward-curved equivalent (typically 80+% efficient), and it is less well suited to the higher pressure drops of ducted air systems, so is unlikely to be appropriate when the ‘outdoor’ coils have a ducted air supply.

In conjunction with the flexibility offered at the outdoor unit, a combination of control boxes and manifolds can direct the flow through the pipe networks so that a single external unit can provide concurrent heating and cooling across multiple zones in a

building. The energy is transferred around the building in small-bore (insulated) refrigerant pipework. The indoor units are the only parts that the occupants of the building can normally see – although, by using refrigerant-fed internal units rather than chilled water-based fan coils, they can be smaller and less intrusive. Indoor units can be more than 60m – and several floors – from the external unit. Any designs carrying refrigerant through occupied spaces must be mindful of the requirements of BS EN 378¹³, which sets standards to limit harmful levels of refrigerants. Properly designed, installed and operated VRV/VRF systems readily meet these requirements.

The indoor and outdoor units of a VRV/VRF system contain motors and fans and/or compressors, which will all generate noise and vibration. However, the transmission of



Figure 2: An 823mm-high external refrigerant R410a unit, capable of providing more than 12kW cooling/heating acting as a heat pump and supplying variable refrigerant temperature control (Source: Daikin)

this can be significantly reduced through the careful design and installation of the units. This includes resilient mountings for the motors and sound-insulating enclosures – and, potentially, sound-absorbing materials on the ducted air paths.

Through acoustic analysis and design, a manufacturer¹¹ has developed refrigerant distribution boxes (used in the occupied space) that have a reduced overall noise level – by 10 dBA at 1.5m – compared with similar products.

Water-sourced heating and cooling for VRV/VRF

VRV/VRF is traditionally associated with outdoor air heat exchangers, providing a source of heat when the outdoor coil is acting as an evaporator, or a heat sink when the outdoor unit is truly acting as a condensing unit. This unit can be replaced

Going Dutch

A ground-loop water-sourced VRV (Figure 3) was recently implemented in the new multi-storey Park Phi complex of buildings at Enschede in the Netherlands. The VRV has been applied in conjunction with other technologies – including ground thermal storage systems, solar panels and grey-water systems – to deliver a BREEAM Excellent-rated building. The integrated systems and integral heat pump in the water-sourced VRV systems (one per floor) allow the heat to be shifted around the building and into – and out of – the ground loop that is embedded in a massive thermal store of sand. The combination of systems is claimed to have provided an 80% reduction in energy use compared with a standard modern office complex of the same size.

with, or augmented by, one that is designed to exchange heat with water rather than air. Water can offer significant advantages, by supplying increased availability of heat, both as a source and sink. This can lead to smaller, quieter, single or multiple VRV/VRF ‘condensing’ units, with smaller refrigerant charges that can be readily installed in plantrooms at practically any level of the building (or externally), connected to the water source by pipework. The system that excited interest at the recent COP21 Paris conference was the provision of city-wide water mains delivering a thermal resource that could, for example, supply water-sourced VRV/VRF systems. Alternatively, water could be drawn from sources such as wells, ground loops and boreholes.

© Tim Dwyer, 2016

References:

- 1 Interview with David Garwood of BSRIA, www.modbs.co.uk/news/fullstory.php/aid/14607/The_UK_market_for_air_conditioning_heats_up.html, accessed 3 December 2015.
- 2 Niemelä, R, et al, ‘The effect of air temperature on labour productivity in call centres – a case study’, *Energy and Buildings*, Volume 34, Issue 8, September 2002.
- 3 Lan, L, et al, ‘The effects of air temperature on office workers’ well-being, workload and productivity – evaluated with subjective ratings’, *Applied Ergonomics*, Volume 42, Issue 1, December 2010.
- 4 Seppänen, O, et al, *Effect of Temperature on Task Performance in Office Environment*, Helsinki University of Technology, 2006.
- 5 Lakeridou, M, et al, ‘The potential of increasing cooling set-points in air-conditioned offices in the UK’, *Applied Energy*, Volume 94, June 2012, pp 338–348.
- 6 www.theguardian.com/environment/2015/oct/26/cold-economy-cop21-global-warming-carbon-emissions, accessed 3 December 2015.
- 7 *CIBSE TM55 Design for Future Climate: Case Studies*, CIBSE, 2014.
- 8 Yamamoto, Y, *Development of High Efficiency Swing Compressor for R32 Refrigerant*, Purdue University, 2014.
- 9 *The Little Black Book, Property Construction Benchmarks, 2011-2*, Franklin and Andrews, 2011.
- 10 <http://sustainability.bam.co.uk/insights/2014-04-22-is-breeam-outstanding-worth-it>, accessed 3 December 2015.
- 11 Private communication with Martin Passingham, Daikin UK.
- 12 Daikin VRV-i product information www.daikin.co.uk/citysecret, accessed 3 December 2015.
- 13 BS EN 378-4:2008+A1:2012 *Refrigerating systems and heat pumps. Safety and environmental requirements. Operation, maintenance, repair and recovery.*

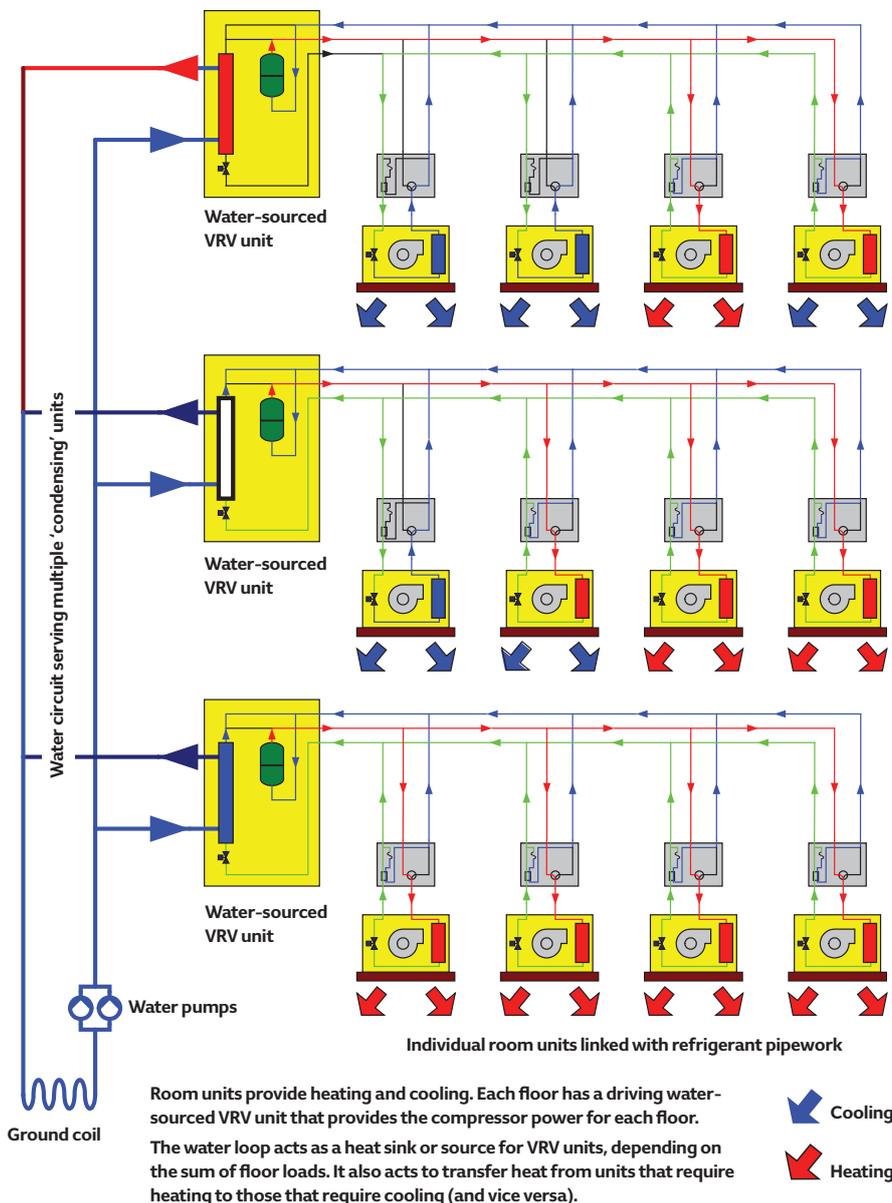


Figure 3: A representation of the type of system applied in the Dutch multi-storey Park Phi complex

Turn over page to complete module ➤

Module 89

January 2016



1. In the research cited in the article, what was the likely upper limit of temperature that was considered acceptable for conditioned offices?

- A 21°C
- B 22°C
- C 23°C
- D 24°C
- E 25°C

2. Which of these components is most likely to be incorporated in a swing compressor, but not in a traditional rotary compressor?

- A Suction inlet
- B Crank shaft
- C Swinging bushes
- D Roller
- E Vane

3. What is the approximate maximum distance that a compressor can be located away from its associated (external) heat exchanger when the components of the traditional 'condensing' unit are split up, as in the systems discussed in the article?

- A 10m
- B 20m
- C 30m
- D 40m
- E 50m

4. Through good acoustical design, by how much has noise level been reduced from the refrigerant distribution box, compared with similar products?

- A 5dBA at 1.5m
- B 10dBA at 1.5m
- C 15dBA at 1.5m
- D 20dBA at 1.5m
- E 25dBA at 1.5m

5. In the Dutch example building, how much energy use reduction has been claimed through the adoption of the innovative – and good practice – techniques?

- A 50%
- B 60%
- C 70%
- D 80%
- E 90%

Name (please print)

Job title

Organisation

Address

.....

.....

Postcode

Email

Are you a member of:

CIBSE

If so, please state your membership number

(if available)

Other institution

(please state)

To help us develop future CPD modules, please indicate your primary job activity:

Building services engineer

Mechanical engineer

Electrical engineer

Commissioning engineer

Energy manager

Facilities manager

Other (please give details)

If you do NOT want to receive information about Daikin, the sponsor of this CPD module, please tick here:

By entering your details above, you agree that CIBSE may contact you from time to time with information about CPD and other training or professional development programmes, and about membership of CIBSE, if you are not currently a member.

Please go to www.cibsejournal.com/cpd to complete this questionnaire online. You will receive notification by email of successful completion, which can then be used to validate your CPD records in accordance with your institution's guidance.

Alternatively, you can fill in this page and post it to:

N Hurley, CIBSE, 222 Balham High Road, London, SW12 9BS



Energy efficient cooling at the University of Essex

Underfloor systems use the plenum beneath a raised floor as the ventilation zone, removing the need for most – if not all – ceiling-based ducting or pipework.

The system supplied by AET to the University of Essex's Silberrad Centre was a bespoke design, comprising four custom conditioned air module units supplying conditioned air at high volume, with low energy output, to the individual zones. Conditioned air is introduced into the space using 124 floor-recessed fan terminal units.

● Call +44 (0)1342 310400, email lucy@flexiblespace.com or visit www.flexiblespace.com

Mikrofill at the Westgate School in Winchester

Completed in 2015, the Westgate is recognised as the first 'super school' in Hampshire, catering for children aged four to 16.

Recognised services contractor ARB Mechanical Engineering installed numerous Ethos wall-mounted 90kW and 110kW stainless steel condensing boilers. The boilers – with a turn down ratio of 10 > 1 and a seasonal efficiency in excess of 95% – provide low pressure hot water to radiator and underfloor heating circuits, as well as indirect primary to a hot-water system cylinder.

● Call 03452 606 020 or visit www.mikrofill.com



Jaga case study: Sky Believe in Better Building

The Sky Believe in Better Building is a showpiece in the heart of the Sky UK West London campus. Completed in September 2014, the complex demonstrates how sustainable building practices and energy efficient long-term operation can work in harmony.

By adapting proven products to meet the requirements of the project, Jaga Heating helped to ensure the architectural vision was ostensibly retained, and its occupants could work in a comfortable and energy-efficient environment.

● Call 01531 631533, email jaga@jaga.co.uk or visit www.jaga.co.uk

Bringing clarity to ventilation specification with RIBA

Airflow Developments has announced RIBA approval of its two latest CPDs.

Developed by the company's experienced team, the comprehensive presentations – *UK Building Regulations Relating to Ventilation and Heat Recovery*, and *Mechanical Ventilation with Heat Recovery in Non-residential Buildings* – collate all relevant ventilation legislation for those designing and specifying compliant ventilation within residential and non-residential buildings.

Both documents provide more quality information on the UK Building Regulations relating to the ventilation of residential buildings.

● Visit <http://bit.ly/1PewcL> or follow @AirflowD on Twitter



CP Electronics offers rapid route to energy measurement

New patented, real-time, web-based energy measurement technology is now available exclusively on the latest generation of RAPID lighting control module (LCM), and DALI gateway pluggable and DIN rail variants, from CP Electronics.

The new technology monitors in real time the actual energy consumption – rather than a monitored average – of each luminaire connected to an LCM or RAPID system.

Measurements can also be provided by LCM, area, floor or even building, in multi-time and multi-date formats.

● Call +44 (0)333 900 0671



Kingspan Insulation sets benchmark

As part of its forward-thinking approach to responsible sourcing, Kingspan Insulation was one of the earliest adopters of the BES 6001: Responsible Sourcing of Construction Products standard. Now the firm has gone even further, becoming the first insulation manufacturer to have its products certified as 'Excellent' under BES 6001.

The rigorous standard, developed by BRE Global, provides a detailed framework of the processes that must be addressed to ensure responsible sourcing of construction materials.

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

UK first for hybrid chiller technology as King's College London installs creative solution

The first UK installation of Rhoss EXP hybrid cooling and heating technology from Klima-Therm has been completed at the new Creative Industries Centre at King's College, London.

The three-storey state-of-the-art facility offers outstanding energy efficiency, and houses several of the college's programmes.

The innovative heat pump-based chiller was installed by Lowe & Oliver, and specified by consultant Hamson JPA for its energy efficiency and ability to provide simultaneous chilled and hot water.

● Call +44(0)20 8971 4195 or email info@klima-therm.co.uk



Remeha boilers provide warmth and comfort for residents at Bath almshouse

Two Remeha Gas 210 Eco Pro 4-section high-efficiency condensing boilers have been installed at St John's Hospital's Combe Park Almshouse, in Bath. They are part of a system redesign to improve the energy efficiency and reliability of the heating and hot-water provision throughout the 54 individual flats and communal areas. 'Our recommendation was due to the high performance and reliability of the products, and the excellent service Remeha Commercial provides,' said BJP Consulting Group. 'The Remeha boilers are small and compact, and relatively low in height, making them the perfect installation for this project.' The contractor was RV Services.

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



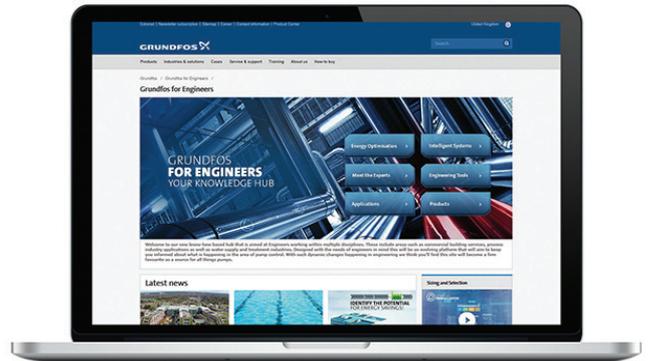
Grundfos engineering support now at a hub near you

Grundfos is delighted to invite you to visit its knowledge-based hub specifically aimed at engineers who work across multiple disciplines. Regardless of whether you work within commercial building services, process industry applications or the water supply and treatment industries, this online destination is for you.

Designed by engineers for engineers, the hub was developed as an evolving platform, which aims to keep engineering partners interested in pump technological advances informed about the latest industry happenings, as well as the wider subject of fully integrated pump systems.

Broken down into sections – with topics such as applications and engineering tools – the hub also includes in-depth areas on energy optimisation building on system intelligence, and an opportunity to watch a range of clips. Video clips include 'Meet the experts', who share their knowledge on different applications and their challenges.

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



Marshall-Tufflex looks to broaden successful apprentice initiative

An apprenticeship scheme to attract fresh engineering talent has proved so successful for Hastings-based Marshall-Tufflex that it is considering extending it to other areas of the business.

Steven Baldry, group personnel development manager, said: 'To help fill this gap in what is a critical area we've invested in an apprenticeship programme to attract young people into engineering, so we may develop and grow the technical skills needed to meet our demands.'

Four apprentices have been appointed.
● Visit www.marshall-tufflex.com

Lochinvar upgrades CPM boiler range

Boiler and water heater manufacturer Lochinvar has upgraded its ever-popular CPM range of fully condensing, gas-fired, stainless steel, wall-hung boilers in line with the requirements of the newly enforced European Eco-design of Energy Related Products Directive (ErP). Lot 11 of the directive requires that all integrated glandless circulating pumps have a maximum Energy Efficiency Index (EEI) of no more than 0.23.

The innovative CPM range offers low-NO_x, high-efficiency operation for a wide variety of commercial heating applications using either natural gas or LPG. The revamped boilers all contain an A-rated, integral, fully modulating pump, in line with the directive, which also requires contractors and system engineers to calculate the overall efficiency of heating and hot-water systems.

Full product details, including energy labels, product data tables and fiches are available via the Lochinvar website to support the use of CPM boilers in ErP-compliant systems.

● Visit www.lochinvar.ltd.uk



Evinox eco-efficient HIUs tested by BSRIA

Evinox is pleased to share the results of tests conducted by the Building Services Research and Information Association (BSRIA) on its ModuSat heat interface units (HIUs) in BSRIA's independent laboratories.

The objective of the testing was to establish the performance of its HIUs against best practice recommendations in the CIBSE Heat Network CP1. The results show that ModuSat units have the ability to achieve a large Delta T of up to 65°C and deliver a low system return temperature. This demonstrates Evinox's HIU's surpassed the benchmark requirements set out in the *CIBSE Heat Network Code of Practice*.

Testing was conducted in accordance with BS EN 1148:1999 heat exchangers – water-to-water heat exchangers for district heating – test procedures for establishing the performance data. BS EN 1148:1999 tests and ascertains performance characteristics and pressure drop for plate type heat exchangers

● Call + 44 (0)1372 722277 or visit www.evinoxenergy.co.uk



Rinnai launches online video resource

Rinnai UK has launched its own video resource link on YouTube as a useful and dynamic adjunct to its newly updated website.

Rinnai's customers have added their own testimonial videos to the channel by presenting the contractor's view of the benefits of continuous flow hot-water heating technologies.

The videos show Rinnai customers discussing the reliability of Rinnai products where they have been installed in a range of diverse sites with a variety of different applications.

● Visit www.rinnaiuk.com/resources/videos/ or www.rinnaiuk.com



Rinnai red-hot customer service knows no bounds

Rinnai, one of the UK's largest suppliers of continuous flow Infinity gas-fired water heaters, supports its benchmark A-rated range of energy efficient products with a dedicated customer service team.

Steve Thompson, Rinnai UK internal sales and purchasing officer, said:

'One of the best products available, paired with exceptional customer service, engenders customer trust and loyalty to the Rinnai brand. Our team – Red H2ot Rinnai Excellence Delivered – is dedicated to this simple premise.

'Nothing is more frustrating for customers than to be calling a phone that isn't answered. That is why we aim to answer all calls within just a few rings.'

● Visit www.rinnaiuk.com



Smart design boxes off the legionella threat

A lot of potentially worrying problems in legionella control can be solved by choosing to install a continuous flow hot water heating system.

With Rinnai's continuous flow units, water temperature for distribution is accurate to $\pm 1^\circ\text{C}$. No storage means no stratification, ensuring permanent even temperature. There is no requirement to heat a volume of water just to ensure the elimination of legionella bacteria because the minimum temperature that a continuous flow unit achieves is in excess of advisory levels.

● Visit www.rinnaiuk.com

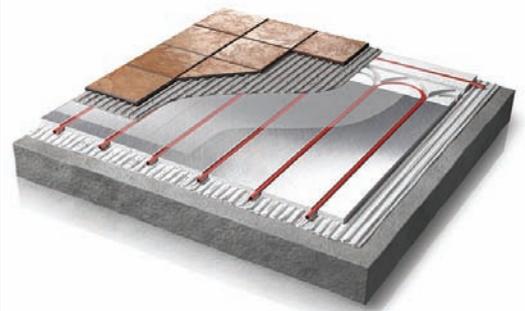


Introducing the universal sensor from Sontay

The single output UN-sensor is the latest low-cost addition to Sontay's range of sensors and is an ideal choice for tight-budgeted projects. Installers can expect devices within the range to automatically detect the controller signal, whether it is 4-20mA or 0-10V and rest assured it will have both accuracy and reliability.

The installation of the UN-Sensor entails a very simple six-step process and can be ready to use in just 30 minutes.

● Email sales@sontay.com or visit www.sontay.com



Choose the Total-16 low profile system for your next project

Floor height is often a restricting factor when choosing water underfloor heating solutions.

The Total-16 system has a low build; at only 16mm thick it fits into design plans where there is a limited allowance for increase in floor height. You can install Total-16 directly onto both wood and concrete subfloors, and tile directly onto it once installed. Total-16 comprises three modular boards – straight, return, and multi-feed. The straight boards come complete with pre-installed aluminium heat diffusion plates. Because the system is not installed within screed, it is able to heat up a room in minutes, as opposed to hours.

● Visit www.warmup.com

PRODUCTS & SERVICES

Telephone: 0207 880 7633 Email: greg.lee@redactive.co.uk

Panasonic brings back its seven-year warranty

Panasonic is showing support for its extensive network of PRO Partners by announcing the return of its seven-year warranty for Aquarea heat pump systems.



As one of the longest warranties offered within the heating and cooling sector, Panasonic also promises a quick and simple approval programme. PRO Partners simply elect for an extended warranty when installing an Aquarea system. Once the installation has been commissioned, the warranty extension can be easily submitted online.

● Email uk-aircon-propartner@eu.panasonic.com



Spirotech specified for major district heating project

Air, dirt, pressurisation and water treatment products supplier, Spirotech, has been specified for a £120m Blackburn Meadows biomass plant. The 30MW plant, delivered by E.ON Community Energy, will power 40,000 homes and supply hot water to a new 8km district heating network. Spirotech's top control pressurisation system and three 10,000-litre expansion vessels will be key to the optimum functionality of the pipe network, which will handle 1.6 million litres every year.

● Call 02084 513 344 or visit www.spirotech.com

Sleek new profile Elegance 170 goes to the top of the class

Marshall-Tufflex's newly-launched Elegance 170 aluminium profile has scored top marks after proving perfect for a new school in Belfast.

Elegance 170 Aluminium (170x55mm) is hard-wearing, good looking and lightweight, making it a good choice for educational and office projects which require a robust cable management solution with extra mechanical strength and a higher cable capacity.

This new profile builds on the success of Elegance 110 Aluminium (110x55mm) – a smaller dado trunking system with a single cover.

Marshall-Tufflex has produced a brochure giving full details of both Elegance 110 and 170.
● Visit www.marshall-tufflex.com



DIRECTORY Your guide to building services suppliers

Telephone: 020 7880 7633 Email: greg.lee@redactive.co.uk

Air Conditioning

CLIVET
For total solutions in air-conditioning
E: info@clivet-uk.co.uk
W: www.clivet.com
T: 01489 572238
W: www.versatemp.co.uk

Air Conditioning

PAYING TOO MUCH FOR DAIKIN PARTS?
Space Air
DAIKIN
Space Air have been supplying genuine Daikin parts since 1980.
Call now for the best prices and availability!
0333 0069 754
www.spaceair.co.uk

Air Handling

AirCraft
AIR HANDLING LTD
Manufacturer of high quality bespoke AHU's.
Specialists in refurbishment and site assembly projects.
Rapid delivery service available.
Aircraft Air Handling Ltd
Unit 20, Moorfield Ind Est,
Cotes Heath, Stafford, ST21 6QY
Tel: 01782 791545 Fax: 01782 791283
Email: info@aircraftairhandling.com Web: www.aircraftairhandling.com

Energy Efficiency

GROENHOLLAND
Ground Source Heat Pump Installations
Meeting Renewables Targets
Tel: 02392 450889
Fax: 02392 471319
www.groenholland.co.uk

Approved partner
Microgeneration Certification Scheme
Certificate Number MCS 1201 Heat Pumps
BREE GLOBAL LISTED

Ventilation and Air Conditioning

Grilles & Diffusers **Heat Recovery Units** Menerga
Chillers & Heat Pumps
VRF & DX Splits Radiant Heating
Fan Coil Units **Fans** Air Curtains
Fire & Smoke Dampers **Air Handling Units**
Trust systemair.
One Partner - a million possibilities
Email: info@systemair.co.uk
Web: www.systemair.co.uk
Tel: 0121 322 0200



conrad consulting
technical recruitment specialists

further your career

BIM Manager (MEP)

Central London

£50,000-£70,000 Plus Benefits (DOE)

Are you an experienced BIM manager looking for the next stage in your career? We currently have a rare opportunity with an instantly recognisable building services consultancy that has a strong global presence. If you have solid management and BIM skills, as well as a desire to get involved in ground-breaking projects, then please get in touch to find out more!

Associate Mechanical Engineer / Team Manager

City of London / Bank

£70,000 Plus Benefits Package

An international multi-disciplined engineering consultancy has a fantastic opportunity to lead a team of 8 mechanical building services engineers. You will be working on well publicised projects in London and Middle East. This role will place the right candidate in an ideal position for rapid career progression to Directorship.

Senior Mechanical Design Engineer

Croydon, Surrey

£50,000 Plus Benefits Package

A medium sized international building services consultancy are currently looking for a Senior Mechanical Design Engineer to join their award winning team. You will be charged with leading projects within the healthcare, commercial and retail sectors, benefitting from working with some of the most prestigious clients in London and South-East.

Senior Mechanical / Revit Engineer

Central London

£50,000 Plus Benefits Package

An award winning building services consultancy are looking for a Senior Mechanical/ Revit Engineer to join their team. This is a pioneering consultancy who use REVIT MEP extensively and who now require mechanical engineers with experience using this system. Working with some of the most prestigious developers and architects in the world, this is a fantastic opportunity to work on famous projects with the possibility of international travel.

Contract Electrical Design Engineer

King's Cross, London

£35 Per Hour

A building services consultancy is looking for Electrical Engineers on a contract basis. They are seeking experienced engineers to work on a wide selection of varied and interesting projects, including high end residential, commercial and airports. The contract is on-going throughout the duration of 2016, and would be an excellent route to a senior role.

Contract Lead Mechanical Design Engineer

Southwark, London

£45 per hour

A building services consultancy is looking for a lead Mechanical Design Engineer on a contract basis. An experienced engineer, you will work on Data Centre projects across Europe. The ideal candidate must also have a good commercial and industrial engineering background. This is a great opportunity to step up and lead your own team.

Senior Energy Engineer

Birmingham

£35,000-£40,000 Plus Benefits

One of the top building services consultancies in Birmingham would like to appoint a senior engineer to head up their thermal modelling team. Ideally you will possess extensive experience in IES & have the ability to lead a small team, and mentor junior engineers. This role has arisen due to the consultancy winning some of the biggest projects in the Midlands region.

Senior Revit MEP Coordinator

London, Farringdon

£37,500-£47,500 Plus Benefits

A rare and exciting opportunity has become available for an experienced Revit MEP Coordinator to join this established building services consultancy in their modern London offices. With a long list of awards under their belt, this forward thinking company are looking for a technician that is ready to move to the next stage of their career and take the lead on a range of new projects.

Associate Director of Building Services

Cardiff

£55,000-£65,000 Plus Benefits

A forward thinking multi-disciplinary consultancy are looking for an Associate Director to head up and build the team in Cardiff. Technically sound in either a mechanical or electrical bias, you will have a wide spread knowledge of the Cardiff market. This role will allow the candidate to develop the team strategy going forward. You will be responsible for recruitment, proactive business development and forging strong relationships with major clients to continue the success of the last 2 years.

Divisional Director of Building Services

Birmingham

£65,000 Plus Benefits Package

A strong building services design candidate with exceptional experience in business development is required for a strategic appointment within an up and coming multi-disciplinary consultancy. Reporting to the Board, you will be looking to help build the M&E services on offer throughout the Midlands. You will possess a strong skillset in business development covering a range of schemes, and be able to lead a team who can produce well designed sustainable solutions within the built environment.

Find more jobs online at
conradconsulting.co.uk

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

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



beeby anderson recruitment

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

Resident Mechanical Engineer

Netherlands, £300 a day + accommodation, flights & car

This is a great opportunity for a Resident Mechanical Engineer to join a front runner in the Mission Critical sector that have 85 years of bespoke engineering experience. You will be based on site at one of the largest Data Centre developments in the world, managing the client, design teams, and coordinating the mechanical services. BAR2956/GD

Senior Public Health Engineer

Central London, £50k - £60k + benefits

If you are an exceptional Public Health Engineer or aspiring to become one, you could start 2016 working for one of the best known building services consultancies in the UK. Leading PH on large iconic projects and taking ownership with full support of the highest calibre engineers, you'll work across varied sectors with freedom and the backing of a top ten consultancy. BAR3202/AA

Senior/Principal Mechanical Engineer

London, £45 - £70k + benefits

Experienced (8 Years+) Mechanical Engineers are required for a very successful MEP Consultancy that specialise in high profile projects within Leisure, Hospitality, Commercial, Residential, and Finance sectors. This company operates very competitive salary and bonus schemes; and represents a fantastic opportunity for engineers with good all round technical capabilities to join a company that offers the freedom to develop and deliver according to your skillset. BAR3199/CB

Senior Electrical Design Engineer

London, £42p/h

A truly unique building services consultancy with an excellent reputation and consistent repeat business are looking for a Senior Mechanical Design Engineer as a result of increased workload. They operate in the commercial, high end residential, banking, and mission critical sectors. BAR3190/KB

Principal Electrical Engineer

London/Reading, £50 - £55k + benefits

My client is a leading design consultancy with offices across the UK that have been recognized with numerous awards in sustainability. They are looking for a vibrant, career focused, and motivated engineer that has extensive experience of Building Services design. You will work in a client facing role, manage a team, and accept responsibility for successful delivery of projects. In return you will receive excellent pay and rewards including bonus, promotion prospects, and personal development. BAR3146/MO

Mechanical Director

Qatar, 75,000 QAR PCM + package

My client a well established British consultancy, recently established themselves in the Middle East by opening an office in Qatar. They now require a Mechanically bias Director to head up and run the business in the Middle East region. You must have 10 years post degree experience, and ideally you will be a chartered engineer with previous experience in the Middle East. BAR3207/PA

Thinking of your future

www.b-a-r.com



The official magazine of the Chartered Institution of Building Services Engineers

Are you looking for experienced staff?

Then advertise to the professionals.

To reach CIBSE members contact the recruitment team now at **paul.wade@redactive.co.uk** or call on **020 7880 6212**

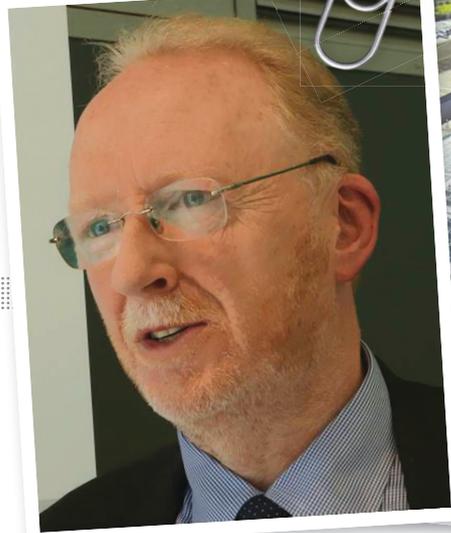


With over **20,000** CIBSE members receiving the **magazine**, **15,000** receiving the **e-newsletter** and over **7,500** unique visitors to the **jobsite**, many companies are successfully filling vacancies with highly qualified candidates using **CIBSE Journal Jobs**.

Our experienced recruitment team will help you all the way giving you the best chance to find **your perfect candidate**.

ZERO-ING IN ON ENERGY SAVING

On its way to achieving a net zero energy business by 2020, Kingspan Insulated Panels has reduced its carbon emissions by almost 50%. **Mark Harris**, divisional building technology director, explains how it was done



Between 2012 and 2014, Kingspan Insulated Panels reduced its carbon emissions by almost 50%, helping parent company Kingspan Group to save 15GWh and add around £727,000 (€1m) to its net profit. More than 34% of the energy used by Kingspan Insulated Panels in 2014 came from renewable sources, while the group's facilities in Sherburn, Holywell and Walsall, in the UK, and Kingscourt, in Ireland, send zero waste to landfill. In 2011, Kingspan committed to becoming a net zero energy business by 2020, and the company is expecting to hit its interim target of 50% this year.

Why were energy efficiency measures undertaken?

The requirement for all new buildings to be nearly net zero energy by 2020, as outlined in the EU's recast Energy Performance Buildings Directive (EPBD) in 2010, was a defining moment for us. It became clear that we needed to address carbon emissions from our facilities. The result was an ambitious commitment to go well beyond the EPBD requirements and make our whole estate net zero energy by 2020, with an interim target of 50% by 2016.

We are also motivated by a desire to demonstrate the business case for investment in both energy efficiency and renewable energy generation to stakeholders across the building sector.

How was energy demand cut?

Our first action was to set up a process to capture energy use and carbon emissions on a monthly basis at each of our 80 sites around the world.

Every site is different, and the optimum energy-saving solution is

Optimum energy saving is often a combination of employee awareness, energy metering, building management systems, and various building and service technologies

often a combination of employee awareness, energy metering, building management systems, and various building and service technologies – for example, lighting upgrades using our ZerO Energy Lighting. The implementation of the ISO 50001 energy management system is also paying dividends at some of our sites.

The economics of energy-saving opportunities are closely studied, and investment decisions are based on economic payback. In addition to funding measures with our own capital expenditure, we have made use of energy performance contracting (EnPC) to reduce energy demand.

Why did Kingspan use EnPC?

We see several benefits of an EnPC: the energy savings are guaranteed; the provider has world-class expertise; the blend of energy efficiency measures allows relatively long payback items to be implemented; and the EnPC – under certain circumstances – can be considered as an off-balance-sheet investment.

To date, we have implemented three EnPCs – at Holywell with Johnson Controls, and Sherburn and Kingscourt with Siemens. Performance is guaranteed by the provider, and savings are assessed annually as part of a formal measurement and verification process. Overall, the projects have involved investment of more than £2m, yielding annual savings in excess of 4,000MWh.

How has zero waste to landfill been achieved?

Setting up specialist teams to manage, monitor and measure waste has been

key. For example, at our biggest site we segregate different waste streams, and work with a materials recovery facility (MRF), achieving a transfer station recycling rate of approximately 80%, with the balance going to refuse delivered fuel (RDF).

We have optimised our production, with all factory-generated waste insulation recycled back into the manufacturing process at our Kingscourt site, in Ireland, which produces our trapezoidal roof panels. These now contain up to 3% recycled content in the insulation, in addition to the 20-25% recycled content in the steel.

We also provide site services to help manage and recycle packaging and product waste on behalf of our customers – big and small.

How will facilities become energy neutral by 2020?

We have a three-step strategy:

- Save more, to minimise energy use by investing in energy efficiency
- Generate more on site, using solar PV and hot water, biomass and wind
- Buy more renewable energy. We aim to procure fully certificated renewable energy as far as possible.

Net zero energy will be achieved through the optimal balance of these stages. We recognise that the renewable energy landscape is evolving rapidly, and are open to new and innovative ways of achieving our goals. Just 5% of the group's energy came from renewable sources in 2011. By 2014, it had risen to 28% and we are on track to exceed our interim target of 50%.

● **MARK HARRIS** is divisional building technology director at Kingspan Insulated Panels

Events & training

NATIONAL EVENTS AND CONFERENCES

CIBSE Technical Symposium 14-15 April 2016, Edinburgh

The 2016 technical symposium will take place at Heriot-Watt University, Edinburgh. Titled 'Integration for whole-life building performance', the symposium will again feature more than 60 papers presented across the two days.
www.cibse.org/symposium

CIBSE Building Performance Conference and Exhibition 2016 17-18 November

Dates for next year's Building Performance Conference and Exhibition have now been announced, with next year's exhibition being twice the size of this year's. Book the dates into your diary now.
www.cibse.org/conference

CPD TRAINING

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

Practical controls for HVAC systems 15 January, London

Energy Building Regulations: Part L 19 January, Exeter

Fire risk assessment to PAS 79 22 January, London

Electrical services explained 26-28 January, London

Mechanical services explained 26-28 January, Birmingham

Air conditioning and cooling systems 27 January, London

Practical project management 28 January, London

Energy efficiency Building Regulations: Part L 29 January, London

Power system harmonics 29 January, London

Lighting design: Principles and application 9 February, London

Fire sprinkler systems design 10 February, London

Building services explained 10-12 February, Manchester

Energy Building Regulations: Part L 11 February, Birmingham

Energy system ISO50001 (ESOS compliant) 12 February, London

Designing water efficient hot and cold supplies 17 February, London

Standby diesel generator 18 February, London

Preparing FM and maintenance contracts 19 February, London

Mechanical services explained 23-25 February, Manchester

Understanding psychometric charts 26 February, London

Emergency lighting to comply with fire safety 26 February, London

ENERGY ASSESSOR TRAINING

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

ESOS training 13 January, Manchester

LCC/EPC training 21-22 January, Leeds

ESOS training 25 January, London

LCC/DEC training 26-28 January, Birmingham

EPC training 3-4 February, London

LCC/DEC training 23-25 February, London

CIBSE GROUPS, REGIONS AND SOCIETIES

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

CIBSE East Midlands Region: Electrical regulations 12 January, Kegworth

CIBSE North East Region Technical meetings: LED truths 12 January, Newcastle upon Tyne

CIBSE West Midlands Region: Human-centric lighting in practice 13 January, Birmingham

SoPHE: Clean technology in the bathroom 14 January, Bristol Talk by TOTO.

SLL lighting for the built environment guide LG10: Daylighting 20 January, London A look at LG10: Daylighting – a guide for designers, by Ruth Kelly Wasket, of De Montfort University.

SoPHE Scotland seminar 20 January, Edinburgh Mechanical valves and systems to combat legionella in hot and cold water systems, by Kemper.

SoPHE: Continuous flow water heating as an innovative method of satisfying regulatory and energy demands 20 January, Manchester Presentation by Chris Goggin and Mike Wheeler, of Rinnai UK.

Daylight Group: LG10: Daylighting 20 January, London www.cibse.org/daylight

SLL lighting masterclass 21 January, Manchester The masterclass series continues, with 'Inside out: Light and architecture'.

CIBSE Southern Region: Energy and building regulations 21 January, Chichester

Ecobuild

8-10 March, ExCel, London



PCRUAGATI / SHUTTERSTOCK

Ecobuild, the exhibition and conference for the sustainable construction and energy markets, returns to ExCel for another year. Visit CIBSE on stand E4190, where it will be hosting one-on-one membership workshops and showcasing its latest projects.

The free-to-attend conference and exhibition will again display the latest products and cutting-edge technology, while delivering a high-level conference and practical seminar programme. Positioned at the centre of the building industry, Ecobuild will focus on the priority markets of housing, infrastructure and technology, with sustainability still at its heart.

The conference will look at short- and long-term growth in the industry, bringing in provocative, educational and inspirational speakers to inspire manufacturers, designers, developers, housebuilders and contractors.

For more information and to register visit www.ecobuild.co.uk

CIBSE HCNW Region: Making a career of it 21 January, London Presentation by CIBSE past president George Adams.

CIBSE East Midlands Region: Renewable energy storage 26 January, Northampton

CIBSE HCNE Region: Commercial kitchen ventilation 26 January, Brentwood

CIBSE West Midlands Region: Underfloor heating – using renewable energy effectively 27 January, Birmingham

Lifts Group: AGM and evening meeting 9 February, Balham

CIBSE East Midlands Region: Utility connections 9 February, Kegworth

CIBSE NE region: BS1 1000 9 February, Newcastle upon Tyne

CIBSE West Midlands Region: Pressure vessels 10 February, Birmingham Presentation on air/dirt removal equipment and balanced pressurisation systems.

Climate-based daylight modelling: The what, the why and the how 10 February, London Talk by Eleonora Brembilla and Professor John Mardaljevic, both from Loughborough University.

CIBSE Southern Region: Water safety management 11 February, Brighton

CIBSE HCNW Region: What still works around here? Disasters recovery 11 February, London John Taylor, previously with the Royal Engineers, now in FM, talks about disaster recovery.



design | construct | perform

08-10 MARCH 2016 EXCEL LONDON

Evolving with the building industry Here's what's NEW for 2016

- New show layout
- 1,000s of innovations from over 800 exhibitors
- The latest thinking at the conference, covering hot topics - Homes, Architecture & Next Generation
- CPD accredited learning hubs - Building Performance, Design, Energy, Infrastructure Revolution, Digital Building and #BuildCircular
- Ground breaking interactive features and product showcases

Register for your **FREE** ticket:
www.ecobuild.co.uk

Co-located with **resource**
THE LEADING EVENT FOR THE CIRCULAR ECONOMY

GOVERNMENT PARTNER:



LEAD PARTNER:



RESEARCH & INNOVATION PARTNER:



LEAD SUPPORTERS:



OFFICIAL CHARITY:



ORGANISED BY:



ECOBUILD IS ISO 20121 SUSTAINABLE EVENT MANAGEMENT SYSTEM CERTIFIED

CMR

in complete control

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

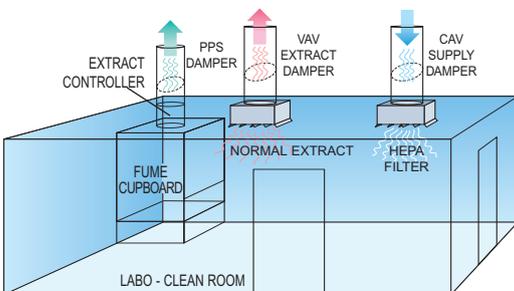


DPM PRESSURE SENSOR

Panel Mount Pressure or Velocity Transducers with remote alarms, analogue and digital interfaces. Traceable calibration certificates supplied as standard.

AIR MANAGEMENT SYSTEM

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



DPC CONTROLLER

Fast and accurate controls to drive high speed dampers or invertors. Full PID stand alone controls with BMS interface.

CAV AND VAV DAMPERS

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



Metal Damper

PPS EXTRACT DAMPER

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



PPS Damper

PRECISION COMPONENTS FOR VENTILATION AND PROCESS CONTROL

CMR CONTROLS

A Division of C. M. RICHTER (EUROPE) LTD

22 Repton Court, Repton Close,
Basildon, Essex SS13 1LN. GB
Website: <http://www.cmr.co.uk>

Tel: +44 (0)1268 287222
Fax: +44 (0)1268 287099
E-mail: sales@cmr.co.uk

