

CIBSE

JOURNAL



The official magazine of the Chartered Institution of Building Services Engineers

October 2013

FUTURE GLAZING

How building physics dictated the design at Siemens' cutting-edge Crystal

CUTTING CARBS

Award-winning research pinpoints energy waste in pub kitchens



The **M&E** **BELOW**

The importance of services design
on a Royal Navy nuclear submarine

Available now!

Why Vaillant?

Because with outputs ranging from 80kW to 120kW and cascades of up to 960kW, our new wall hung commercial boiler is the face of 2013.



Models:

Wall hung boilers
80, 100, 120kW
Stainless steel heat exchanger

Cascade rigs:

Wall to wall
Back to back
L-shaped
Full pipework and insulation
Cascade flues
Low loss header

Integrated in the boiler or separate as an accessory:

Modulating shunt pump
Isolation valves
Pressure safety valve
Gas isolation valve

Controls:

Compatible with Vaillant controls
Compatible with BMS systems
Boiler management system VRC630
Boiler and solar integrated management system VRS620

For more information or to contact your local business manager please call **0870 240 7545** or visit www.vaillantcommercial.co.uk

■ Heating ■ Hot Water ■ Renewables



Because  **Vaillant** thinks ahead.

Contents

NEWS

7 News

Industry urged to learn lessons from 'Walkie Scorchie'; authorities zero-in on projects missing CE marks; top graduates make New York shortlist

14 CIBSE News

Inaugural building façade competition opens; six make shortlist for CIBSE Employer of the Year award; showcasing passive potential

OPINION

16 Feedback

LinkedIn members discuss whether modelling could have prevented London's controversial Walkie Talkie building hitting the headlines

17 Renewable heat

Hywel Davies examines government plans to extend the Renewable Heat Incentive

18 Nearer to zero?

Chris Twinn argues that China is beating the West when it comes to zero carbon buildings



Hotel and leisure special

39 CIBSE turns the spotlight on the hotel and leisure industry: Mitchells & Butlers' research could be the key to slashing costs across the industry; a new scheme is helping a top London hotel make substantial savings; the energy centre at Center Parcs' latest venture is saving time and money by being manufactured off-site; and advice on keeping fish cool and comfortable in a large aquarium

32



Features

22 The silent service

How service engineers keep the Royal Navy's fleet of submarines safe to operate and live in

28 Multiple choice

A look at the worldwide array of environmental certification systems on offer to developers

32 Glass act

How The Crystal building in east London became the first in the world to achieve the highest possible BREEAM and LEED ratings

60 Something in the water

How the updated TM13 will help minimise the risks of a legionnaire's disease outbreak

65 Way to flow

Innovative design tools and pumping technology can give substantial savings in energy consumption

68 Keep it clean

A recently published British Standard looks set to disperse the cloud of confusion surrounding the issue of cleanliness in ductwork

LEARNING

71 CPD

Application of variable volume fume cupboards

CLASSIFIED

76 Products

A round-up of gadgets and services for the industry

82 Directory

A guide to suppliers

PEOPLE AND JOBS

83 Appointments

Jobs at jobs.cibsejournal.com

85 Change agent: Munish Datta

M&S' Plan A for sustainability

86 Looking ahead

CIBSE Annual Lecture and Seminar

Nine models from
200-900kW

Energy efficiency
in condensing operation
up to 109%

Wide
modulation
range 1:40

Low NOx <31ppm

Low operating
noise level
<49dBA

Compact with
excellent power
to weight ratio



NEW ARES Tec

High output modular condensing boilers

With their clever modular design, ARES Tec boilers deliver an impressive array of benefits for all project stakeholders.

Available in a choice of outputs up to 900kW, each model is made up of a series of self-contained heat generating modules.

Capable of running concurrently at very low loads, these modules enable the boilers to match output to actual demand with exceptional precision and speed, achieving outstanding levels of energy efficiency in the process.

ARES Tec boilers have all the benefits of a cascaded boiler system – including the ability for each heating module to operate independently – but in a single integrated unit.

For more information, call us on 0844 871 8760
or visit www.alpha-innovation.co.uk

Alpha
HEATING INNOVATION





www.cibsejournal.com

Editorial

Editor: Alex Smith
Tel: 01223 273520
Email: asmith@cibsejournal.com
Deputy editor: Carina Bailey
Tel: 01223 273521
Email: cbailey@cibsejournal.com
Senior designer: Kevin Reed
Technical editor: Tim Dwyer

Advertisement sales

Sales manager: Jim Folley
Tel: 020 7324 2786, jim.folley@redactive.co.uk
Sales consultant: Mark Palmer, Tel: 020 7324 2785, mark.palmer@redactive.co.uk
Sales executive: Darren Hale
Tel: 020 7880 6206, darren.hale@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

Publishing co-ordinator: Neil Walsh
Tel: 020 8772 3696, nwalsh@cibse.org

Editorial advisory panel

George Adams, engineering director, Spie Matthew Hall
Patrick Conaghan, partner, Hoare Lea Consulting Engineers
Rowan Crowley, director, insidetrack
James Fisher, e3 consultant, FläktWoods
David Hughes, consultant
Philip King, director, Hilson Moran
Nick Mead, group technical director, Imtech Technical Services
Jonathan Page, building services consultant engineer, MLM
Dave Pitman, director, Arup
Christopher Pountney, senior engineer, Aecom
Alan Tulla, independent lighting consultant
Ced 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) 1223 477411. 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 1759-845X

Subscription enquiries

If you are not a CIBSE member but would like to receive *CIBSE Journal*, subscribe now! Costs are £30 (UK) and £100 (international). For subscription enquiries, and any change of address information, please contact Neil Walsh at nwalsh@cibse.org or telephone +44 (0)20 8772 3696. Individual copies are also available at a cost of £7 per copy plus postage.

The 2013 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.

ABC audited circulation:
18,558 January to
December 2012



Feeling the heat

It's not often a story about façade modelling sits at the top of the 'most read' column on the BBC website. But that was the case with 20 Fenchurch Street, aka the Walkie Talkie, when it was reported that glare from its glass façade had melted the bodywork of a parked Jaguar on the street below.

It appears that the full consequences of the unusual 'popcorn bucket'-shaped design had not been foreseen, other than by a CGI expert in the film industry who had created a 'five-minute' model a year ago showing how the façade had concentrated the sun's rays on the street below (see the @CIBSEJournal Twitter feed).

Ant Wilson, the co-founder of the Society of Façade Engineering, says the issue is a wake-up call for industry (page 7). He said there were no protocols for modelling the extreme consequences of reflection and called on planners to consider the impact of buildings on the surroundings.

The most illuminating discussions on the topic can be found on the CIBSE LinkedIn pages, where engineering experts have been debating the issue (page 16).

The Walkie Talkie is an extreme metaphor for the consequences of climate change and the challenges facing engineers in cities

as they attempt to mitigate against rising temperatures while attempting to maximise return on investment for clients.

Soaring temperatures as a result of climate change are only going to get worse, a fact that has been recognised by Chinese policy-makers who are encouraging the concept of zero-carbon buildings at 'zero extra cost' (page 18).

Arup associate director Chris Twinn has been working in China and says that the UK can learn lessons from their approach, which embraces innovation and Western best practice.

Building modelling is part of the solution, as demonstrated at The Crystal (page 32) in London Docklands. Here, Arup used modelling to angle the glass façade so as not to cause excessive solar gain. It meant that the architect's vision of a modern-day crystal palace could still be realised, while delivering a low-energy building.

There is no such thing as a performance gap on a nuclear submarine. Any deficiencies in the design, installation and operation of the building services can have catastrophic consequences. See how naval designer Keith Bate (page 22) ensures the comfort and safety of submariners in possibly the most challenging building services projects on the planet...

Alex Smith, editor
asmith@cibsejournal.com



The Renewable Solutions Provider
Making a World of Difference

Renewable heating solutions designed to meet the needs of the community

Mitsubishi Electric's Ecodan heat pumps are specifically designed for community heating schemes or any commercial building that requires space or water heating.

Using proven heat pump technology to deliver effective, low carbon heating, our Ecodan systems provide a simple, renewable solution that rivals traditional heating systems.

- Centralised or Decentralised solutions to help achieve renewable energy targets
- Capable of reducing running costs and CO₂ emissions
- Easy to design, install and maintain
- Fully scalable and can work independently or in conjunction with other systems
- Optimised systems from 5kW to 688kW
- MCS approved



Certificate Number: MCS HP0002
Product Reference: CAHV-P500YA-HPB,
PUHZ-W50VHA-(BS), PUHZ-W85VHA2-(BS),
PUHZ-HW140VHA2/YHA2-(BS)



For more information please call: **01707 282880**
email: heating@meuk.mee.com or visit:
www.heating.mitsubishielectric.co.uk



Air Conditioning | Heating
Ventilation | Controls

ecodan[®]
Renewable Heating Technology

In brief

AIREDALE HIT BY FIRE

Following a fire at Airedale International Air Conditioning's site in Leeds, the UK manufacturer says it expects production to be back to normal by the new year.

The most critical areas of Airedale's factory were reported to be relatively unscathed, and production of its precision IT cooling range could start up again within four to six weeks. An investigation was under way to determine how the fire started.

'Full production is expected to be back to normal within two to three months and we will be looking to deliver orders by 2 January 2014,' said managing director Clive Parkman.

All members of Airedale's 300+ Leeds-based workforce were accounted for, and said to be keen to get back to work as quickly as possible. The company said there would be no job losses as a direct result of the fire.

FMS STILL CONFUSED ABOUT BIM

Most facilities managers believe building information modelling (BIM) will make their lives easier, but only a few understand how.

This was the finding of a survey carried out by the BIM4FM group, which was set up to champion the involvement of FM with BIM and Government Soft Landings (GSL) projects.

Although 65% of respondents said they had heard of BIM, only 23.5% said they would use it. However, the surprise finding was that 26.5% claimed already to have used BIM on a project.

SOLUTION FOR THE SHARD

Frese has won a £135,000 contract to supply the luxury Shangri-La Hotel at The Shard, London Bridge, with 800 of its dynamic pressure independent control valves. The hotel is situated inside the spire of Europe's highest building, from floors 34 to 52. The valves, which were specified by Briggs & Forrester, are designed to ensure the hydraulic balance of the piping and offer precise temperature control for both heating and cooling.



AMER GHAZAL / DEMOTIX / PRESS ASSOCIATION IMAGES

Industry urged to learn lessons from 'Walkie Scorchie'

● Value engineering can have unforeseen impacts, warns CIBSE façade expert

The building engineering industry needs to learn the lessons from the melted car incident outside the so-called 'Walkie Talkie' building, according to a leading façade engineer.

The distinctive shape of the new 37-storey building at 20 Fenchurch Street, close to the heart of the City of London, was blamed for directing the heat of the sun onto a parked Jaguar, causing parts of the bodywork to melt. However, Ant Wilson thinks it would have been hard for the modellers to anticipate such an eventuality.

'There are no protocols for modelling this,' said Wilson, co-founder and first chairman of the Society of Façade Engineering. 'It is easy to apportion blame in retrospect, but normally the engineering team will only model a façade for certain things like thermal and sustainability values.'

However, he urged the industry to regard this incident as a 'wake-up call' and urged planners to have more consideration for the possible impact of

a new building on its surroundings.

The architect Rafael Viñoly claimed he had anticipated problems and his original design had included sun louvres on the building's south-facing façade, but that these had been removed to save money. A hotel designed by the same architect in Las Vegas had a similar problem, which reportedly led to sunbathers by its swimming pool receiving a rather more intensive suntan than expected.

'We need to look again at how we model for the impact of reflected light'

'Value engineering can often have an unforeseen impact,' added Wilson. 'For example, they may have modelled for a less-reflective type of glass than was actually installed. Ironically, the shape of this building looks ideal for reducing solar gain so would probably

score highly on a thermal model.

'We need to learn from this and look again at how we model for the impact of reflected light from buildings at various angles of the sun at different times of year,' said Wilson.

Netting has been erected on scaffolding in front of the offending part of the building and the developers, Land Securities and Canary Wharf Group, say they are working on a long-term solution.

● See page 16 for CIBSE LinkedIn discussion

Fund aims to cut cost of energy efficient building

The government is to spend £75m over the next five years developing more energy efficient building techniques for homes in a bid to make them cheaper to build and refurbish.

Currently, it costs around £35,000 to completely overhaul a home to improve its energy performance, and the Technology Strategy Board (TSB) aims to reduce that by about half.

The TSB receives £60m government funding, which is matched by investment from the industry; an additional £30m is expected to be provided in the coming five years.

The head of the Low Impact Buildings Innovation Programme, Ian Meikle, said the money for housing would be shared equally between retrofit and new build.

'With the previous round of funding, we were developing energy-saving technology for homes on an individual level, and our business case for the next round of funding was to scale it up,' he said. 'Going forward, we've got to halve the cost of deep retrofit from about £35,000 to a more affordable £15,000 - £20,000. If people are going to spend that much money, we need to ensure the quality is getting delivered.'

Mr Meikle said over the last five years they did this on individual buildings, but the challenge for the next five years is to do it 'to the scale of a whole housing estate'.

'We want to help develop the technology so that every developer is building Code 6 homes on every site,' he said.

Davey backs shale exploration

Secretary of State for the Environment, Edward Davey, has said the government would support the 'safe and responsible' exploration of shale gas in the UK. He claimed 'economically viable' and 'environmentally friendly' development would benefit the UK and have a lower carbon footprint than coal or imported liquified natural gas.

Authorities zero in on projects missing CE marks

● Manufacturers scrambling to catch up with legislation

Building control and trading standards officers are tightening the screws on projects using equipment that doesn't comply with new CE marking legislation.

On 1 July it became compulsory for many products used in building services systems to carry a CE mark, following the implementation of the European Construction Products Regulation (CPR). As a result, end users could be forced to remove any equipment not properly tested and accredited.

Products subject to CE marking include: flues, chimneys and fittings; heat and smoke extraction fans; fire and smoke dampers; fire-rated ductwork systems; radiators and heat emitters. Third-party testing, certification, factory testing and audit trails are required.

Manufacturers report that contractors are increasingly aware of the requirement and are asking suppliers to provide the evidence of testing and certification. Building control officers are carrying out on-site checks; and trading standards is charged with prosecuting suppliers



DIMITRY KALINOSKIY / SHUTTERSTOCK

who fail to comply with the new law.

'The mandatory use of CE marks should be welcomed by specifiers and their suppliers, as it will help to improve the quality of products used across the construction and building services industry,' said David Fitzpatrick, chairman of the CIBSE CE Marking working party.

'Robust policing is welcome because it creates a level playing field and makes it hard for suppliers to place non-compliant products on the market,' added Fitzpatrick.

Many UK manufacturers are scrambling to catch up, because the original EU CE marking Directive was not mandatory and was not adopted by the UK or Ireland – giving continental firms a head start.

'We are fortunate that our parent company is based in France,' said Kerry Jones, director of smoke control and ventilation manufacturer Adexsi UK. 'This means that every product we supply in the UK [is] already fully tested and CE marked.'

'It is clear that specifiers want to ensure they are protected from non-compliant products that could undermine their whole building operating strategy – not to mention leaving their clients with potential legal problems.'

CIBSE formed the working party to show support for a new initiative it believes 'will raise standards, particularly in life safety applications and installations,' said technical director Hywel Davies.

Europe publishes new heating rules

Tough new energy-efficiency standards for boilers and water heaters have been welcomed by manufacturers.

The ecodesign and energy labelling regulations – due to be implemented by EU member states by 2015 – are designed to cut carbon dioxide emissions from space heating systems by about 100 million tonnes, and from water heating by 26m tonnes.

The Association of the European Heating Industry (EHI) said it welcomed last month's publication of the detailed measures that will be used to achieve these savings, which include a package label for combining space heaters with solar thermal devices and/or temperature controls.

'The industry strongly believes that the largest potential for improving the energy consumption of buildings lies in the replacement of the vast majority of old and less efficient heating equipment, with new

generation systems,' said a statement from the EHI, which represents European manufacturers and trade associations.

David Pepper, managing director of boiler and water heater manufacturer Lochinvar, added that the new labels would be an important step forward.

'The industry has already made major strides in improving the energy efficiency of individual appliances – the big future savings are going to come from measuring the performance of complete systems.'

'The new labelling system will require design engineers to look at how all the components of a system interact, and how renewables integrate with conventional heating products. This will be very challenging, but essential,' added Pepper, who is also chairman of the ICOM Energy Association boiler and water heater group.

'The big future savings are going to come from measuring the performance of complete systems'

Top graduates make New York shortlist

Ten top young engineers have been shortlisted for this year's CIBSE ASHRAE Graduate of the Year award. This is the largest group of finalists for this prestigious industry prize in more than a decade.

Six companies have also been shortlisted for this year's CIBSE Employer of the Year award (see page 14).

The awards highlight the talent available to engineering employers, while demonstrating the importance of providing young engineers with opportunities to advance their careers.

Both awards comprise the CIBSE Young Engineers' Awards, which will be presented at the Institution of Mechanical Engineers on 9 October.

'It is very exciting to have such an impressive line-up for

this year's awards,' said chairman of judges Tim Dwyer.

'The Graduate of the Year shortlisting panel had a very difficult job because of the large number of excellent entries. So, while we are delighted with the final line-up, we must commiserate with the unsuccessful candidates, all of whom displayed talent and passion for our industry. The future is clearly in good hands.'

The winning graduate's prize will include a trip to New York City from 18-22 January 2014 to attend the ASHRAE Winter Conference, where the key focus will be on the design, development and operation of tall buildings.

The October awards event is free to attend, but requires registration in advance.

For more information, visit:
www.cibse.org/YEA2013



1



2



3



4



5



6



7



8

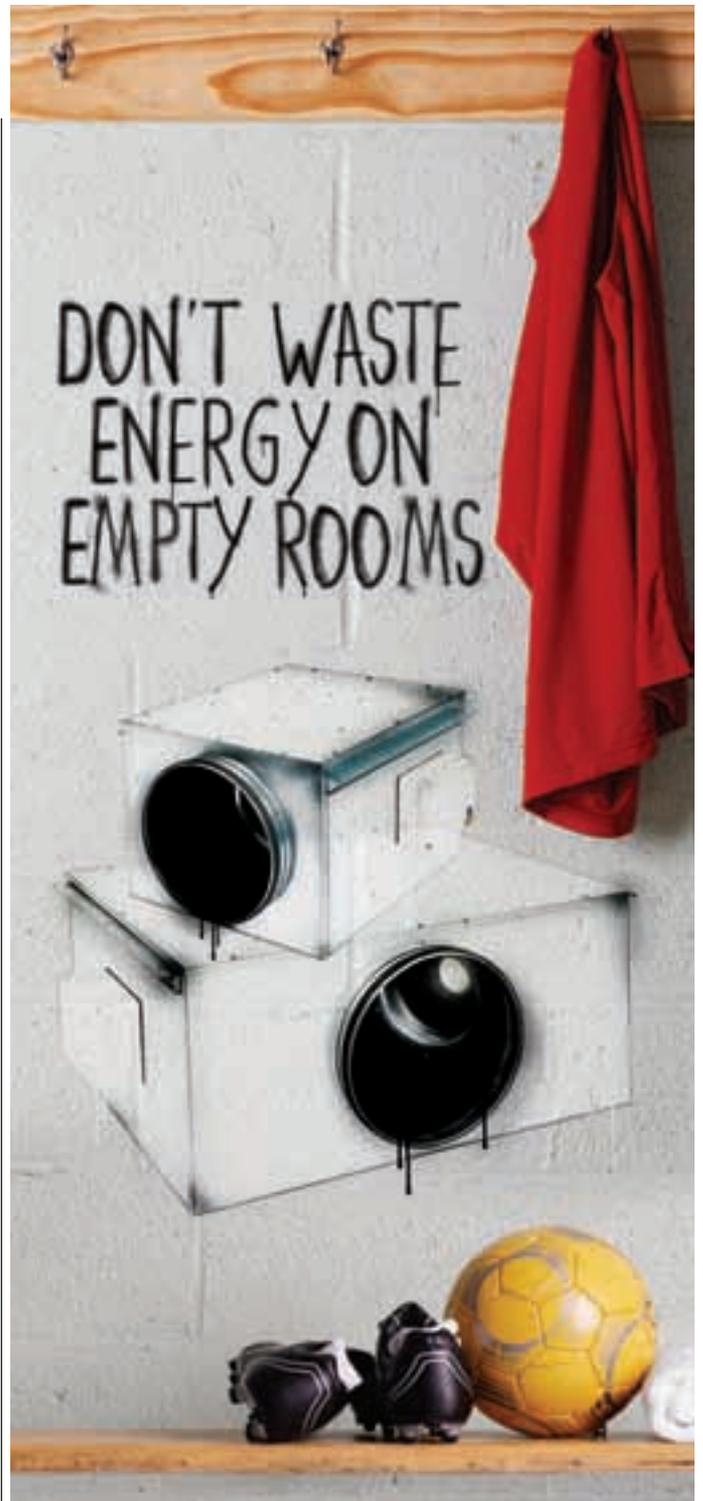


9



10

Those on the shortlist are: 1 Carla Bartholomew, UWE and AECOM; 2 Bonnie Brooks, London South Bank Uni. and URS; 3 Sandra Camacho, Loughborough Uni. and Colombia Green Building Council; 4 Kathryn Dryden, Sheffield Uni. and Atkins; 5 William Holley, Nottingham Uni. and Buro Happold; 6 Elinor Huggett, UCL and Max Fordham; 7 John Hughes, University of Ulster and Semple and McKillop; 8 Chris Iddon, Loughborough Uni. and SE Controls; 9 Kayley Lockhead, Leeds Metropolitan Uni. and NG Bailey; 10 Emily Woodhouse, Cambridge Uni. and AECOM.



VARIATION IN VENTILATION.

At **Elta Fans**, we understand the principle behind **Demand Control Ventilation (DCV)** to ensure your building is ventilated effectively according to occupancy levels and carrying ambient conditions, thereby minimising energy wastage, whilst maximising indoor air quality.

This is achieved by using different sensors which provide an almost infinite amount of possible variation to the ventilation system; matching, almost identically, the level of occupation within the area to be ventilated.

For more information contact Elta Fans on **+44 (0) 1384 275800**.



DEMAND CONTROL VENTILATION
demandcontrolventilation.com

Biomass facing funding test

Users of biomass plant will need to meet new sustainability criteria or face losing their funding from the Renewables Obligation (RO), the government has announced.

From April 2015, they will have to show that the biomass comes from a sustainably harvested source; its suppliers are meeting biodiversity protection rules; and that there has been no infringement of land use rights in the production of the fuel.

The government says this is an important element in its bid to ensure that biomass-generated electricity reduces greenhouse gas emissions by 70%, compared to fossil fuel alternatives.

Greg Barker, Minister of State for Energy and Climate Change, said the new criteria 'will provide the necessary investor certainty and, crucially, ensure that the biomass is delivered in a transparent and sustainable way'.

All generators of 1 Megawatt (MW) capacity or more, using solid biomass or biogas feedstock, will be required to demonstrate that they are meeting the criteria in order to claim support under the RO. This applies to around 98% of biomass power generation in the UK.

Generators of 1MW capacity and above will also have to produce an independent audit with their annual sustainability report, the Department for Energy and Climate Change added. It also said that, in order to 'provide the certainty that investors and developers need, there will be no further unilateral changes to the sustainability criteria before April 2027'.

No cut in RHI tariffs imminent

● RHI escapes payments cut as criteria change

Renewable Heat Incentive (RHI) projects have narrowly avoided a cut in payments, according to the Department for Energy and Climate Change (DECC).

The 'quarterly degeneration' statement for the non-domestic RHI scheme, published at the end of August, forecast that £59.3 million would be spent in tariffs during the coming year. As this is £0.8m below the 50% trigger level of £60.1m that would trigger a cut

in tariffs, DECC said there was no need to make a change.

However, it did say it had identified some 'discrepancies' in the scheme that would be addressed by a review next spring.

DECC also announced a simplification of the metering requirements so that only the minimum number of meters necessary to calculate the RHI payment will be required. It will also allow heat loss from external pipework to be disregarded in some circumstances.

In addition, applicants who can prove it is 'either physically or

financially overly burdensome to install a heat meter' will be allowed to submit a heat loss calculation instead.

Other changes to the criteria, in force from September, include an allowance, in certain circumstances, for heat to be used for processes other than in a building. This allows accredited installations to be relocated, provided the installation meets the necessary requirements at its new location, and allows installations that were used by an installer to gain their MCS accreditation to be eligible for the RHI.

Renewables use leaps in US

Americans used more natural gas, solar panels and wind turbines and less coal to generate electricity in 2012, according to the researchers at the Lawrence Livermore National Laboratory (LLNL).

Natural gas use is up, particularly in the electricity generation sector, where it has effectively replaced coal, while sustained low natural gas prices have prompted a shift from coal to gas in the electricity generating sector, according to the lab's latest energy flow charts that track the nation's consumption of energy resources.

The rise in renewables is tied to price, with the underlying cost of solar panels and wind turbines falling; and policy decisions such as government incentives or renewable energy targets in various US states.

Wind power saw the highest gains, but solar power also expanded due to dramatic falls in the price of photovoltaic panels, caused by a global oversupply, according to the study.

The LLNL team said it was the first year in at least a decade where there has been a measurable



SPRING OF AMERICA / SHUTTERSTOCK

decrease in nuclear energy, adding that it was likely to be a permanent trend as nuclear capacity was taken off stream.

Overall, energy use in the residential, commercial and transportation sectors decreased, while industrial energy use increased slightly, the team added.

nbs Create

NBS

provides the most up-to-date specification software for Building Services Engineers

- Technical content updated regularly and automatically
- Produce outline, performance and full specifications
- Links to CAD via NBS Plug-ins, including Autodesk® Revit®
- Export to COBie format
- Level 2 BIM compliant.

To find out more call 0845 456 9594 or visit theNBS.com/service

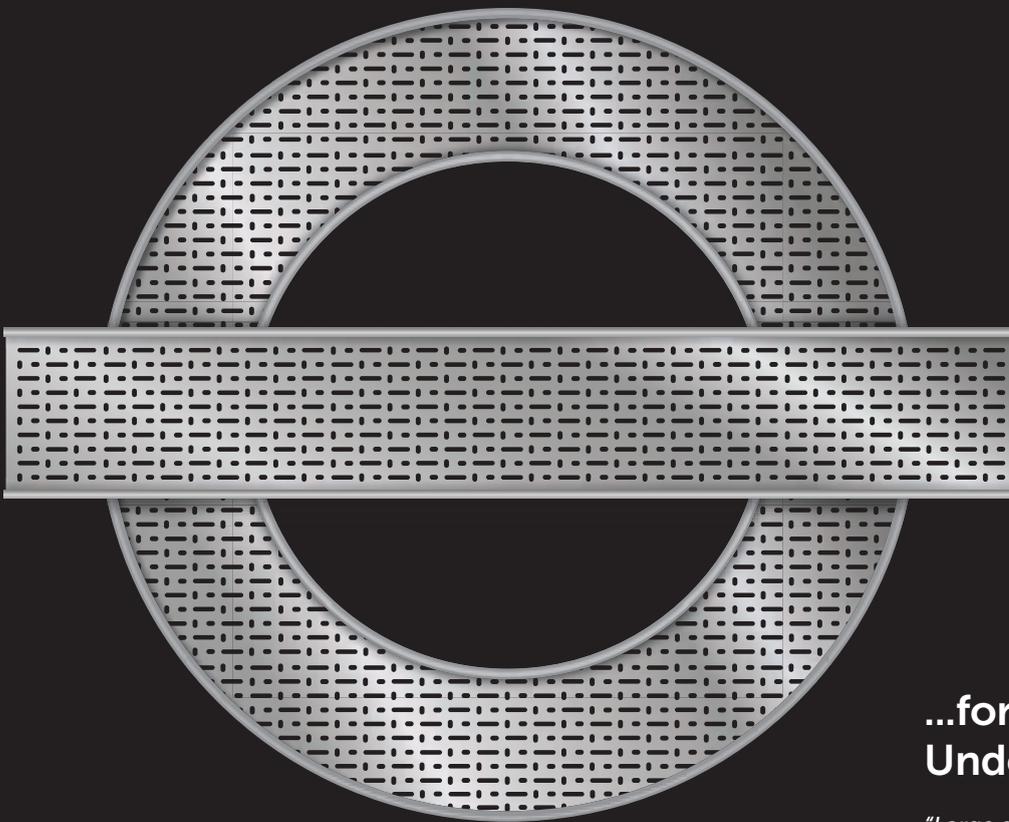
theNBS.com/service



A cable management solution that provided the perfect platform...

 www.metsec.com/cj1

- **Fully accredited** wide range of products from Metsec Cable Management, formerly Metstrut, includes London Underground approval and BES 6001.
- **Availability** and great service are a direct result of our local manufacturing.
- **Quality** of our products supports health & safety demands.
- **Technical support** is drawn from expertise across Metsec and our parent company.



...for Canary Wharf Underground Station

"Large sections of this project must be installed to London Underground LU1085 standards. Therefore choosing a supplier with London Underground approval was essential."

David Raine, Briggs & Forrester

Long, slow haul ahead warns Bisset

The industry is benefiting from increased confidence, investment and workloads, but recovery remains a 'long, slow haul', according to Bruce Bisset, president of the Building & Engineering Services Association (B&ES).

Speaking at this year's B&ES President's Luncheon, Bisset said he was happy to be 'just a wee bit more optimistic than my recent predecessors could manage', but warned that some of the signs of recovery were 'fragile'. He predicted a more significant pick-up in construction activity during the first half of 2014.

He also urged building services firms to adapt their working practices to be 'fit for the challenges presented by the emergence of new technologies, and the requirement for enhanced technical and managerial skills'. He particularly pointed to the wider use of Building Information Modelling (BIM), which will become mandatory on public-sector contracts in less than three years' time.

'We must continue to review the shape and structure of the workforce, to ensure that it remains fully in line with the needs of our industry and our clients,' Bisset said. 'We must play our full part in the implementation of the Industrial Strategy for Construction, which sets extremely challenging targets in terms of cost reduction, project timescales and the minimisation of greenhouse gas emissions.'

'And we must do everything we can in every other area to assist government in meeting its economic, commercial and environmental objectives.'

These would be achieved by supplying advice, guidance and good counsel, he added.



NEW STREET, NEW LIGHTING

Wieland Electric has supplied connectors, radio-controlled switching devices, automation and pluggable distribution boxes as part of a new lighting system for the concourse at Birmingham New Street station, which was the subject of a three-year regeneration project to improve accessibility and aesthetics

UK construction costs hold steady

● Manufacturers scrambling to catch up with legislation

Construction costs in the UK remained at a stable level last year, despite increases elsewhere in Europe, according to the 2013 *International Construction Costs Report* from consultancy EC Harris.

The annual study, which benchmarks building costs in 47 countries, found that relative construction costs have been affected by substantial fluctuations in currency.

Although building costs have fallen in the UK over the past 12 months, the UK has maintained its position in the rankings due to a combination of the weaker pound and inflation in some European markets.

The cheapest locations to build are India, Indonesia and Vietnam, where construction costs are 30-40% of levels in the UK. Five of the top-10 most expensive markets are in Europe and costs in Belgium,

France, Sweden and Denmark have increased by 3-4%.

The top-10 most expensive countries to build in are: Hong Kong; Switzerland; Denmark; Sweden; Macau; Australia; Japan; France; Singapore; and Belgium.

Inflation of 7-9% during 2012 was the significant issue in Hong Kong, but its construction market has remained buoyant through the delivery of infrastructure and new commercial and residential space in previously industrial areas. Output grew by 15% in real terms in 2012, triggering significant cost inflation.

The fall of the Yen against world currencies and the weakening of the Australian Dollar caused substantial fluctuations in relative construction costs. The most significant movement has been the 5% appreciation of the Chinese Yuan. Not only has this contributed to China moving up the construction costs rankings, it will also make Chinese imported materials to the UK and

other developed markets more expensive, the report said.

Simon Rawlinson, head of strategic research and insight at EC Harris, warned there could be a knock-on effect in the UK in 2014 if the construction recovery takes hold, 'with more expensive imported materials contributing to the potential for inflation in UK construction markets'.

Since 2011 the price of metals has fallen progressively, despite increasing after January 2009, because of increased demand in the BRIC countries and the high volumes of commodities trading.

'Some forecasters are predicting an end of the "commodities super cycle" and claim that commodities have already entered a sustained period of below trend price growth,' said Rawlinson.

'This development will be of huge importance for low-cost construction economies, where material costs are a more significant component of project costs.'

Movers and makers

Send your job moves to
editor@cibsejournal.com



Gareth Rodwell has moved to hurleypalmerflatt as associate director, after 13 years at BDP, where he was associate environmental engineer.



Joanna Robinson has been appointed managing director at Yorkshire-based manufacturer Mansfield Pollard, after 13 years at the firm.



Huw Blackwell has moved from Hoare Lea to Islington Council, where he will project-manage the second phase of the Bunhill district heating extension.

We're on top.



Introducing our DVM S VRF.

The DVM S provides world-class energy efficiency while giving you powerful, quick cooling and heating with minimum energy consumption. What's more it has the longest piping length in its class, enabling the utmost flexibility for numerous applications.

www.samsung.com/uk/dvms

SAMSUNG

Six of the best make shortlist

Six companies have been shortlisted for this year's CIBSE Employer of the Year award.

The award, sponsored by Daikin, Lochinvar and Ruskin Air Management, will be presented on 9 October at the Institution of Mechanical Engineers (IMechE). The employer prize is part of the CIBSE Young Engineers' Awards, along with the CIBSE ASHRAE Graduate of the Year competition.

Entries were invited from small, medium and large employers and two candidates have been selected in each category: Small employer - Avoca and Energy Excel; Medium employer - Couch Perry Wilkes and Max Fordham; and Large employer - Grontmij and Hoare Lea.

One winner will be chosen in each category and the judges will also select an overall winner to be crowned CIBSE Employer of the Year 2013.

During the event, the IMechE Construction and Building Services Division award will be presented, along with the annual ASHRAE Presidential Lecture by Bill Bahnfleth.

Chairman of the judges, David Fitzpatrick, said: 'The standard of submissions was very high and we were delighted to see a number of companies taking part for the first time.'

For more information visit www.cibse.org/YEA2013

Inaugural building façade competition opens

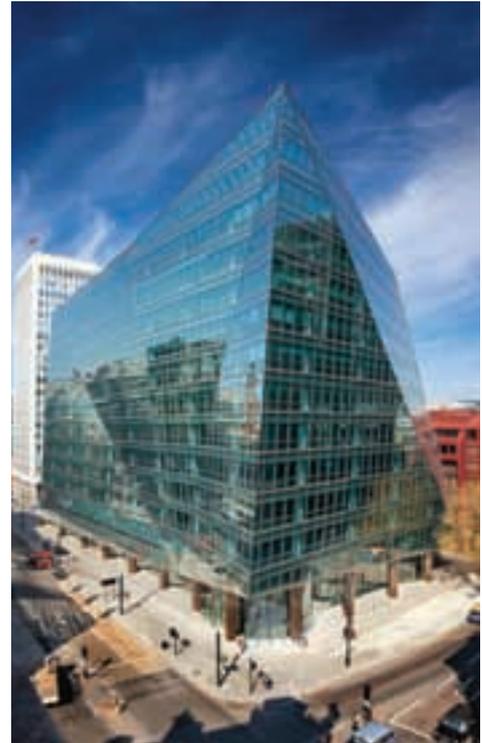
● Project entries for FAÇADE2013 must be submitted by 1 November 2013

To celebrate its 10th anniversary, the Society of Façade Engineering (SFE) has announced the launch of FAÇADE2013, an international competition designed to recognise, promote and reward excellence in this key element of building design and construction.

The prize will be awarded on a project basis, with entries welcome from individuals, project teams and companies from around the world. The winner will be decided by a panel of experts who will make their choice based on a clear demonstration of excellence in the technical design and/or research that has made a significant contribution to the discipline of façade engineering. The contribution may be demonstrated in the form of technical advances, innovations or advanced engineering systems that result in practical design solutions for the completion of a project.

Chairman of the judging panel Chris Macey said: 'Many of the demands for ever-higher building performance can only be met by proper consideration of the contribution of façades, while also satisfying the aesthetic vision of the client and design team... This competition is intended to recognise and reward excellence in this key area of building design and execution, and we welcome entries from anyone involved in this key niche.'

The winner will be announced on 20 November at The Glass Supper, an annual event attended by architects, engineers and others involved with the discipline of high-performance architectural façades. The award will be presented by architect Daniel Libeskind.



FAÇADE2013 entries are open now and must be received by 1 November 2013.

SFE has strong links with IStructE and RIBA and has published a number of technical memorandums in its first ten years. For a history of the group by co-founder Ant Wilson read this story at www.cibsejournal.com

To enter the FAÇADE2013 competition, visit www.sfecompetition.org

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



NVG showcases passive potential at design seminar

Speakers at Natural Ventilation Group event looked at passive response to climate change

Maintaining building occupant health and comfort in an energy-efficient way can be aided by passive design, according to experts at the Passive Building Technology in Practice seminar, organised by the Natural Ventilation Group (NVG).

The scene was set by Sue Roaf, detailing the need to move from cheap 20th-century energy approaches to using ambient energy for the 21st. Roaf said that building fabric and technology must work with occupants and surroundings to deliver efficient systems compatible with low-carbon energy supplies.

Matt Santamouris and Denia Kolokotsa presented the latest developments in 'cool' materials, which can mitigate the requirement for air conditioning, while combating wider heat island effects. Often appearing the same as conventional materials, these alternatives

are highly reflective in the infra-red band, significantly reducing external surface temperatures.

Brian Ford took a step back to look at empirical traditions in building construction from centuries past, illustrating their robust solutions to natural ventilation and cooling. Modern examples, using evaporative driven airflow, were also showcased from

Nottingham University's Solar decathlon house.

Michael Hutchins and Paul Littlefair looked at complementary requirements of the building form for effective daylighting and natural ventilation. They said integrating complex glazing systems in a way that blocks glare and heat gain requires much care.

In conclusion, the seminar demonstrated that new technology continues to support efforts to harmonise the built and natural environment; however, much may still be learned from traditional architecture pre-dating the energy glut.

For more information on the CIBSE Natural Ventilation Group, visit www.cibse.org/nvg



ZHU DIFENG / SHUTTERSTOCK.COM

Become a Tech Symposium referee

The CIBSE ASHRAE Technical Symposium will shortly commission around 50 authors to submit papers, all of which will need to be peer reviewed. The institution is now seeking volunteers to act as referees.

Any members or Fellows who are willing to review papers should get in touch, providing a few sentences about the practical areas of your technical expertise.

As well as helping to ensure the papers presented are of a high standard, it will give referees a chance to find out about some of the developments that will be presented at the event. If you are interested in helping, email groups@cibse.org

The CIBSE ASHRAE Technical Symposium will take place on 3-4 April 2014 at the Dublin Institute of Technology. For more information visit www.cibse.org/symposium2014

Double milestone for social media

It's time to #celebrate, as September saw two of CIBSE's online communities reach key milestones.

Firstly, the CIBSE LinkedIn group exceeded 10,000 members and, shortly afterwards, the @CIBSE Twitter account hit a whopping 10,000 followers too.

The LinkedIn group sparks in-depth debate and sees members sharing insight, and giving fresh perspectives on

topical issues. CIBSE's Twitter community shares breaking news, blog posts and event details and sees the institution engaging with the wider industry.

Specialist groups and societies are now catered for, too (see box, right).

Don't forget, you can also keep up to date with the views of CIBSE president George Adams and his guest bloggers at www.cibsepresidentblog.co.uk

CIBSE's online community

LinkedIn Groups (member numbers in brackets)	Twitter (follower numbers in brackets)
CIBSE (10,657)	@CIBSE (10,132)
Society of Façade Engineering (1,783)	@SLL100 (1,554)
CIBSE Young Engineers Network (YEN) (1,143)	@cibse_jobs (1,459)
WiBSE Women in Building Services Engineering (428)	@CIBSEWomen (550)
CIBSE Young Energy Performance (327)	@CIBSEAwards (441)

OUT WITH THE SOLDIER in with the new



UP TO
3X
FASTER
TO INSTALL

Introducing **TracPipe®**
the revolutionary, flexible alternative to rigid copper or steel gas piping.

Key TracPipe® Benefits...

- Bend by hand
- Up to 75% time savings*
- No hot work
- Long lengths & fewer joints
- Lower installed cost



Visit: www.tracpipe.co.uk
call: +44 (0) 1295 67 66 70
Email: eurosales@omegaflex.net
or contact your local merchant.

Manufactured in the UK
TracPipe®
Flexible Gas Piping by Omega Flex

* Compared to copper pipe installation.

Your feedback

This month: LED lighting, district heating and the Walkie Talkie

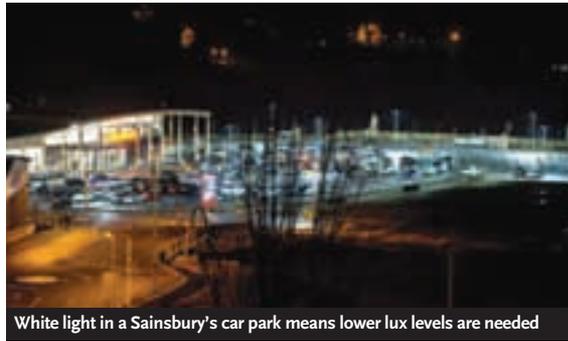
LED's bright future

Beyond the Fridge (*CIBSE Journal*, August 2013) reports that the use of 'very white LEDs' permits 'lower lux levels' to be provided in Sainsbury's car parks. What is the reason for this?

Ernest Wotton, FCIBSE, FSLL, Toronto, Ontario, Canada

● Sainsbury's head of engineering Mark Hawker replies: We design to BS EN 13201-2:2003 *Road Lighting* and BS 5489-1 *Lighting for outdoor car parks*, which places car parks as an S1 roadway requiring an average level of 15 lux. We also comply with Association of Chief Police Officer guidelines, CIBSE and Institution of Lighting Engineers guidance on lighting and light pollution. The maximum level allowed under these criteria is 22 lux.

The human eye (and CCTV)



White light in a Sainsbury's car park means lower lux levels are needed

responds better to white light than a yellow SON (sodium). Therefore, the eye needs less white light than yellow light to perceive the same level of vision.

The corridors of power

A carefully constructed, designed and built district heating scheme, can be incredibly effective, but only if the concept design and planning gives suitable consideration to the issues of heat service integration...

The majority of developments are designed and built with landlocked communal corridors, featuring low air admittance and air change rates...

6 We need a shake-up of the entire process, from inception to completion

Needless to say, schemes can be effective, but need a trained and skilled workforce that is able to build and implement designs that meet two key objectives: efficient system performance and affordability for the consumer. If we do not succeed in this, there is a real risk that, as Huw Blackwell cited; 'district heating schemes will become the next low carbon system to fall from grace.'

We cannot allow this to happen; we need a shake-up of the entire process, from inception to completion.
Jayne Clare, ENER-G Switch2

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

Please send all letters and any other items for possible publication in the *CIBSE Journal* 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. Please indicate how you wish your letter to be attributed, and whether you wish to have your contact details included.



Walkie Scorchie's glare of publicity

Could modelling have stopped the Walkie Talkie's concave façade from concentrating the sun's rays into dangerous hot spots on the streets below? Industry experts in CIBSE's LinkedIn pages had their say on the story that made the national news

Shelley Davis

Given the high profile of this, I can see solar reflection modelling becoming a requirement – if not UK wide – then at least for London developments. Perhaps it may even lead to a requirement for broader analysis on the contribution infill developments that could have on localised heat islands.

Ken Carmody

It would be interesting to find out what instructions the modellers were given at design stage. For example, were they asked to provide wind wake,

glare or shadowing? Who takes responsibility in this respect? My own experience is that I was requested only once to complete a wind wake analysis, and this was a planning request. If anything good can arise from this, it is that all members of design teams can begin to understand the importance of openness.

Dawn Hare

Yes, modelling can prevent this happening again, but there needs to be a controller at the helm who understands the value of all the specialists, the information they

provide and how they all work together.

Malcolm Wallace

This could be part of a larger (and relatively new) design concern: vertical reflectances off glazing, whether concave or flat. Up until now this has only been a nuisance to test match cricket...

Tony Thurgood

So many people these days rely totally on the computer and do not have the in-depth science education and experience to even think that such a problem might

exist in the first place. I suspect that even I – with 45 years plus in construction and construction consultancy – almost certainly would not have thought about it.

Mike Barker

An integrated design approach not only leads to more sustainable and lower cost buildings, but hopefully creates a design environment where nothing falls between the cracks. We need to learn from motor vehicle design – a tightly integrated design team will always produce a better product.



RENEWABLE HEAT

In July, the government announced its intention to extend the Renewable Heat Incentive to the domestic sector. **Hywel Davies** outlines the plans, and looks at the non-domestic scheme

On 12 July, the government announced its response to the consultation on the design of the domestic Renewable Heat Incentive (RHI), which was held in autumn 2012. This is the culmination of a process that began when the previous government announced its intention to introduce the scheme, to subsidise the generation of domestic heat from renewable energy sources in order to drive the uptake of renewable heating systems in the UK, in July 2009.

Since then there have been protracted discussions about the form of the domestic scheme, while the non-domestic scheme was launched in 2011. An interim scheme – the Renewable Heat Premium Payment – provided single incentive payments for the domestic sector as an interim measure, pending the introduction of the full domestic RHI scheme. The July announcement has set this for April 2014, along with a new non-domestic tariff from that date.

The government also announced that it would honour the previous government's promise that any installation completed on or after 15 July 2009 would qualify for the tariffs.

Legacy applicants will also be entitled to the domestic RHI for all eligible renewable heating systems installed since 14 July 2009. These applicants will apply in phases, to manage the volume of applications, and there will be a deadline after which legacy applicants will no longer be eligible. It is likely that legacy applicants who have received the RHPP voucher scheme will be able to apply first. Final details are being worked out with Ofgem.

The Impact Assessment, published alongside the response, states that the RHI has two purposes: 'To incentivise roll out of renewable heating systems



Solar thermal panels will be a common sight

in the domestic sector "to help meet part of heat's share of the 2020 renewable target", and to prepare for mass rollout of renewable heating technologies in the domestic heating sector during the 2020s by building sustainable supply chains, improving performance, reducing costs and reducing the barriers to take-up of these technologies.'

The scheme is accessible to almost all domestic properties, with social and private landlords and self-build homes, as well as owner-occupiers of main or second homes, all allowed to apply. It covers the installation of biomass, air and ground source heat pumps and solar thermal systems.

The scheme is intended to increase the level of renewable installations of eligible technologies from the current level of 5,500 per annum to around 160,000 units a year. While many will be on individual homes, there may well be scope for installations as part of larger refurbishment schemes.

More detailed reading of the projected uptake suggests that this is expected to be almost entirely achieved using air source heat pumps and solar thermal installations, with very few

ground source heat pumps or biomass installations, due to additional costs.

Technical requirements include minimum levels of energy efficiency in the property, which will be determined based on a Green Deal assessment. Loft and cavity insulation must be installed, but other recommended 'green tick' measures will be optional.

Measured performance

The calculation of the tariff paid to consumers for their particular heating installation will be 'deemed' rather than metered. All installations must be meter ready and bivalent systems will need to be metered. Some systems will be metered for evaluation.

In its response to the consultation, CIBSE argued that it was important to collect performance data on the installations funded by the RHI. The Metering and Service Monitoring Scheme will pay consumers up to an extra £230 per year for allowing the collection of data from their systems, with heat pump installations receiving £230, and biomass systems £200.

This data will provide proper feedback on the performance of installations, enabling the effectiveness of the technologies to be assessed, improving the manufacturing of these systems; and building consumer trust in renewable technologies.

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

The scheme covers biomass, air and ground source heat pumps and solar thermal systems

TARIFF LEVELS

Payments will be for renewable heat generated, in pence per kilowatt hour, as follows: biomass: 12.2 p/kWh; air source heat pump: 7.3 p/kWh; ground source heat pump: 18.8 p/kWh; solar thermal: 19.2 p/kWh

FURTHER READING

To download the full announcement, including the original consultation document, the government response and the latest impact assessment, see:

www.gov.uk/government/consultations/renewable-heat-incentive-proposals-for-a-domestic-scheme

IS CHINA ABOUT TO LEAVE THE WEST BEHIND?



The Chinese may be ahead of the game when it comes to zero carbon buildings, argues **Chris Twinn**

We often hear about China's phenomenal rise towards super-power status. In just two decades, its construction industry has grown to deliver more infrastructure and buildings than anywhere else in the world. There are 36m new homes in its *Twelfth Five-Year Plan*, as 25m new Chinese urbanites are created each year.

China's manufacturing sector now delivers most of our very latest technology, as well as being the world's largest manufacturer and implementer of renewable energy systems. This support for rapid change and desire for innovation is fostered by a forward-looking government which knows that – now Pandora's box is open – the population of 1.3bn aspire to the living standards of the West.

However, China realises it is on a collision course. It's demand is sucking the planet dry of natural resources and depleting abilities to absorb waste and pollution. Its people are finding their voice via the internet to demand faster change, on issues such as poor air pollution or factories discharging into local watercourses. China simply cannot follow the West's route of resource use profligacy. It is already the largest importer of most raw materials and the single largest emitter of CO₂. Yet its energy use per person is still less than one fifth of that of the US.

As a consequence, the Chinese government is eager for the latest Western thinking on cutting resource use and sustainability. It knows it has to short-circuit the route the West has already taken. Intriguingly, the Chinese policymakers tend to take a longer view on things than their Western counterparts – not least because they perceive they carry the baton of 4,000 years of Chinese civilisation!



So, the West offers China the likes of LEED Platinum as the best it has to offer (see page 28 for more on energy rating schemes). Yet, it does not need very much analysis to realise that – if applied across every new and existing building – this would result in China's energy use more than doubling. Given the scale of China, this would set the world firmly on the path toward 6°C of climate change.

Hence, constructing buildings that do not add to carbon emissions makes real sense to the authorities. To this end, there has been a flood of zero carbon demonstrators across East Asia. Most, it has to be said, are simply duplicating the process the West has previously been through. But with active government backing, they seek to move beyond the West's one-offs into more pragmatic roll-out solutions. Key to this is capital costs for, in a context where electricity costs are half what they are here, payback periods and whole-life costs mean little.

This is where the fusion of Western experience and East Asian innovation drive is creating new ideas. Among these is 'zero carbon at zero extra cost' for your new office building. Harnessing 'smart' thinking and its impact on both base-buildings

Constructing buildings that do not add to carbon emissions makes real sense to the Chinese authorities

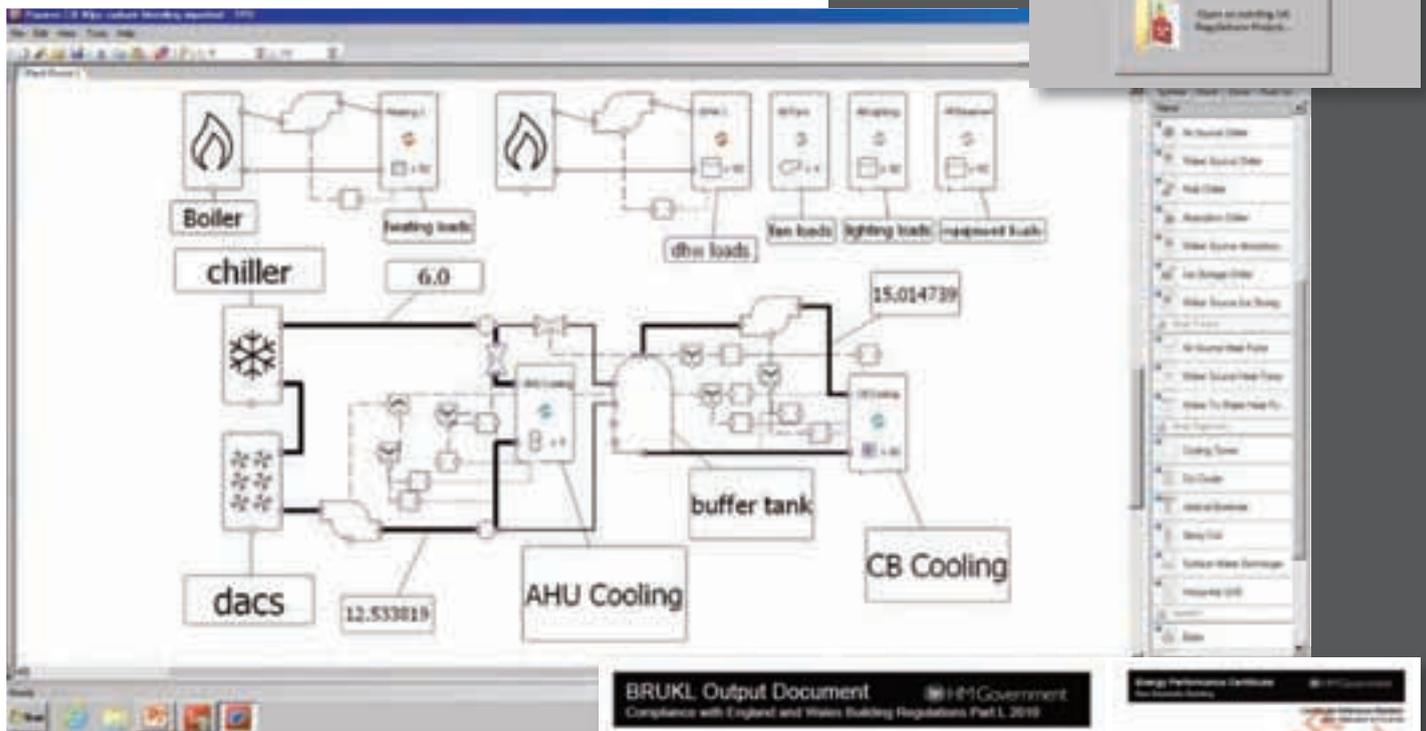
and fit-outs is where this thinking is going. This includes the trend towards the tablet workplace, wireless connectability, remote data processing, LED task lighting and design for daylight 'quality' instead of daylight factor 'quantity'. Smart metering, coupled with building thermal inertia to avoid punitive time-of-day maximum demand tariffs in the future, is another thread. Pulling together such trends starts to deliver very interesting and substantial changes for HVAC plant, with capacity reductions of up to 75%. In turn, this offers benefits of reduced plant space, increased net to gross, reduced storey-height structures and reduced cladding areas.

More importantly, this provides capital cost savings. So, alongside the very significant reduced renewables capacities needed to meet building demand, this opens up the opportunity for zero carbon to be achieved within the conventional overall capital budget.

What is intriguing is this kind of thinking could well be useful back in the UK, as we grapple with how to deliver on the 2019 target for zero carbon non-domestic new buildings.

CHRIS TWINN FCIBSE is an Arup fellow and director of Ove Arup & Partners

EDSL Tas Design and Compliance Studios



The EDSL Tas UK Building Regulations Studio automates the sequence of tasks required to complete and report Part L2 and EPC calculations.

When changes are made to any aspect of the design, from geometry changes to alternative plant selection or renewables, the studio will recalculate all necessary tasks.

The studio uses EDSL's advanced plant and controls simulation, and is capable of calculating the impact on CO2 emissions of innovated plant and controls.

EDSL Tas is multi-core enabled and performs many of the calculation tasks in parallel. This significantly reduces calculation time and offers a very productive design capability. By example, to complete the calculations for both Part L2 and EPC takes about 5 to 10 seconds per building zone. More complex plant and controls take a little longer. A 100 zone model would take about 15 mins to complete both Part L2 and EPC calculations.

Tas Daylight calculates perimeter zone daylight factors, which are automatically used in the building simulation to perform climate based analysis of the benefit of daylight saving lighting controls.

The EDSL Tas ASHRAE 90.1 Studio automates the baseline building and systems generation. Depending on how many cores are available, this studio takes full advantage of multi-core processing. This studio is fully loaded with ASHRAE databases and is capable of switching between SI and Imperial units at any time.

For details on international availability of EDSL Tas contact sales@edsl.net

For details on consultancy services at EDSL Tas contact consultancy@edsl.net



Environmental Design Solutions Ltd
13-14 Cofferridge Close, Stony Stratford
Milton Keynes MK11 1BY

Tel: +44 (0)1908 261461
Fax: +44 (0)1908 566553
Email: sales@edsl.net

www.edsl.net

ENGINEERING KNOWLEDGE AT YOUR FINGERTIPS

CIBSE Journal is now optimised
for tablets and other digital devices

GET THE
CIBSE APP
NOW!



The digital version of your **CIBSE Journal** is now specially optimised in an iPad app and is viewable on Android tablets, laptops, PCs and other devices. Featuring video, additional imagery, links to further reading – and opportunities to easily share content... all presented in a stunning format.

➤ To download the CIBSE iPad app from the App Store: cibsejournal.com/app

➤ To view the latest issue on other devices: www.cibsejournal.com



GE
Lighting

LED Innovation

for sustainable offices

Dramatic improvements to the working environment and elimination of the routine maintenance for the next 10 years have been achieved at the iconic Ark building in London through the use of GE's innovative LED lighting solutions.

www.gelighting.com



GE imagination at work

The SILENT SE

Submarines are among the most hostile environments on Earth, and poorly designed systems can have disastrous consequences.

So how do services engineers make these volatile vessels safe to operate and live in?

Keith Bate explains

When I moved from a building services consultancy to work at BAE Systems on the design of

Royal Navy submarines, the first question most of my former colleagues asked was, 'How does the ventilation work?' often followed by a joke about opening windows... Of course, the services in a nuclear submarine are among the most hard-working on Earth. The importance of operating the ventilation system correctly, for example, was highlighted by the Chinese Submarine No 361 disaster in 2003, when the 70-man crew was suffocated after the vessel submerged with the diesel engine running.

Add factors such as the need to keep noise to a minimum in order to avoid detection by possible enemies, and the



RVICE

devastating effects that can result from faulty pipework, and it becomes clear that the cost of getting the services wrong could not be higher. In this article, I will show how some of the systems used in buildings are integrated into this unique – and potentially volatile – environment.

Breathing space

Ventilation is obviously a vital consideration in any submarine. When submerged, the air in the submarine is continuously recirculated using centralised fans ¹ with electrostatic precipitators to filter out particulates and aerosols, and chilled-water coils to cool and remove excess moisture. Carbon filters are used to extract odours from the galley ² and bathrooms. Compartments with high heat gains, such as the engine

room, are cooled using large-capacity fan-coil units, referred to as air treatment units ³.

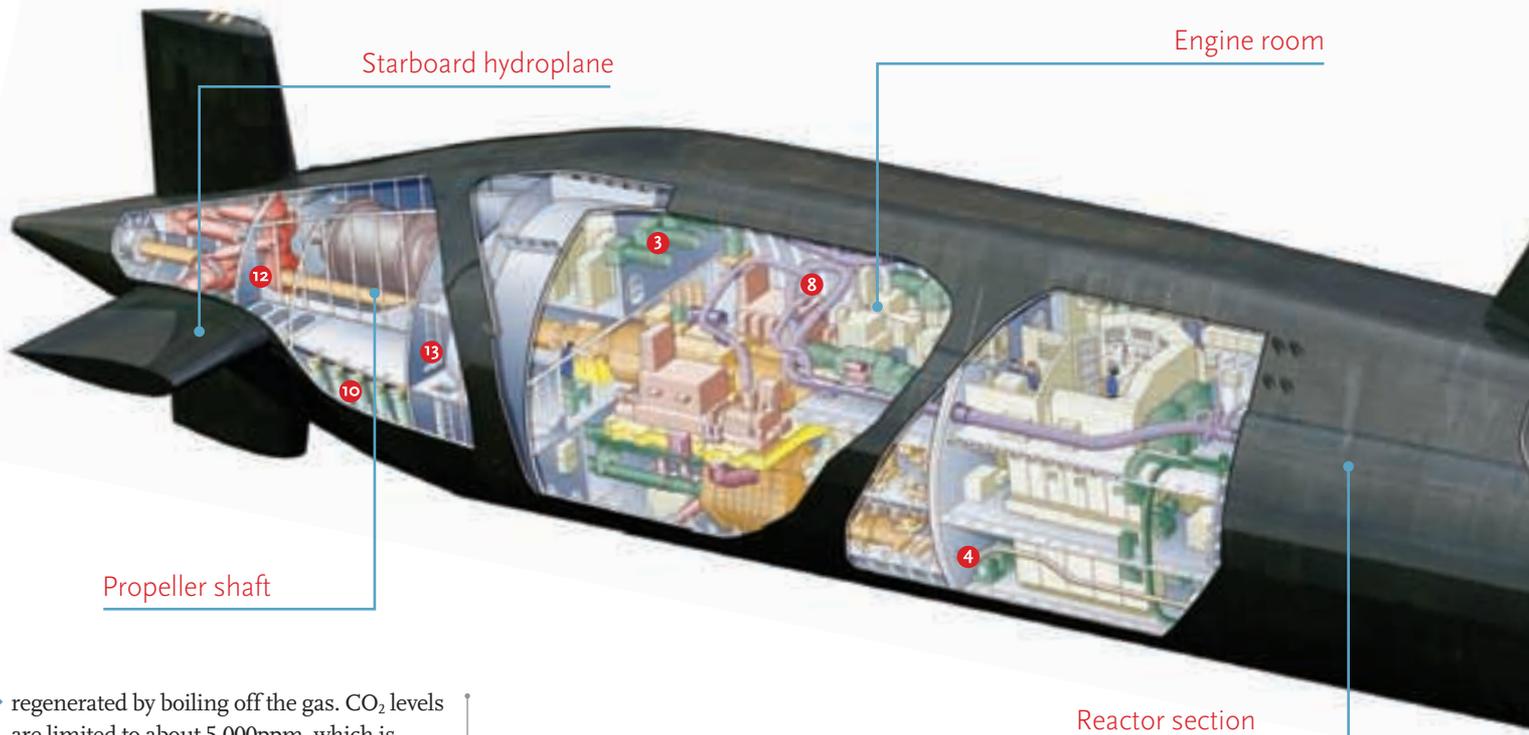
A diesel-electric submarine has to surface regularly to charge its batteries. Running the diesel generators ⁴ draws in large quantities of outside air, restoring oxygen levels and diluting gaseous contaminants such as carbon dioxide (CO₂). To avoid fully surfacing, air is drawn in through a 'snort induction mast' ⁵ – a pipe extending just above the surface when at periscope depth. Although 'periscope depth' is still used to describe being submerged with just the periscope above the water, modern submarines don't actually use direct line of sight periscopes any more – digital imaging is now used ^{6 7}.

As a nuclear-powered submarine doesn't need air to generate power, it can remain submerged indefinitely. To maintain a viable atmosphere without surfacing, nuclear submarines are equipped with air purification systems that control the concentration of oxygen (O₂), carbon monoxide (CO), carbon dioxide (CO₂) and hydrogen (H₂).

CO is produced from hot lubrication oil and cooking, and hydrogen is produced by the batteries. Air is passed through a high temperature burner to oxidise these to CO₂ and water respectively. CO is kept below 12ppm and H₂ below 2%, well below the lower flammability limit of 4%.

The CO₂ from the burner and from respiration is removed in a dedicated plant using a chemical absorbent that is





regenerated by boiling off the gas. CO₂ levels are limited to about 5,000ppm, which is significantly above what would be acceptable in a building but below the level that would have long-term health implications for the crew. However, high CO₂ levels create a risk of developmental problems for unborn babies. With the introduction of women to submarine service, a method of reducing CO₂ levels to 2,000ppm in an isolated area of the vessel is under development for use if a pregnancy is identified at sea.

O₂ is generated by electrolysis of seawater that has been purified using reverse osmosis. The O₂ level is maintained below an upper limit of 22% to prevent an increased risk of fires, while the lower limit for respiration is a partial pressure of 137 Torr, equivalent to 18% at atmospheric pressure. Partial pressure is used because

the air pressure inside a submarine can vary significantly more than in buildings. While normally maintained close to atmospheric pressure, it can vary by more than 25% above or below this for short periods, depending on the operation of various systems. As well as causing ears to 'pop', this affects the lungs' ability to absorb O₂. Even at a normal atmospheric concentration of 21%, a drop in pressure of just 20% would create a partial pressure of 126 Torr – in the range where physiological effects can be expected.

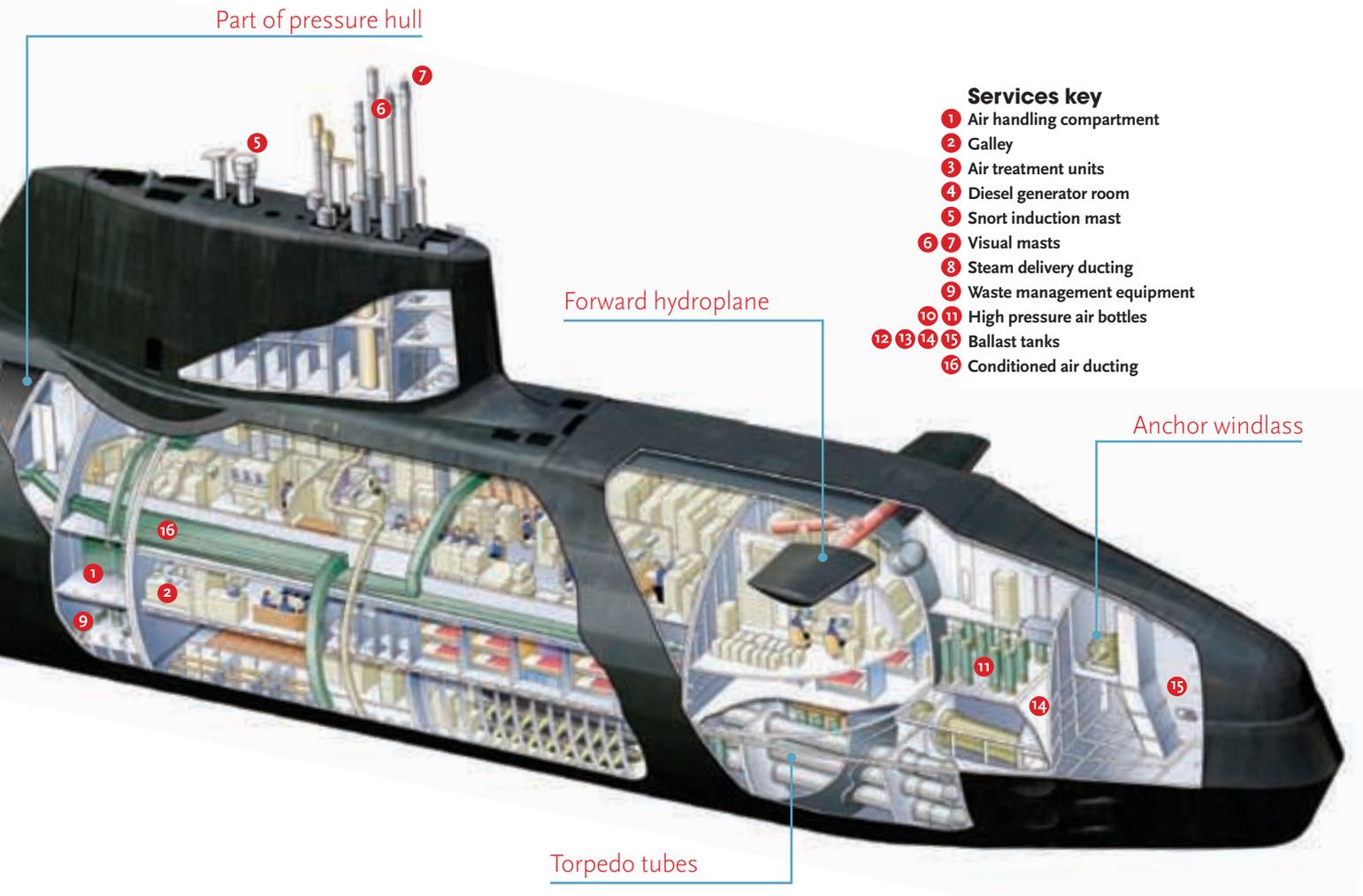
The quantity of O₂ needed is surprisingly small – just 1.25 l/s for 160 submariners. This is equivalent to 7l/s of outside air, less than 1% of the volume provided for the same number of people in a typical building.

The huge disparity is because buildings are principally ventilated for odour control and CO₂ dilution, providing far more O₂ than is needed. In submarines, odour control, CO₂ removal and O₂ production are all dealt with separately.

By opening and shutting dampers, the ventilation system can operate in a number of different 'line-ups', including full recirculation, providing air for the diesel generators, purging the atmosphere in different parts of the submarine to clear



Bunk space (left) has adjustable louvers for individual air supply to each bunk; wardroom (above right) showing textile duct for air supply; and commanding officers' cabin (below right)



Services key

- 1 Air handling compartment
- 2 Galley
- 3 Air treatment units
- 4 Diesel generator room
- 5 Snort induction mast
- 6 7 Visual masts
- 8 Steam delivery ducting
- 9 Waste management equipment
- 10 11 High pressure air bottles
- 12 13 14 15 Ballast tanks
- 16 Conditioned air ducting

pollutants, and ventilating using outside air when the boat is in harbour.

Pressure on the piping

Nuclear submarines have a huge cooling demand. Although surrounded by relatively cool seawater, the heat gains within the submarine far outweigh the losses through the hull. The nuclear reactor, steam piping ⁸, electrical equipment and the submariners themselves all generate heat that must be removed. Water-cooled chillers generate chilled water at about 7°C with the condenser heat rejected to a ‘fresh water’ circuit. Major propulsion equipment is generally cooled directly using the fresh water circuit. Heat from this is transferred to the seawater at about 35°C using shell and tube heat exchangers, which serve two purposes: separating the corrosive seawater from the fresh-water system, and allowing the pressure in the system to be kept to a reasonable level.

Pipes carrying seawater are exposed to the same extreme water pressures that act on the hull. The worst submarine disaster in history, the sinking of the USS Thresher in 1963 with the loss of 129 lives, was caused by a leak from poorly brazed seawater

pipework. To prevent such incidents, all seawater pipe fabrication and welding is carried out to rigorous standards, with every weld subjected to non-destructive testing. All penetrations through the pressure hull have two in-line valves, so piping can be isolated.

Seawater is also used for drinking and washing, having been treated using reverse osmosis and stored in tanks. The system pressure is kept at about 3 bar using a compressed air supply to the storage tanks. Although not energy-efficient, this is quieter and takes a lot less space than booster pumps.

Submarines present particular challenges for drainage design. Restricted headroom and long runs make it difficult to achieve reasonable falls. Gravity drainage systems rely on liquid flowing downhill, but a submarine can be up to 30 degrees from vertical in any direction. Vacuum systems can be used to address these problems. Sewage waste is stored in tanks ⁹, which are pumped overboard when full; tanks of oily waste are disposed of in port.

Another key factor in emergency situations is the compressed air system. In buildings such as manufacturing facilities and laboratories, these systems typically



EMERGENCY STATIONS

Fire safety in most buildings is based on making sure occupants can be evacuated safely, with fire-fighting left to the emergency services. A submarine cannot be evacuated and poisonous smoke can spread rapidly in the sealed atmosphere, reducing visibility to near zero. This necessitates a very different approach.

In the event of a fire, all fans are stopped and fire dampers shut to prevent the spread of smoke. Because of the limit on the number of people a submarine can carry, most members of the crew have more than one role. Anyone not manning a “watchkeeping” position, such as steering the submarine, is employed either actively fighting the fire or in various other parties, connecting hoses, undertaking M&E and emergency repairs, or dealing with casualties.

Strategically located hose reels and fixed suppression systems, such as water spray and aqueous film forming foam, are fitted. Water mist suppression systems are also used on some submarines.



Commanding officer's cabin



Nuclear submarines can remain submerged indefinitely as they don't need air to generate power

operate at pressures of 10 bar. The air compressors in a submarine operate at nearly 300 bar. This air is mainly stored in groups of bottles ^{10 11} suspended in the ballast tanks between the pressure hull and the outer casing.

There are many day-to-day uses for the air such as pressurising tanks, blowing debris out of seawater valves and pneumatic tools. But the biggest demand on the system – and the main reason for the exceptionally high pressure – is to blow the ballast tanks ^{12 13 14 15}. Under normal operation, a submarine is designed to be neutrally buoyant, making significant changes of depth using lift from the hydroplanes to effectively ‘fly’ up and down in the water. In the worst-case scenario of losing all power, the last resort is an emergency blow. Opening the emergency blow valve empties the compressed air bottles into the ballast tanks, forcing the water out and lifting the submarine to the surface.

Compressed air can also be used if there is a leak in the hull. The submarine is divided into sections separated by airtight steel bulkheads. Each section can be pressurised so that if there is a leak the air pressure will hold back the water, giving the crew time to make repairs or return to port.

Weight watchers

In buildings, the weight of the engineering systems only needs to be below the allowance in the structural design, which itself includes a significant margin. In a submarine, weight must be managed much more closely as it is crucial to achieving correct buoyancy. Submarines carry lead weights to ensure they can sink but also to

make sure they sit level in the water, with the centre of gravity below the centre of buoyancy. Too much weight at either end of the submarine and it will not sit level in the water. Too much weight on the upper decks and the submarine will not stay upright.

The human factor

One of the fundamental differences between submarines and buildings is the role of the users. Most modern building services are computer-controlled and the users have little idea what goes on behind the scenes to keep them comfortable. In submarines, the use of software is strictly controlled, partly due to the potential for cyber attacks. There is a control system to automate many routine day-to-day activities but, if this fails, the systems can revert to manual control. A submarine operates in the most isolated and hostile environment on Earth and the lives of the crew depends on them understanding not only how the systems work but how to keep them going if they start to fail.

The scope of engineering systems in submarines is far wider than one article can cover. However, with the exception of submarine-specific plant such as the air-purification and propulsion systems, the equipment used would generally be familiar to building services engineers. Although the operating environment, hazards and spatial constraints in a submarine are far more extreme than a typical building, the same basic components can form a vital part of some of the most remarkable engineering products anywhere in the world. **CJ**

KEITH BATE, principal engineer at BAE Systems Maritime – Submarines

The importance of operating the ventilation system correctly is highlighted by the suffocation of the 70-man crew of the diesel-electric Chinese Submarine No 361 when it submerged with the diesel engine running



SHOCK ABSORBERS

Shock is the rapid acceleration of the submarine caused by underwater explosions. To see the damage shock can cause, look up the YouTube video of *HMAS Torrens* being sunk by the shock wave from a torpedo. The level of shock equipment must withstand depends on whether it has vibration-isolation mounts or is fixed to the structure. Depending on its importance, equipment is either specified to remain operational after a shock event or just to prevent risk to crew. The minimum shock rating for most equipment is equivalent to being dropped from the back of a lorry. For welded equipment, the potential shock level can be 10 times higher.

The ‘signature’ of a submarine, meanwhile, is the noise it makes in the water. A lot of effort is spent making it as difficult as possible for the enemy to detect or identify the submarine. The signature includes turbulence from the propeller, acoustics, vibration, electrical charge and magnetism. Equipment must meet stringent noise and vibration targets and all significant equipment, piping and ducts are supported using vibration-isolation mounts.

For FREE entry register online at acrshow.co.uk/b01

THE DEDICATED EVENT FOR THE AIR CONDITIONING AND REFRIGERATION INDUSTRY

Discover how the latest products & solutions can reduce your carbon footprint, save energy & improve efficiency with a visit to the ACR Show.



Official magazine **ACR News**

Official awards event

Supported by

Efficient heating technology that fits into any budget and in any plant room



The commercial Vitodens 200-W is a wall hung gas condensing boiler for all applications. Available in 45,60,80,100, 125 and 150 kW models, the Vitodens 200-W features easy installation, optional cascade, weather compensation and high efficiency pump as standard - Energy label A.

- Output from 45 to 150 kW
- Cascade up to 900 kW
- Compatible with solar thermal and heat pumps
- Efficiency up to 98%
- Low NOx and CO emissions

Available now, for more information please see our website or email us at info-uk@viessmann.com www.viessmann.co.uk

10 Year Warranty
on all stainless steel heat exchangers for gas condensing boilers up to 150 kW



High efficiency pump meets the ErP directive for A rated energy pumps



climate of innovation

Viessmann Limited • Telford • Telephone 01952 675000



Multiple CHOICE

BREEAM is the most popular environmental certification system in the UK, but globally there are several schemes with different parameters to choose from, as **Daniel Olsson** reports

Certification systems for buildings can be divided into two main types, depending on which perspective they are based – the holistic or the specific.

The first type embraces environmental certification systems, which often consider a large number of aspects, from the choice of building materials and the disposal of waste products, to the distance to the nearest stop for public transport. These systems can be said to quantify a building's total environmental footprint, which can – of course – be commendable.

However, individual aspects, such

as energy performance, can risk being overshadowed by all the others.

This would not happen to the energy performance aspect in an energy certification system, as this would have a specific perspective.

On the other hand, it would be the only question to be addressed (though often together with certain indoor environmental criteria). Energy certification systems are often regarded, therefore, as 'single issue systems'.

Generally, it is not possible to say which type of certification system is best: this will depend on the perspective chosen by the property owner as well as on a number of other factors.

These could include: the benefits to be gained from certification itself; the country in which the building is located; the cost of the certification process; and so on.

A quick look at the environmental certification systems described in *Simply Green*¹ will reveal certain common approaches. For instance, with respect to the choices of what has an effect on the environment.

However, a closer look will show that a number of the systems are significantly different – for instance, when it comes



to how different parameters are assessed and weighted or how the significance of a particular parameter is judged in respect to other parameters.

Weighting can be carried out in two ways: by applying a weighting factor to an individual parameter or to a whole category of parameters, depending on the scoring method used in a particular system; or by assessing a larger number of parameters within the categories on which the system developers want to put the greatest focus.

Some systems have a clearer target than others and it is interesting to note how these are reflected both geographically and culturally.

For example, the Indian IGBC system is strongly biased towards the precarious fresh water situations found around a number of major Indian cities.

The Japanese CASBEE system, on the other hand, is more specific than others when it comes to requirements and measures to minimise damage caused by earthquakes.

This system also places great importance on so-called light pollution, which is most likely due to prevailing problems in Tokyo and other major cities.

A European example that illustrates

local and cultural aspects is Minergie, the Swiss energy certification system, which – perhaps not unexpectedly – is primarily marketed as a quality ‘Swiss made’ brand.

One way in which similarities and differences between systems can be illustrated is by setting them out in a table with corresponding explanations of the parameters that each takes into account. Unfortunately, it would be virtually impossible to comprehend such a table without first actually dictating under which category headings the systems and their environmental parameters were to be sorted.

In the table on page 24, an attempt has been made along these lines in order to visualise the differences between the different systems.

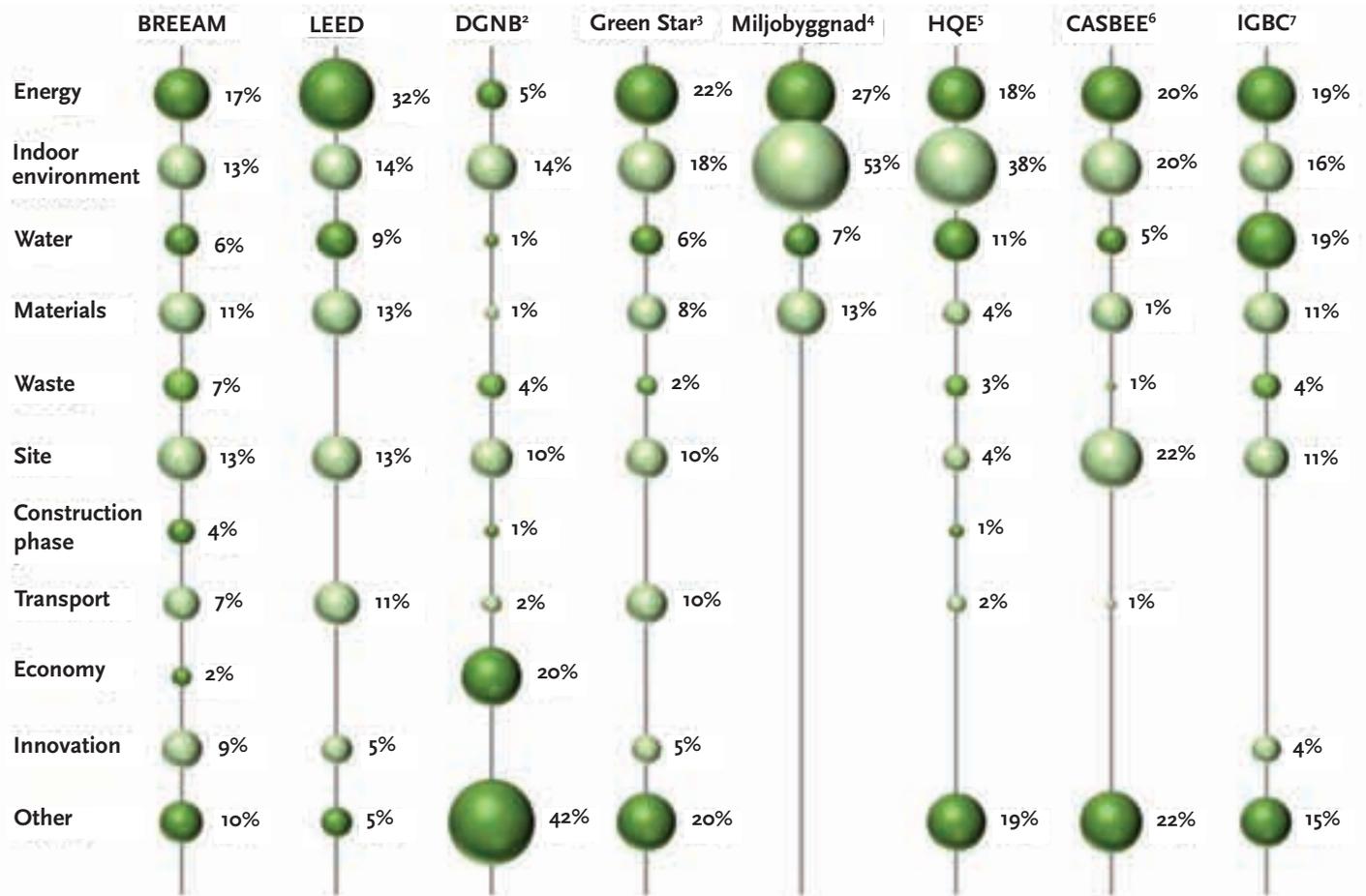
Note, that no single environmental certification system shown here is actually summarised according to the headings in the table.

Subsequently, as there is no universal way of organising environmental parameters, these headings will have to suffice.

However, four points must be noted:

- 1) Even if a system actually assesses categories using the same headings as in the table, it is not necessarily true that

The Indian IGBC system is strongly biased towards the precarious fresh water situations found around a number of major Indian cities



Environmental certification systems with weightings

- the headings always include the same parameters. This can be illustrated by the environmental parameter legionella, which in some systems is found under the category indoor environment while in others it is found under the category water. In the table above, it is categorised under 'water'.
- 2) In the German DGNB system there is a large 'sphere' representing the category 'other' and this is because the system places great importance on issues related to planning and the building process. These parameters have not been given an individual assessment category here because they are not clearly distinguished in the other systems.
- 3) Systems with a large proportion of mandatory parameters (which are not awarded points) are, to some degree, misrepresented. This is especially true in the case of LEED, which takes into consideration the categories 'waste management' and 'construction phase' but regards them as mandatory measures. This means that these parameters are not apportioned points in the table, which can be interpreted as

them being of less importance in LEED, which, in fact, is not the case.

- 4) A number of the certification systems in the table are divided into sub-systems, for example, for dwellings and commercial buildings, for which the assessed parameters and requirements can vary. The sub-systems chosen for inclusion in the table have been regarded as being representative of their respective certification systems. Common to all is that each system is applicable to new buildings, though not neighbourhoods. The sub-systems are:
 - BREEAM Europe Commercial 2009 - Office
 - LEED 2009 for New Constructions and Major Renovations - Commercial
 - Green Star Office
 - HQE International
 - CASBEE for New Constructions
 - IGBC Green Home



References

¹ *Simply Green: A quick guide to environmental and energy certification systems for sustainable buildings*, Swegon Air Academy by Daniel Olsson, CIT Energy Management AB, Gothenburg, Sweden www.swegonairacademy.com

SCHEME DETAILS

BREEAM: Developed by BRE in the UK

LEED: Leadership in Energy and Environmental Design, developed by US Green Building Council

DGNB: Developed by Deutsche Gesellschaft für Nachhaltiges Bauen (German Sustainable Building Council)

Green Star: Rating scheme developed by Green Building Council of Australia

Miljobyggnad: Scheme by Swedish Green Building Council

HQE: French Rating system controlled by the Association pour la Haute Qualité Environnementale.

CASBEE: Comprehensive Assessment System for Built Environment Efficiency developed by Japan GreenBuild Council and Japan Sustainable Building Consortium

IGBC: Indian Green Building Council rating system



Indirect adiabatic and
evaporative Data Centre
Cooling



...and join the growing number who are benefitting from this exciting innovation
– a world class leading, multi award winning technology.

www.excool.com T: +44 1527 492750

forward through innovation

The Crystal in east London was designed to host events on sustainability. But the real star of the show is the building itself – which is the first in the world to achieve the highest possible ratings in BREEAM and LEED. Arup's **Mark Plummer** explains how it was done

From the start, we knew that something spectacular would be required. The idea behind the Crystal, as agreed by Siemens and London mayor Boris Johnson in 2010, was to showcase London as global leader in the low-carbon economy. The 6,900m² building was to include high-spec offices, conferencing facilities, a 270-seat auditorium and the world's largest interactive public exhibition dedicated to the future of cities.

Less than three years later, the £30m Crystal was complete. The team, which included architects Wilkinson Eyre and Pringle Brandon, and engineer Arup, had created a building that was at the pinnacle of sustainable development: it is predicted to emit 85% less carbon dioxide than Part L target requirements; to consume between 189 and 234kWh/m²/year, which averages out as a 42% improvement on other buildings of its type; to use 52% less electricity; and to use mains water for only 10% of its needs.

The Crystal is the first building in the world to receive design and construction stage certification for LEED Platinum and BREEAM Outstanding (see page 28 for

more on energy rating schemes). Here are some of the key systems and technologies we used to achieve this.

Façade

Of course, the project was not all about the integration of the latest technology. Great emphasis was placed on developing a high-performance façade that could minimise heating and cooling demand.

We were initially concerned that the architectural vision did not have the traits





“ Daylighting was one aspect of the design where we had to choose whether to target the LEED or BREEAM credits, as BREEAM uses the overcast sky, while LEED uses direct sunlight

of a typical sustainable building. The concept mostly comprised transparent glass, which is excellent for natural light, but performs poorly from a thermal and solar gain point of view.

Throughout the early design stages, multiple computer analysis models were used to play with the ζ to optimise daylighting, reduce solar gain and maximise thermal efficiency and natural ventilation. The process was intense, but the results are truly remarkable.

The curtain walling system allowed Wilkinson Eyre tremendous flexibility when it came to the striking building shape. Arup experimented with the glazing facets, tilting clear glazing towards the sun where the rooms behind were predominantly heated, and away from the sun where the rooms were mainly cooled.

Six types of glass have been used, each different in opacity and transparency, so that the need for daylighting and reduction in solar gain could be balanced depending



Throughout the early design stages, multiple computer analysis models were used to play with the façade to optimise daylighting, reduce solar gain and maximise thermal efficiency and natural ventilation

on the location. The engineering team settled on 39% strategically placed transparent glazing, with the rest made up of highly insulated panels.

It is worth noting that daylighting was one of the occasional aspects of the design where we had to choose whether to target the LEED or BREEAM credits, as BREEAM uses the overcast sky while LEED uses direct sunlight.

It was calculated that a maximum average U-value of $1\text{W}/\text{m}^2\text{K}$ was achievable with the façade system, without jeopardising the budget. The curtain walling has also achieved excellent airtightness of $2.4\text{m}^3/\text{hr}/\text{m}^2@ 50\text{Pa}$.

Ventilation

The crystalline roof created the challenge of where to put the HVAC plant. There was nowhere obvious to place the large air-handling plant required for the exhibition and auditorium.

Once the engineers reduced the air volume requirement to a minimum using computational fluid dynamics (CFD), the chosen solution was to break down the large air-handling units (AHUs) into modular units, and mount these vertically to work as giant exposed down-flow units. This approach minimised the amount of floor space to 4m^2 per AHU while taking full advantage of the triple-height exhibition space.

The exhibition hall incorporates eight 11m-high, vertically mounted exposed ventilation units, three of which are supply and extract units, with thermal wheel heat recovery for minimum fresh air use. The other five supply-only units are coupled with the roof-mounted extract fans – to be used during the summer months. The modular nature of the units means that they only operate when they are needed and no energy is wasted during times of low occupancy.

A 1m-deep floor plenum supplies low-



Above: The clean lines of the crystalline roof with its extensive PV array (above) were achieved by incorporating the ventilation units in a 11m vertical stack in the exhibition hall (top right)



level air to the exhibition hall at 20°C. It uses air displacement to take advantage of the triple-height hall and only conditions the occupied zone. The same space-saving vertically mounted AHU and displacement air system approach has been used in the auditorium.

The Crystal's mixed-mode system provides occupants with the choice either to mechanically cool or naturally ventilate. The decision to use a mixed-mode system was driven by the flight-path for nearby City Airport. Although Siemens aspired to a fully naturally ventilated building, it was equally important to have very high-spec conference facilities that were not affected by outside noise.

The façade provides natural ventilation through high- and low-level parallel openings that maximise the amount of air intake and exhaust without compromising the architecture. Openable rooflights ventilate deeper spaces.



SERVICES FIT-OUT

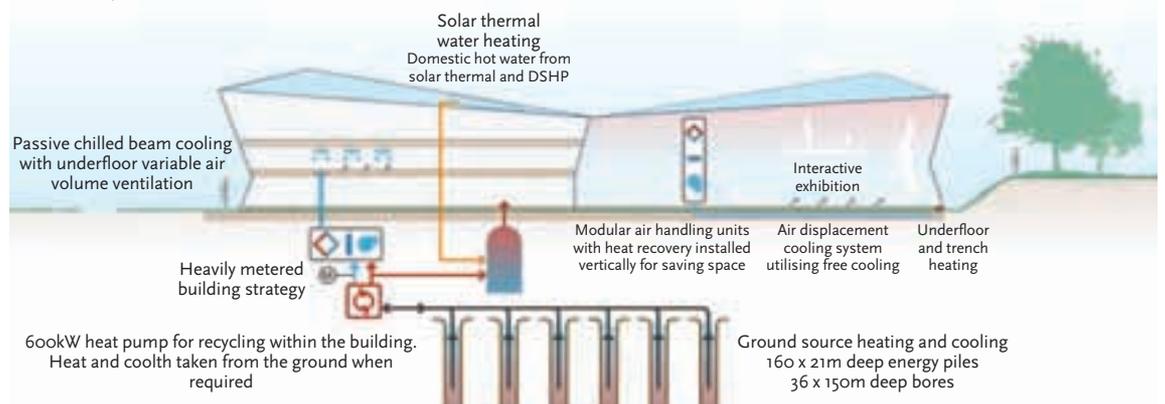
The Crystal can be used as a single large space for conferences or divided into separate meeting spaces, and the building services are designed to reflect this inherent flexibility. The meeting rooms benefit from a regular grid of noise-free passive chilled beams with underfloor fresh air supply. Removable partitions are used to separate the space and alert the BMS of a change in use. With the partitions closed, temperature and fresh air automatically adjust to save energy and ensure user comfort.

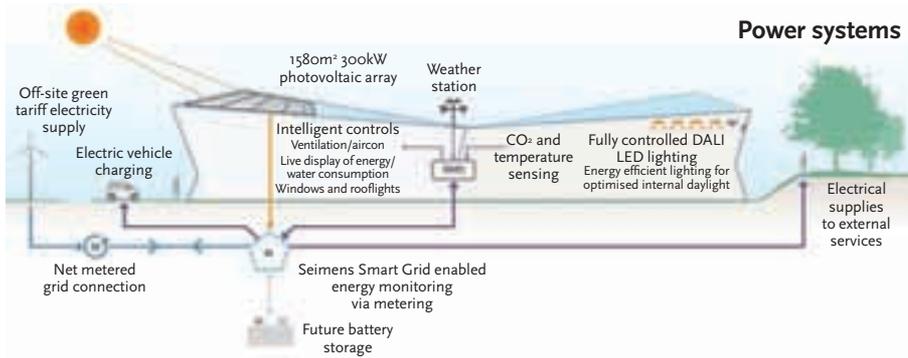
The multi-service chilled beam cooling system in the second-floor open-plan office space takes full advantage of the variable roof height and irregular geometry to conceal services, providing lighting, passive cooling, associated sensors, audio and wi-fi.

The high-specification boardroom uses plasterboard chilled ceiling rafts, one of the first systems of its kind to be installed in the UK. These are supported from the irregular roof soffit and incorporate lighting, cooling, AV and acoustic treatment, without having a noticeable impact on the sense of height.

A mix of underfloor heating and perimeter trench heaters is employed throughout the building; these use the 50/40°C low temperature hot water (LTHW) supply and return temperatures.

Active systems





THE ALL-ELECTRIC FUTURE

A key requirement of the brief was to ensure the building would operate exclusively on electricity. The 'all electric' operation anticipates the increasing decarbonisation of electricity generated by a grid network.

The elegant Crystal roof, which is a prominent sight on the east London skyline, is an integral part of this strategy, integrating a 300kWp 1,580m² photovoltaic (PV) array. This generates 156Mwh of power, which adds up to 17.5% of the building's annual needs.

The PV panels clip onto a frame fixed to the standing seam, and can easily be changed for more efficient arrays as technology advances. The roof is relatively flat, with angles ranging between 5° and 10°. The PVs face south, east and west, so different arrays will yield higher outputs throughout the day.

The building also demonstrates smart operation, reducing reliance on the grid during times of peak demand. The lighting is by LED, metal halide or fluorescent, and these are individually controlled via the Dali lighting control system. This provides maximum flexibility to suit individual room settings, dimming depending on daylight levels and switching on or off by presence detection.

The continuing advancement of LED technology provided the opportunity to work closely with OSRAM and produce innovative lighting and fixture designs. There are some spaces in the building, such as the cafe and auditorium, that are lit solely with LEDs.

There are also six AC electric car charging points – which take between one and five hours to charge a car – and one DC fast charging point, which typically takes about 30 minutes.

➤ The building management system (BMS) will decide the optimum time to ventilate naturally or mechanically, with some local override. The roof-mounted weather station uses wind speed and direction to inform how far windows open on each façade. Rain sensors on the weather station close the openings during rain.

Heating, cooling and water

The building uses two 300kW electric ground-source heat pumps for 100% of the heating and most of the cooling. This system involves some 17km of pipework that loops around 160 21m-deep structural piles and 36 150m-deep bores.

The pump system enables heat rejected from the server room cooling system or exhibition space to be recycled and reused for heating other areas of the building. Unused rejected heat is stored in the ground until it is needed.

The heat pumps are located in the energy centre, which also houses the back-up air-cooled chiller, all the primary and secondary pumps, the transformer and switch room. The 400kW air-cooled chiller can be used for peak cooling loads should there be a large event or as a back-up cooling source.

The ground-source heat pumps raise the water temperature to 45°C. Energy from 19m² of roof-mounted solar thermal panels further heats the water to 65°C for kitchen use and legionella prevention.

Only 10% of the water used in the building will be supplied by the public

mains. The rainwater harvesting and 100% blackwater recycling systems are designed to meet the non-potable demand for WC flushing and irrigation, while water treatment technology treats stored rainwater to achieve potable quality.

Controlling and monitoring

The Crystal showcases Siemens' latest technology for BMSs, lighting control, security and fire safety. KNX controllers were selected for the lighting control (interfacing with the Dali fittings), occupancy sensors, room HVAC controllers and blinds.

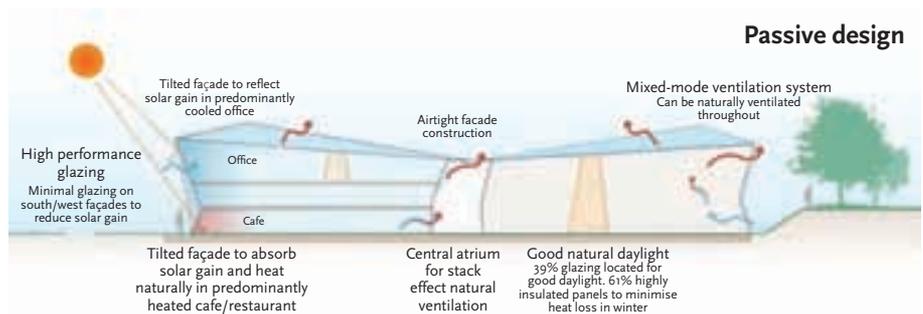
The BMS system uses the BACnet-based PX controllers and a Desigo head-end to control and monitor the HVAC systems. There are BACnet links to the variable speed drives, ground-source heat pump control system, the chiller and blackwater and rainwater treatment systems. There are also extensive interfaces with the KNX control networks.

User panels located throughout the conference facilities control the audio-visual equipment, room booking, blinds, mood lighting, room temperature and natural ventilation.

All systems are metered. As part of the building's LEED certification, a measurement and verification plan is in place to collect this data and allow the building to be compared against its projected performance. In addition, the energy piles used in the ground-source heat pump system had sensors installed during construction, so that they can be monitored for research purposes.

The monitoring enables the FM team to identify poorly performing systems and ensure that the building performs at its optimum level. Even with its final BREEAM and LEED ratings, the process of cutting, refining and chipping away at the Crystal goes on... CJ

MARK PLUMMER was the Arup project mechanical engineer on The Crystal





Seasonal efficiency

- Market-leading energy efficiency
- Winner of the Japanese Energy Efficiency & Conservation Award 2013

Flexibility built in

- 2-pipe heat pump or 3-pipe heat recovery from a single unit
- 100+ indoor unit combinations

Quick installation

- Lightweight and modular outdoor unit
- Piping lengths up to 1000m and improved height difference

Well connected

- H-LINK II and CS Net Web for seamless connectivity with all leading BMS protocols

Comfort guaranteed

- Comfort protection function across the range eliminates cold draughts
- Low noise levels

Unique capacities

- 5HP and 6HP 3-pipe heat recovery outdoor units

Two pipe. Three pipe. Hi Efficiency VRF without compromise

Install Hitachi's new Hi Efficiency Set Free VRF and you're on to a winner. FSXNH offers 2-pipe heat pump and 3-pipe heat recovery options from a single compact, modular unit, allowing air conditioning requirements to be tailored to individual needs* – with future flexibility built in.

New FSXNH models range from 5HP to 36HP, and along with 100+ indoor unit and heat exchanger combinations - with nominal capacities as low as 0.6HP (1.7kW) - there's a combination to suit every installation, and all with market-leading energy efficiencies.

With Hitachi's new FSXNH, there's no need to compromise.

*requires CH Box

DEMAND MORE

DEMAND GRUNDFOS MAGNA3



Demand More Efficiency Demand More Convenience

Complementing the MAGNA3, Grundfos GO enables easy pump configuration, monitoring and diagnostics using iPhone, iPod Touch or Android mobile devices.



Demand More Cost Saving Functionality

- **AUTOADAPT:** The pump is continually monitoring system conditions as they change over time and making adjustments to the pressure control settings in order to best match the system loads, as they continually change within the building.
- **FLOWADAPT:** In addition to AUTOADAPT function, the maximum flow that the pump can produce is also limited. This reduces the need for specific heating zone commissioning and mechanical flow limitation in the form of a zone commissioning valve.

- **Heat Meter:** By installing a separate temperature sensor into the return pipe the heat energy being consumed in the zone can be monitored. The data can then be retrieved for keeping energy consumption records, fault finding on system controls and valves, and energy optimisation.

Scan the QR code for a video



be
think
innovate

GRUNDFOS

COOKED TO ORDER

Full Breakfast ... £6.95

Veggie Breakfast...£5.75

Breakfast Roll ...£3.75

School Breakfast...£5.75

*Please see our
Full Menu
for our extensive
range.*

FOOD FOR THOUGHT

Mitchells & Butlers' research could help the energy-hungry catering sector cut costs in a big way

OFF-SITE INSIGHT

Why Center Parcs' new energy centre is being built in the factory

HOTEL AND LEISURE SPECIAL

LET'S ALL GO DOWN THE STRAND

Innovative scheme helps London hotel slash its bills



We've had some cool innovations in our history.

For our customers it's comforting to know that we have a history in the design and manufacturing of refrigeration systems, dating back to 1920. Mitsubishi Heavy Industries (MHI) is known worldwide for innovations ranging from aerospace to air conditioning, and from cargo ships to chemical plants. Our innovative culture continues to drive our product development and enhance our global reputation for reliable HVAC solutions.

Mitsubishi Heavy Industries Air Conditioning Europe Ltd (MHIAE) is a new company created by MHI for all HVAC solutions across Europe. MHIAE offers high-efficiency systems for cooling and heating air and water in residential, commercial and industrial applications. As a reputable engineering company with vast expertise and experience, we are fully equipped to meet all your HVAC needs.

www.mhiae.com



Our Technologies, Your Tomorrow

Hot potato...

Total energy consumption of the UK's catering industry is estimated to be in excess of 21,600 kWh a year. With ever-rising energy bills, restaurant chains are now getting serious about tackling the energy use of greedy grills and runaway rotisseries.

Pub and restaurant company Mitchells & Butlers is keen to take the heat out of its hell's kitchens. And it has been working with University of Reading research engineer Samantha Mudie to monitor energy use in its commercial kitchens.

Mudie installed automated meter reading devices in 772 sites across the company's estate, which includes famous brands such as All Bar One, Browns and Toby Carvery, with some startling results – see page 42.

Mudie said more research was needed before any meaningful energy-reduction strategies could be implemented, because existing benchmarks for the sector were out of date – energy use in pubs has increased rapidly in recent years, as they've been forced to

“Let's hope that other restaurant businesses take up Mudie's offer of sharing her findings for the benefit of the wider industry”



offer cooked food to attract a new generation of pub-goer and stay afloat during tough times.

Mudie advocates implementing a range of new benchmarks, which could be accepted and adopted across industry.

Mudie's academic research isn't gathering dust on a corporate shelf. Using AMR data operators, restaurant managers and energy auditors identified potential energy savings on each site.

Big wins have included an 88% reduction in lighting consumption, both as a result of switching to LEDs and an estate-wide energy competition, which saved £250,000 of consumption during its 24-week run.

Mudie's resulting paper on the project was eminently worthy of an award at CIBSE's 2013 Technical Symposium in Liverpool.

Whatever the outcome on benchmarking proposals, let's hope that other restaurant businesses take up Mudie's offer of sharing her findings for the benefit of the wider industry.

Alex Smith, editor
asmith@cibsejournal.com

CONTENTS

- 42 WHAT'S COOKING?**
Energy benchmarking under scrutiny in the restaurant sector
- 48 PREFAB CLOUT**
Parc life under the microscope in Woburn
- 54 CAPITAL GAINS**
A look at the innovative financing of one hotel's energy-saving refurbishments
- 59 THE LIFE AQUATIC**
Aquarium temperature control in focus



48



Research by pub and restaurant company Mitchells & Butlers suggests that the figures used to benchmark the sector's energy consumption are well past their sell-by date. The University of Reading's **Samantha Mudie** explains

Since two Midlands families came together to form Mitchells & Butlers in 1898, the company has grown to become the largest restaurant and pub company in the UK. The business now includes such well-known brands as All Bar One, Browns, Harvester and O'Neill's.

Although Mitchells & Butlers has taken great strides in reducing the emissions from its buildings, Richard Felgate – who heads up its energy, environment and sustainability team and is founding board member of the Energy Managers Association – was frustrated by the lack of industry research and real innovation in reducing consumption from kitchens.

Commercial kitchens are one of the most profligate users of gas, water and electricity in the UK with a large carbon footprint. Indeed, CIBSE and the Carbon Trust have estimated the total energy consumption of the UK's catering industry to be in excess of 21,600m kWh a year.

Mitchells & Butlers wanted to access the most up-to-date and scientifically robust research for its future energy-reduction strategies. However, the most recent and detailed work was CIBSE's *TM50: Energy Efficiency for Commercial Kitchens*, which is now four years old – while the benchmarks within it are even older. The industry needed a robust method of measuring its progress.

In 2011, the company teamed up with the University of Reading for a four-year industrial doctorate (EngD) to investigate 'energy reduction from commercial kitchens', with a specific focus on the catering operations. I was the doctoral student selected for the project.

It seemed to me that the best place to start on such a broad and complex project was in benchmarking the whole-building energy use of the estate and the pub-restaurant sector in general. How much energy do these establishments currently use? Which are the worst offenders?

I quickly discovered that sector benchmarks, reported in *TM50 and CIBSE's Guide F: Energy Efficiency in Buildings*, originate from work done

Breakfast with ALL · BAR · ONE
 Freshly squeezed breakfast juice of the day £2.45
 Daily selection of breads or bagels £1.95
 Cereals or muesli for £1.95
 Pastry and toast £3.45
 Fruity carrot cake muffin £2.50



WHAT'S

COOKED TO ORDER

Full Breakfast ... £6.95

Veggie Breakfast ..£5.75

Breakfast Roll ...£3.75

School Breakfast ...£5.75

*Please see our
Full Menu
for our extensive
range.*



COOKING?



The review of energy benchmarks for Display Energy Certificates is available at tinyurl.com/o87y943

➤ in the 1980s; subsequently, the sector has not been forthcoming with private energy use data.

Pubs, especially, have evolved a lot, expanding towards food-led businesses in response to increased duties on alcohol sales.

The project called for an extensive investigation of current consumption before practical and robust energy reduction strategies could be formed and implemented.

Mitchells & Butlers installed automated meter-reading (AMR) devices across the estate. Electricity data on a sample of 772 sites was analysed for correlations between electricity use and number of meals, covers (place settings) and financial turnover, in accordance with current benchmarking methods.

Taking all the sites in the sample, the average electricity consumption was found to be 249,965kWh per year. There are 51,178 pubs in the UK, according to the most recent figures from the UK Pub Association. Therefore, the study indicates that the overlapping pub-restaurant sector's consumption could be double that previously thought: 12,792m kWh from electricity use alone.

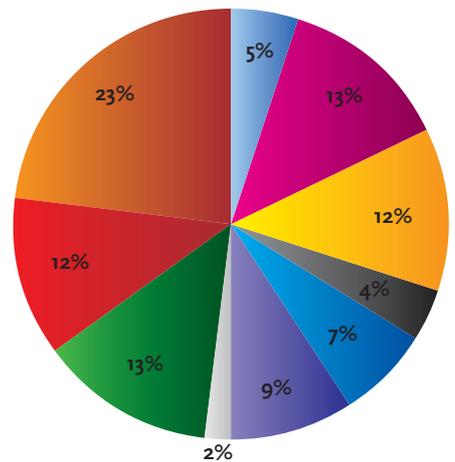
When I compared the figures from my dataset with the published benchmarks, I discovered the relative differences in electricity benchmarks exceeded 90% in some metrics. For example, the BSRIA and Guide F 'Restaurants' benchmark is 90kWh/m² whereas the new dataset sample gives 830kWh/m².

In a 2011 evaluation of CIBSE benchmarks, category 7 and 8 benchmarks (see table overleaf) could not be meaningfully updated due to lack of sample buildings.

There was no correlation found between the size of the business, its financial turnover or the number of covers and electricity consumption; and there was still only a weak linear relationship between electricity use and the number of meals served. The resulting paper was awarded 'Most significant contribution to the art and science of building services engineering' at the CIBSE Technical Symposium in April.

The AMR readings have been vital to the business. Site managers, operators and energy auditors have been able to work together, using the data to identify areas of opportunity for potential savings.

Recently, we've successfully concluded an estate-wide energy competition, which saved £250,000 worth of consumption during its 24-week run. We work closely with manufacturers to develop solutions to the biggest problem areas. Free air cellar-cooling has been installed in all beverage cellars with external wall, heat recovery units providing free hot water in some businesses. Demand-controlled ventilation systems have been rolled out in all three-phase supply sites, and an investment of more than £1m into changing front-of-house lighting to LED is nearing completion. The LED project has seen an 88%



- Walk in fridge
- Walk in freezer
- Grill
- Steamer
- Heat lamps
- Bain marie
- Fryers
- Combi-ovens
- Other refrigeration
- Other cooking appliances

Percentage of power consumed by various catering appliances



Don't miss the next CIBSE ASHRAE Technical Symposium, to be held on 3-4 April in Dublin. Visit www.cibse.org/symposium2014 for more information.



**107% efficient,
100% of the time.**

Most leading brand boilers can only achieve their maximum efficiency in perfect test conditions. Just like the average car will deliver maximum efficiency at 55mph. However there are not many journeys where you can drive continuously at that speed for any length of time. And, the number of days we enjoy perfect test conditions here in the UK are even more few and far between.

The Remeha Quinta Eco Plus, on the other hand, delivers its maximum 107% NCV efficiency, 100% of the time in real conditions. It's all thanks to groundbreaking flue gas heat recovery technology, which pre-heats the water before it enters the boiler. This allows it to deliver 107% NCV at 82/71°C flow and return temperatures, day in, day out. To find out more call **0118 978 3434** or visit **remeha.co.uk**

It's a wonderful world, let's keep it that way.

QR remeha

commercial

Benchmark metric	Previous benchmark		Proposed benchmark value	Percentage difference	Correlation (linear)
kWh/m ² (useable floor area)	TM46 'Category 8; Bar, pub or licensed club'	130	830	84.36	< 0.1000
	BSRIA 'Restaurants' and TM46 'Category 7; Restaurants'	90		89.17	
	Guide F 'Restaurants with bar'	730		12.18	
kWh/meal	TM50 'Traditional Restaurant'	1.73	4.02	57.01	0.4876
	TM50 'Themed'	1.37		65.96	
kWh/covers	Guide F 'Restaurants in public house'	1,500	1,870	19.76	< 0.1000
kWh/m ² per £1,000 turnover	Guide F 'Public houses'	1.8	0.76	-137.13	< 0.1000

In a 2011 evaluation of CIBSE benchmarks, it wasn't possible to update category 7 and 8 benchmarks due to lack of sample buildings



6 If the current benchmarks don't work for one of the largest UK operators of pubs and restaurants, that suggests they need updating

Samantha Mudie's paper, Benchmarking energy use in licensed restaurants and pubs, won the 'Most significant contribution to the art and science of building services engineering' award at the CIBSE technical symposium in April. Read the paper in the technical resources section of the CIBSE website at www.cibse.org

reduction in lighting consumption and a 91% reduction in carbon dioxide (CO₂) emissions. Most of these projects pay back in less than 24 months, some in less than 12.

The shocking fact is that although Mitchells & Butlers has achieved much in energy reduction, comparisons of the data still indicate that the estate is over the recommended benchmark. If the current benchmarks don't work for one of the largest UK operators of pubs and restaurants, that suggests they need updating.

This study has enabled us to see, in detail, the profiles of individual pieces of kit. We've identified possible savings of approximately 70% from appropriate operator behaviour towards some appliances, and 45% from maintenance of refrigerated storage. The really exciting thing about this work is how results are informing our current project – the optimisation of menu and catering equipment for a low-energy kitchen.

Catering appliance designs have remained virtually unchanged since their respective creations, but the markets are pulling for better, more efficient designs. Likewise, there are hundreds of methods one can use to cook a certain menu. Recent work enables the planning of menus using the lowest energy methods. Anyone can buy a more efficient appliance, but it is a more radical and interesting question to ask if the appliance is needed at all. Wasteful energy use is often a symptom of inefficient processes in general; our current projects are set to see

significant savings from other areas, such as consumables like oil, as well as space savings. Further research will investigate the removal of grease from extracted air to enable effective heat recovery, and options for reducing consumption from refrigerated food storage.

I am very grateful to Mitchells & Butlers for the opportunity to work on such an important issue, and to CIBSE for laying the groundwork for the start of the four-year project. Mitchells & Butlers is happy to share the findings of the research with others, both to further academia and to reduce consumption from the wider sector. The benchmarking data has been shared within the CIBSE performance group and relevant benchmarking committees to further awareness of current staggering energy use within catering operations.

It's the lack of previous academic attention to the sector and the complexity of energy use within kitchens that has caused our work to be so well received. This is made even more important by the scale of catering operations – they feature in such a vast number of restaurants, pubs, cafes, schools, universities, hospitals and offices across the globe.

Catering establishments should be of the utmost importance, and become a strong focus of the low-carbon plan of any organisation that contains them. 

SAMANTHA MUDIE is a research engineer at Reading University in collaboration with Mitchells & Butlers

**COMMITTED TO LOWERING CARBON OUTPUT
THROUGH EXCELLENCE IN SYSTEM EFFICIENCY**

**CIBSE BUILDING
PERFORMANCE
AWARDS 2014**
— Sponsor —

Lower Carbon Output by Optimising Hydronic Stability

Pressurisation Systems

To control system pressures and condition refill water

Deaeration Equipment

To remove air, inhibit build up of corrosion and other contaminants, reduce energy cost

Dirt Separators

To remove circulating particulates, provide long term protection and reduce maintenance cost

System Analysis

To diagnose problem systems and plan how to provide best long term solution

Chemical Treatment

To clean & add protection to your investment

Spirotech Total Solutions



The Spirotech Solution is comprehensive and seamlessly integrates all relevant disciplines. We can only ever have the customer's best interest in mind.

Over the life of the system, this provides the most cost effective solution as it removes the strong dependency that the industry places on an expensive Chemical Regime to achieve Hydronic Stability and allows the system to operate at its optimum efficiency.

From designing New Installations through to problem sites, Spirotech Total Solutions are your first point of contact.

Now represented in over 60 Countries

**THE ONLY COMPANY THAT PROVIDE COMPLETE CONTROL
AND CONDITIONING OF YOUR SYSTEM'S FLUID**

To find out how we can lower your overall project cost, arrange a meeting with one of our sales engineers today.



40 years of experience
and full system knowledge

SPIROTECH
FOR BETTER PERFORMANCE

T: 0208 451 3344 | www.spirotech.co.uk | F: 0208 451 3366 | info@spirotech.co.uk

PREFAB CLOUT

Woburn Forest in Bedfordshire will be Center Parcs' fifth village in the UK and showcases the company's latest innovations, including a prefabricated energy centre and district heating. **Andrew Brister** checks in



If you go down in the woods today you're sure of a big surprise. While construction of Center Parcs' fifth UK site – Woburn Forest in Bedfordshire – continues apace, the M&E contractors responsible for the energy centre are conspicuous by their absence. If the park is to complete in spring 2014, shouldn't the building services team be a blur of activity?

Well they are, but all the hard work is being done at the contractors' factory in Wednesbury in the West Midlands. 'When we looked at the tender documents, it ticked all the boxes for off-site manufacture and we incorporated that into our bid,' says Steve Tovey, director of Modular Systems+, the prefabrication arm of M&E contractor Balfour Beatty Engineering Services (BBES). 'You've got a forest site, off an access road, and an energy centre the size of this one contains a lot of big kit. Logistics played a big part in the decision because, by taking assembly

off-site, you haven't got all those delivery vehicles going to the forest.'

Instead of a muddy site with poor access, the centre can be fabricated in clean, dry conditions with major benefits, not only in logistics, but in terms of safety, quality and hours saved. 'The strategy to manufacture a sectionalised plant room was discussed right at the outset,' says Tovey. 'We build the complete unit in the factory then break it down for delivery to site.'

There will be 17 sections to the single-storey centre, manufactured in 18 weeks. Once delivered, the sections can be assembled in three to four weeks. 'We just sit our plant room on a concrete base. Once that is in place, we can deliver the sections and installation on site is so much easier,' says Tovey. 'We have 18 weeks in a clean, dry factory and only four weeks on site instead of 20-odd weeks where it is dirty, muddy and raining.'



The 17-section energy centre is being manufactured in the factory and assembled at the Woburn site in three to four weeks



PARC LIFE

Woburn Forest is a £250m development – one of the largest leisure projects in the UK. Eight years in the planning, Center Parcs' fifth village opens in 2014 when it will boast:

- A 365-acre forest setting, with three distinct hills
- A village with two main areas – the Village Square, which will consist of the Subtropical Swimming Paradise, bowling area, guest services, medical centre, shops and restaurants; and The Plaza, which will have sports facilities, children's club, The Venue conference centre, fitness studios, pottery painting studio, hotel, spa, shops and restaurants

- The Pancake House, next to a lake with a small beach, and The Boathouse

- A range of facilities offering outdoor activities

- An energy centre – the first at a Center Parc in the UK – and district heating system to serve the main areas and the 625 lodges. At the heart of the centre is a biomass boiler

'The energy centre is an integral part of ensuring Woburn Forest is an exemplary, sustainable short-break destination,' says Chris Brooks, sustainability manager at Center Parcs.

'Not only does the energy centre provide a low carbon solution, it also allows us to be flexible and adapt to future

energy demands. The centre has a combination of biomass and gas boilers and gas CHP, which will ensure there is a reliable low carbon energy supply.

'The modular nature of the system was selected for its many benefits, including speed of construction, quality and minimal construction waste.'

BBES is a subcontractor to a joint venture between Birse Civils and Balfour Beatty, one of three major contractors on Woburn Forest. Birse Civils is responsible for managing the site and infrastructure, Bowmer & Kirkland won the contract for the park's leisure buildings and ISG is taking care of the accommodation.



“ The fire risk of welding pipework and steelwork is all taken off site. That’s an important element from a health and safety point of view

► **Site savings**

BBES estimates that that there will be a total of 13,520 hours saved working on site. With 4,470 hours of ‘hot works’ removed from site and 5,900 hours of working at height taken away, this makes installation a much safer proposition than a conventional build. ‘The fire risk of welding pipework and steelwork is all taken off site,’ points out Tovey. ‘That’s an important element from a health and safety point of view.’

Similarly, off-site manufacture avoids having a number of trades all working in the same area, often using steps. ‘We use four or five multi-skilled guys in the factory to do all the work, which vastly reduces the number of operatives and the logistics that go with that on a building site,’ says Tovey. Working in a factory also ensures quality of work is consistent. ‘All the pipework is pressure-tested and we are confident everything that leaves the factory is to a really high standard and quality,’ says Tovey.

BBES is working to a design from

M&E consultant Cunnington Clark and is subcontracted to a joint venture between Birse Civils and Balfour Beatty (see box, Parc life). Manufacturing of the energy centre began once the evolution of the design was finalised in late 2012. ‘The key component for us is the construction issue drawings,’ says Tovey. ‘It’s worth spending time upfront to ensure that the design Cunnington Clark presented to us and our design were compatible, and that all construction issues have been addressed. Once we press the button to go – while it’s not the end of the world to incorporate changes – it’s more effective, more efficient and gets the most benefit if we can make it exactly as per the drawings.’ The first components are the structural elements that provide the framework for the plant room. These are manufactured in parallel with the main plant items ordered by the project team. ‘The idea is that we time everything so we get to a point, after about six weeks, where the first sections land,’ explains Tovey. ‘Once we’ve ►

Bosch inside.

Efficiency
that works.



Bosch Thermotechnology Ltd. is one of the world's leading manufacturers of heating products. In the UK, Bosch Commercial and Industrial Heating specialises in providing complete system solutions and bespoke support services for large scale specification work in the commercial and industrial sector.

Our modular product range consists of both heating and steam boiler systems, large-scale solar plants, heat pumps and combined heat and power units. Bosch's high quality standards and comprehensive technical and service support ensures the long lasting, cost-effective and sustainable operation of your plant.

For more information please call 0844 892 3004 or visit www.bosch-thermotechnology.co.uk



BOSCH
Invented for life



got structural sections of steelwork and the main plant in place, we can then manufacture all the pipework and components, so we've got a nice 'just-in-time' delivery process.'

Tovey argues that clients do not pay more for the benefits of off-site manufacture. 'We tend to find that at worst case it would be cost-neutral,' he says. 'But you are looking at a better value proposition, given the savings in programme, the safety benefits and the taking away the logistics of potentially having 30 or 40 guys on site instead of six or seven.'

Given the advantages of opting for off-site manufacture, it's no surprise to hear that business is booming at Modular Systems+, with turnover up 20-25% year-on-year. Heathrow's

new Terminal 2B (see box, Prefab takes off) boasts £5m-worth of prefabricated products from BBES. Other notable projects currently under way include Cramlington Hospital in Northumberland and London's Sea Containers House. The fact that the latter project is partly refurbishment and partly new build will help to dispel the myth that off-site manufacture is only suitable for new schemes.

Tovey believes the approach is gathering new fans apace. 'There's still a lot of preaching to be done to those that have not experienced off-site manufacture, but people that have been involved realise that it's a great way to do it and want to do it the same way next time.' Who said factories in Britain were dead? 

Prefab takes off

Heathrow Terminal 2's satellite building, T2B, will eventually serve half of the 20 million passengers who will pass through each year. T2B is one of the largest airside projects in Heathrow's history. The construction team is on track to deliver the completed project in October 2013 and will provide 10 new aircraft stands ready for operation in 2014. All mechanical, electrical and public health (MEP) modularisation needs were incorporated into the production design by Balfour Beatty Engineering Services' design team, and this led into the detailed development of the coordinated working drawings being issued in 3D model form, incorporating all building information



modelling (BIM) material details, to the company's Modular Systems+ off-site manufacturing facility. (See BIM on a high, *CIBSE Journal*, June 2013. In all, 549 modules were provided, totalling £5m of products. The MEP solutions for Phase 2 were comprehensive. Multi-service risers could be installed in one night each – compared with six

weeks using a traditional approach – and air handling plant rooms, which were transported across the airfield overnight, could be fixed into position in two days each – a massive saving when compared with 13 weeks for a traditional installation.

The apron service corridor multi-service modules were delivered in sections and formed the spine of the services distribution, while a complete major mechanical plant room could be delivered in eight sections and installed in two weeks – a 24-week time saving. Further solutions included multi-service modules for the 250-metre-long passenger tunnel, as well as modular wiring, pipework and containment for all substructure areas.

Rinnai

EXPERIENCE OUR INNOVATION

FACT

Gas-Fired Water Heaters

Are you aware of the proposed changes to the Building Regulations?*

* Section 2 part L (Conservation of Fuel and Power)

Rinnai Condensing
Water Heaters
already surpass
these proposals

Rinnai UK Limited,
9 Christleton Court,
Manor Park,
Runcorn WA7 1ST
Tel: 01928 531870
Fax: 01928 531 880
www.rinnaiuk.com

Installing Rinnai -
the best solution
for water heating

www.hotwatertechnology.com
- all the information you need
for the provision of high
efficiency continuous flow
hot water in any commercial
or domestic site

High efficiency condensing boilers from Potterton Commercial



Eurocondense three
High Efficiency Floor Standing
Condensing Boiler
125 to 300kW



Paramount three
High Efficiency Wall Hung
Commercial Boiler
30 to 115kW



iHE
High Efficiency Condensing
Stainless Steel Combination Boiler
100kW & 150kW



Sirius FS
Floor Standing Stainless Steel
Condensing Boiler
Single appliance: 50 to 160kW
Modular applications: up to 640kW



Sirius two WH
Wall Hung Stainless Steel
Condensing Boiler
50 to 110kW

Established values.
Leading edge technology.

BAXI
COMMERCIAL

POTTERTON
COMMERCIAL

www.pottertoncommercial.co.uk

ErP
READY

0845 070 1055



An innovative finance agreement is helping one of London's biggest art deco hotels slash its running costs.
Ewen Rose reports

CAPITAL GAINS

The Strand Palace hotel, situated in the heart of London's West End, is the sixth largest hotel in the capital, with 784 rooms and an overall capacity of 330,000 square feet. It is one of the city's art deco landmarks with a colourful history to match.

It is currently implementing an ambitious energy efficiency upgrade programme, aimed at cutting energy use by more than 25% and saving about £125,000 a year. The cost of the improvements is being met from an innovative private finance fund, which provides the necessary capital investment to energy efficiency projects in return for a slice of the savings.

The Strand Palace opened in 1909, when the price of a single room with breakfast was five shillings and six pence (27p in today's money). Refurbished in the art deco style during the 1930s, it has recently been fully modernised, but some of the art deco signatures are still visible.

Innovative building services engineering has played a part in the hotel's story throughout its history. Back in 1928, when it had 980 bedrooms,

“Fund managers are the ‘stewards’ of their investors’ money and so had a duty to make sure risks were minimal and returns would be made within a ‘reasonable’ period

the Strand Palace boiler room was fitted out with two second-hand coal-fired steam boilers salvaged from World War I battleships.

The end of steam

They became a labour of love for one father-and-son team, who between them kept the boilers going day and night for 36 years. The story goes that this self-sacrificing FM team only ever saw each other at the end of their 12-hour shifts.

The hotel became a popular venue with service men and women in the Second World War – US army personnel had a particular affection for the place. The post-war era saw the Strand Palace modernise again, including the introduction of private bathrooms, which led to the fitting of new oil-fired boilers to cope with the increased hot water demand. This prompted the eventual retirement of the younger member of the original father and son team who had lovingly looked after the steam boilers.

Another engineering era began when London and Regional Properties took over the hotel from the Forte Group in 2006. It kicked off a series of carbon and energy saving improvements, spearheaded by the hotel's ‘Green Team’, including the installation of low energy lighting and regular boiler efficiency audits.

The team also implemented a regime to control water temperatures, and to ensure lights, heating and air conditioning in the hotel's conference rooms and offices are switched off when the rooms are not in use. Combined Heating and Power (CHP) units were installed to generate electricity and cut CO₂ emissions. In periods of low occupancy, whole floors can be isolated, so heating can be turned off and lighting reduced to emergency levels only. Boiler flue gas emissions are also diverted through a flue dilution system.

At the same time, water saving devices were fitted in toilets, along with restrictors for taps and showers. Water is softened to prevent lime scale build up and ‘sensaflush’ urinals are used in the public toilets. The management also removed baths from more than 400 bathrooms and installed shower cubicles instead to cut water consumption.

These measures led to the Strand Palace receiving a Green Tourism award from Green London, but the management were keen to go further to make a larger dent in their running costs and carbon emissions.

This prompted them to contact the financial advisers at Sustainable Development Capital LLP (SDCL), who specialise in finding finance for energy efficiency projects. Its managers look after a specialist fund, UK Energy Efficiency Investments 1 LP, to which the UK Green Investment Bank has contributed £50m.





➤ This has been matched by private investors to create a fighting fund of £100m available for suitable energy saving projects.

At a launch of the fund earlier this year, SDCL said energy efficiency would produce increasingly lucrative returns for private investors in the coming years, as the cost of oil, gas and electricity continues to soar.

'Ofgem has told us that there will not be enough energy at peak times from 2015; and from 2018 you will not be able to let a building that is

below a certain energy rating, so every F and G rated building will have to be retrofitted,' said SDCL founding partner Jonathan Maxwell.

The funding gap

'However, many building owners are not making the necessary changes because they lack the capital to invest in new equipment.'

The BRE is providing technical support to the Fund by carrying out both energy assessments, to establish possible savings and post occupancy evaluations to measure improvements. It will certificate that the running costs of the building have been reduced.

The partners are particularly interested in building retrofits that include upgrading lighting, HVAC equipment and the use of voltage optimisation. They also actively promote CHP in larger projects, and are looking for opportunities in district heating and heat networks. The fund will offer funding for up to 100% of the projects – typically around £2m.

Maxwell added that fund managers were the 'stewards' of their investors' money, and so had a duty to make sure risks were minimal and returns would be made within a 'reasonable' period.

SDCL and its technical partners worked with the Strand Palace Hotel management team to identify energy-saving opportunities and design a programme of works. They look closely at cost/benefit analysis to ensure the measures will make a return by cutting running costs – the savings will be used by the hotel to repay the funding.

SDCL ran a competitive tender process for Energy Services Companies (ESCOs) to install and maintain the equipment and systems, 'ensuring energy savings are achieved at the lowest cost and to the highest performance standards'.

'The [Strand Palace] project is expected to be able to generate a sufficient level of savings, through reduced energy and maintenance costs and other benefits, to cover the cost of implementing the project within approximately four years,' a SDCL statement said.

The refurbishment programme began earlier this year and will include LED lighting installations, voltage optimisation, the installation of a building management system and boiler plant replacement.

Overall, the project is expected to cut more than 25% of the hotel's current energy consumption, with estimated annual savings of around £125,000 per year. The project will enable the Strand Palace Hotel to reduce its energy costs and improve its environmental performance, without the investment risk, according to SDCL.

It seems that a new chapter of improved energy efficiency will be the latest in the eventful history of this elegant London landmark.

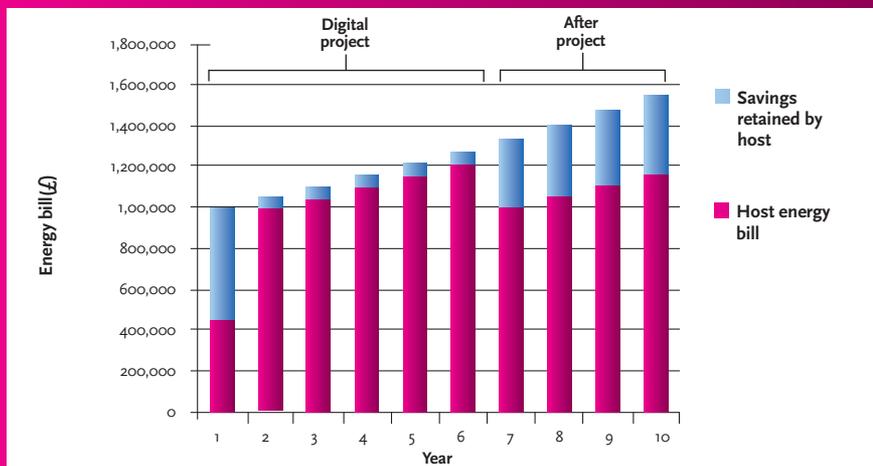
TYPICAL SAVINGS

According to SDCL, a London hotel with an annual energy bill of £1m could reduce its electricity, water and gas bills by 25% by implementing a variety of energy efficiency interventions, including

lighting, insulation, plant upgrades, voltage optimisation and building management systems.

The cumulative impact of the forecasted rise in energy prices, and the additional

opportunity provided by the government enhanced capital allowance scheme, has a material impact on the level of energy savings achievable, as demonstrated below:



Impact of energy interventions on host energy bills during project life cycle and beyond

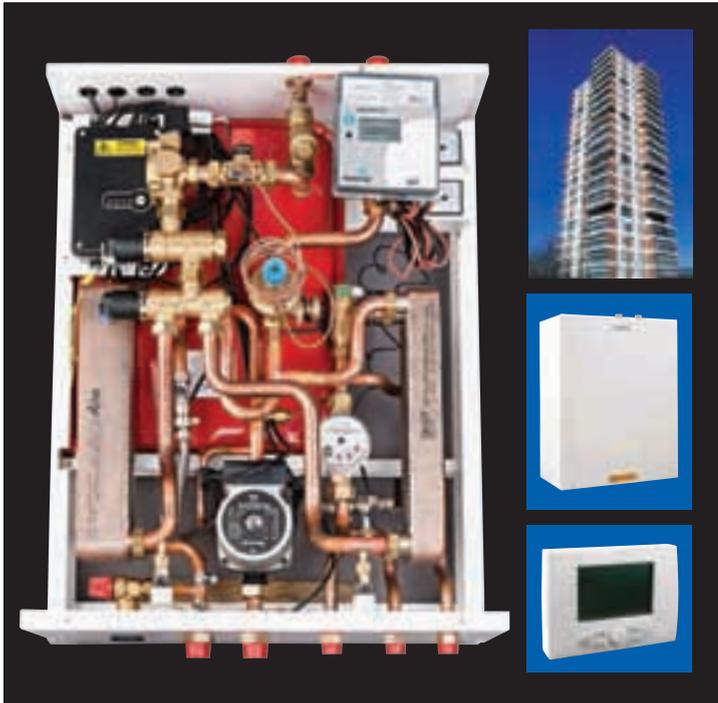


ENERGY

e is here. The ecocirc XL, new from Lowara. It's everything you need in a large wet rotor circulator and nothing you don't. The purposefully engineered, easy-to-install **ecocirc XL** is designed with simplicity and efficiency in mind. With a wide range of sizes and large coverage of flow curve, the **ecocirc XL** fits seamlessly into virtually any environment. This is your opportunity to create a more energy-efficient system. This is the power of **e**.

Learn more at lowara.com/ecocircxl.

Econoplate H Series



Heat Interface Units

providing heat and hot water for private apartments, housing association homes, student flats and sheltered housing.

- *Compact* – Fits within a cupboard or kitchen area
- *No multiple gas supply* – Reduced risk within apartment blocks is achieved
- *No flues* – Unsightly terminals and flue plumbing is eliminated
- *Cylinder space not required* – More storage/usable space in dwelling
- *Rapid/accurate response through plate heat exchanger and control technology* – Energy efficient and comfortable heating and hot water temperatures achieved
- *Renewable energy implemented easier in central/communal plant room* – Solar/Biomass/Heat Pumps
- *Central Boiler House* – A single annual gas safety inspection which is restricted to the plant room
- *Central Boiler House* – Reduction in maintenance costs due to reduced boilers to service
- *Can be installed facing into landlord areas* – Less disruption to dwellings during maintenance
- *Meter reading and energy bills can be carried out remotely from a central location* – This can be very attractive to councils and those with a large portfolio of buildings

For further information or to receive a technical guide tel: 020 8783 3050 or email: info@stokvisboilers.com
www.stokvisboilers.com

Delivering intelligent control at the heart of the system for 25 years

Its not just what we manufacture, **its what we know**

- 25 years of setting the standard in dynamic flow and temperature control valves
- Frese valves are installed in over 40 countries around the globe
- 2.5 million dynamic valves installed globally
- 250,000 dynamic valves produced annually

Since Frese patented its first dynamic flow control valve 25 years ago, continual research and development has resulted in further generations of pressure independent flow and temperature control valves. Our latest addition is the flanged series of OPTIMA PICVs which ensure optimum indoor climate control whilst minimising energy consumption by pumps and other plant room equipment.



Optima Pressure Independent Control Valves

Contact Frese and benefit from our 25 years' experience of manufacturing, commissioning and operating pressure independent flow and temperature control valves.

THE LIFE AQUATIC

Close control of temperature is of paramount importance to the welfare of marine life in aquariums – and it can have significant environmental and cost benefits, too. **Russ Baker** explains

Temperature maintenance is so critical in aquariums that many need contingency solutions to protect against irregularities. A chiller or heater failure could result in water gradually returning to room temperature, risking the health of marine life, so back-up solutions are really important. When handled properly, accurate temperature control will not only ensure the wellbeing of fish and other sea creatures, but will also save on energy costs.

My team has worked with a variety of public aquariums to ensure optimum conditions are maintained, so that a variety of marine species can live together. It is vital to replicate natural environments as closely as possible: if the water is too cold, fish become skittish and easily startled; if it is too warm they become lethargic, resulting in a loss of appetite.

Recently, we worked on a project to replicate the environment of the North Sea, so that fish species including mullet, smooth-hounds, mackerel, cod and triggerfish could survive in

the same tank. We provided a rental contingency package so that rare species including octopuses could also be housed in the same tank. It is not usual for these fish to share the same area of water, as species such as cod tend to prefer colder climes.

In this instance, our engineers connected a process-cooling chiller to a 195,000-litre tank, using a large buffer vessel with multiple compressors to maintain a stable temperature of 15°C. Traditionally, the technology for cooling aquariums and similar projects would have included chillers but with only one compressor, so that the unit could only ever be on or off, which wastes a lot of energy. However, over the

When handled properly, accurate temperature control will not only ensure the wellbeing of fish, but will also save on energy costs

past couple of years, the industry has moved towards multi-circuit chillers and multi-scroll compressors with proportional-integral-derivative (PID) controllers, which have huge energy-saving benefits.

The multiple compressors enable several stages of load control. For example, the chiller can be set to a 25%, 50%, 75% or 100% load, so that the aquarium is only using the energy it needs for a particular temperature. This ensures temperature stability and economy of operation.

PID controllers, meanwhile, are really the heart of this industry: they monitor and regulate the chiller, using technology that calculates the value of three separate, constant parameters, based on the current rate of change. The sum of these parameters is used to adjust the process or the power supplied to the heating element.

The key to this system is that the equipment is able to react before it goes beyond the required setting. In other words, the PID controllers 'think' about what they are doing instead of waiting until it is too late. Therefore, if you need the temperature cooled to 10°C and are currently achieving 12°C on full load, the PID controller will plot a line towards the 10°C mark and automatically tell the chiller to unload so that the temperature will reach the set target, instead of surpassing it.

It should be noted, too, that further efficiency and carbon reductions can be achieved by using the ozone-friendly R410A refrigerant in the chiller.

It is important that all equipment adheres to industrial standards, and we recommend that testing is carried out by an independent body. All of the equipment in our hire fleet, for example, is Eurovent 'Class A' certified, and we ensure that all of the units we use meet the same requirements. It is also vital for equipment to be reserved in either a local depot or on site, so that a rental 'emergency' solution can be achieved within just a few hours – the fast installation of a replacement unit can be critical to the survival of the fish held in the tank.

RUSS BAKER is UK sales director, hire division of ICS Cool Energy



SOMETHING *in*

Last year's outbreaks in Edinburgh and Stoke-on-Trent were a powerful reminder of the danger of legionnaire's disease. The updated TM13 will help minimise the risks, say co-authors **Robert Macleod-Smith** and **Greg Davies**

It has been almost 37 years since the first recorded outbreak of legionnaires' disease occurred at the Bellevue-Stratford hotel in Philadelphia. In the intervening period much has been learned and written about the management of the legionella bacterium and a multimillion-pound industry created as a result.

Yet avoidable outbreaks of legionnaires' disease still occur throughout the world and, as shown by the events last summer in Edinburgh – where three people died and more than 100 required treatment – the UK is no exception. The need for good quality, practical advice remains, as does an understanding of what has to be done to manage and control the risks associated with water systems and equipment in buildings susceptible to colonisation by the bacteria.

In response to this, CIBSE has just published the fifth version of its technical memorandum, *TM13: Minimising the risk of legionnaires' disease*. Historically, the guidance in *TM13* has mirrored that from the Health and Safety Executive (HSE). The current HSE approved code of practice and guidance, *L8: Legionnaires' disease – the control of legionella bacteria in water systems*, is being updated and is due for release at the end of this year. However, a number of the *TM13* working group are also providing support to the HSE, so much of what will be in the new *L8* is already included in *TM13:2013*.

It has been more than 10 years since *TM13* was reviewed, and while many of the key aspects of the guidance have remained the same, advice in other areas has changed significantly in the light of technological advancements and changes in the legal and environmental background to legionella control.

The format and style of *TM13:2013* are consistent with previous versions, although it is now written for a readership beyond the UK, reflecting common needs in

building services around the world. A new appendix listing international legislation, standards and sources of guidance is included. The referencing, glossary, checklists and bibliography have also been reviewed and updated. Below, we look at some of the key updates and new guidance, chapter by chapter.

Legionnaires' disease: background

The last decade has seen significant developments in our understanding of legionella and this is covered in the introduction to this chapter. By investigation work following outbreaks in various parts of the world to more academic-based research, our knowledge of the risk as well as the controls and management strategies needed has grown.

Thereafter the factors that can lead to cases of legionnaires' disease are described under headings such as:

- Risk of infection
- Multiplication factors
- Aerosol generation
- The number of bacteria inhaled
- Susceptibility of individuals and
- Determining the risks

This chapter sets the scene for the guidance that follows on complying with the law and controlling the risk of legionella.

Regulatory framework

Particularly in the UK, there is a comprehensive legal framework that the regulatory authorities (local authority or HSE) can use to prosecute those who own or operate water systems that have caused legionnaires' outbreaks, or do not have adequate controls in place.

In the UK, pre-existing legislation and guidance has been augmented in recent years, for example with the introduction of the Corporate Manslaughter and Corporate Homicide Act 2007 and *British Standard 8580:2010 Water quality*.

“Outbreaks of legionnaire's disease still occur throughout the world and, as shown by events in Edinburgh – where three people died and more than 100 required treatment – the UK is no exception

WATER

the

Risk assessments for legionella control.

This chapter also discusses the existing relationship between the Health and Safety at Work etc Act 1974, the Control of Substances Hazardous to Health Regulations 2002 (COSHH), the Management of Health and Safety at Work Regulations 1999 and the HSE's L8.

All UK regulations and codes of practice relevant to the control of legionella are referenced here, together with other available sources of specific guidance and best practice.

Risk management

TM13:2013 states that 'good management is needed at all stages in the provision of building services', and also identifies risk assessment as a key requirement in satisfying compliance with health and safety legislation in the UK.

A risk assessment is a reasoned appraisal of the likelihood of anyone being infected with legionella from a water system, so it needs to consider:

- Whether the system could be contaminated with legionellae
- Whether any such traces can multiply
- Whether there is a mechanism for any legionellae to be released in an aerosol that could be inhaled
- Whether anyone is exposed to the aerosol and how much they are exposed
- Whether anyone exposed to the aerosol, which might contain legionellae, is susceptible to infection

This chapter also analyses key considerations for each of five stages in the life cycle of a water system and how they can all contribute to its safe operation. These five stages are design and specification, commissioning, operation and maintenance, quality



TRAINING COURSES

6 November 2013, London A1015 HSE Guidance on Legionella Control

This course gives an excellent overview of the HSE L8 approved code of practice and conduct for service providers, as well as reviewing the latest legal findings.

7 November 2013, London A1017 Legionella Control: Role of the Responsible Person

This course acts as an accompaniment to HSE Guidance on Legionella Control and takes delegates into further detail of the role of the 'Responsible Person', including a step-by-step framework to help ensure the legal requirements of this position are fulfilled.

management and microbiological testing.

The final section on testing for legionella not only includes information on the traditional culture method, but also the newer quantitative polymerase chain reaction (qPCR) method.

Evaporative cooling applications

While the HSE Laboratory report *Legionella outbreaks and HSE investigations; an analysis of contributory factors* (HEX/12/07) indicates cooling towers to be the second most common cause of outbreaks in the UK over a 10-year survey, after hot and cold water systems. Cooling towers have long been regarded as the most indiscriminate and highest risk systems – the UK’s two largest outbreaks, at Stafford District General Hospital in 1985 and Barrow-in-Furness in 2002 – both resulted from contaminated evaporative cooling systems.

This chapter has therefore been expanded and covers the different types of evaporative cooling equipment, including adiabatic systems, and their associated risk profiles. Divided into design, operation and control, it provides information on the processes and procedures needed to minimise risk.

The section on water treatment has been extensively updated and includes reference to both chemical and chemical-free systems. The importance of good water quality and cleanliness are highlighted as the key factors in operating these systems safely.

Hot and cold water services

Other data from the HEX/12/07 report identifies hot and cold water systems as the most common cause of outbreak associated cases of legionnaires’ disease in the UK.

Adopting a similar format of design, operation, maintenance and monitoring as that used for evaporative cooling systems, this chapter considers the requirements for safely managing the potential risks of legionella in systems providing hot and cold water to buildings. It also looks at the variety of methods for control now available to the duty holder/responsible person.

Spa pools, whirlpool spas/baths

Increasingly popular in sports centres, health resorts, long-term healthcare facilities and hotels, these systems are the third most common cause of legionnaires’ disease in the UK. Significant outbreaks have also been attributable to spa pools on display, such as that which occurred last year in Stoke-on-Trent, which caused two deaths.

These systems carry an even greater

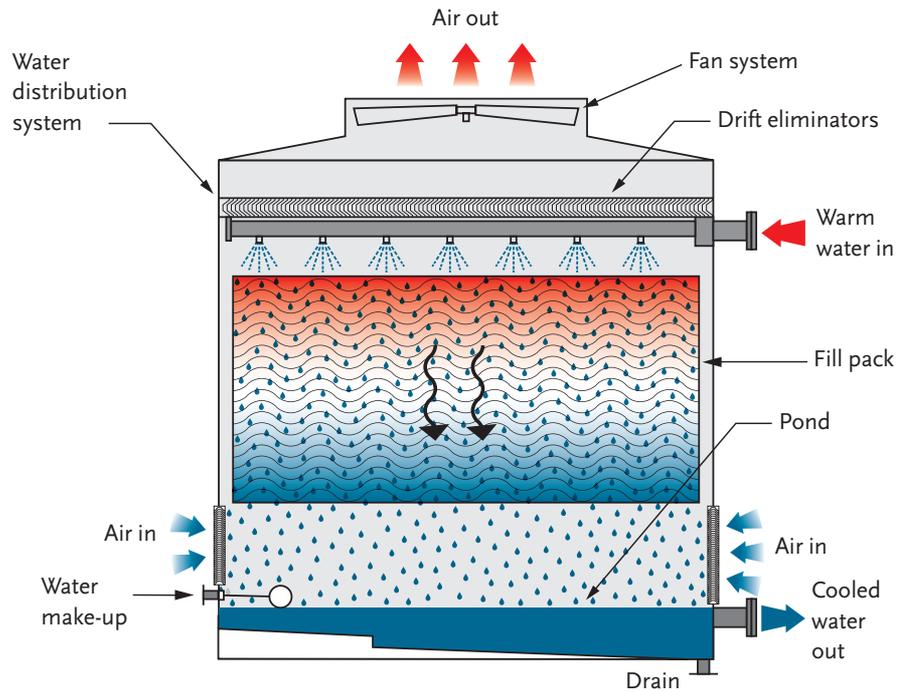


Illustration of an induced draught cooling tower

demand than cooling towers from a testing frequency perspective, and this chapter describes in detail what is required.

Other possible risk areas

There are many other, mostly small, water systems that are potential risks. These are listed in TM13:2013 but it is not feasible to detail precautions for each type. A generic approach is described. This comprises a risk assessment followed by control measures appropriate to the risk.

Conclusion

TM13:2013 offers guidance on design, installation, commissioning, operation and maintenance procedures necessary to minimise the risk of infection by legionella from water systems in a building. Good design principles are highlighted, as well as, technical guidance for practitioners who operate and maintain water systems within buildings. While the focus of TM13:2013 is on building services, the authors believe that the appeal of the document and its usefulness will extend to all designers, contractors, owners and users of water systems that are at risk from legionella. CJ

The working group for TM13:2013 comprised: JOHN NEWBOLD, HSE; JOHN LEE, Legionella; GILES GREEN, Zeta Compliance; MARTIN SHOULER, Arup; JULIAN WILLIAM, Tower Systems; CHRIS WILDING, Ashland; and the authors of this article: ROBERT MACLEOD-SMITH, RIMS Consulting, and GREG DAVIES, Assurity Consulting, (chair).



For details on accessing TM13 visit www.cibseknowledgeportal.co.uk
 The guide is free for CIBSE members and costs £49.50 to download for non-members.
 The book version is available for £27 for members and £54 for non-members



PumpMeter.

Gain a deeper insight into your pump

Would it be beneficial if you could look inside the pump to see exactly how it performs? Now you can with the innovative PumpMeter from KSB.

This monitoring unit is easy to install and more importantly gives, 'real-time' information on where a specific pump is operating within a system.

By the use of WRAS approved transducers, the PumpMeter constantly reads critical pressure conditions and, by doing so, establishes a load profile, thus showing energy saving potential during the life of the pump.

Commissioning and operation is simplified as all the important outputs are displayed on one simple screen.



KSB Limited • 2 Cotton Way • Loughborough • Leicestershire • LE11 5TF • 01509 231872

➤ Our technology. Your success.
Pumps • Valves • Service



50% quicker installation

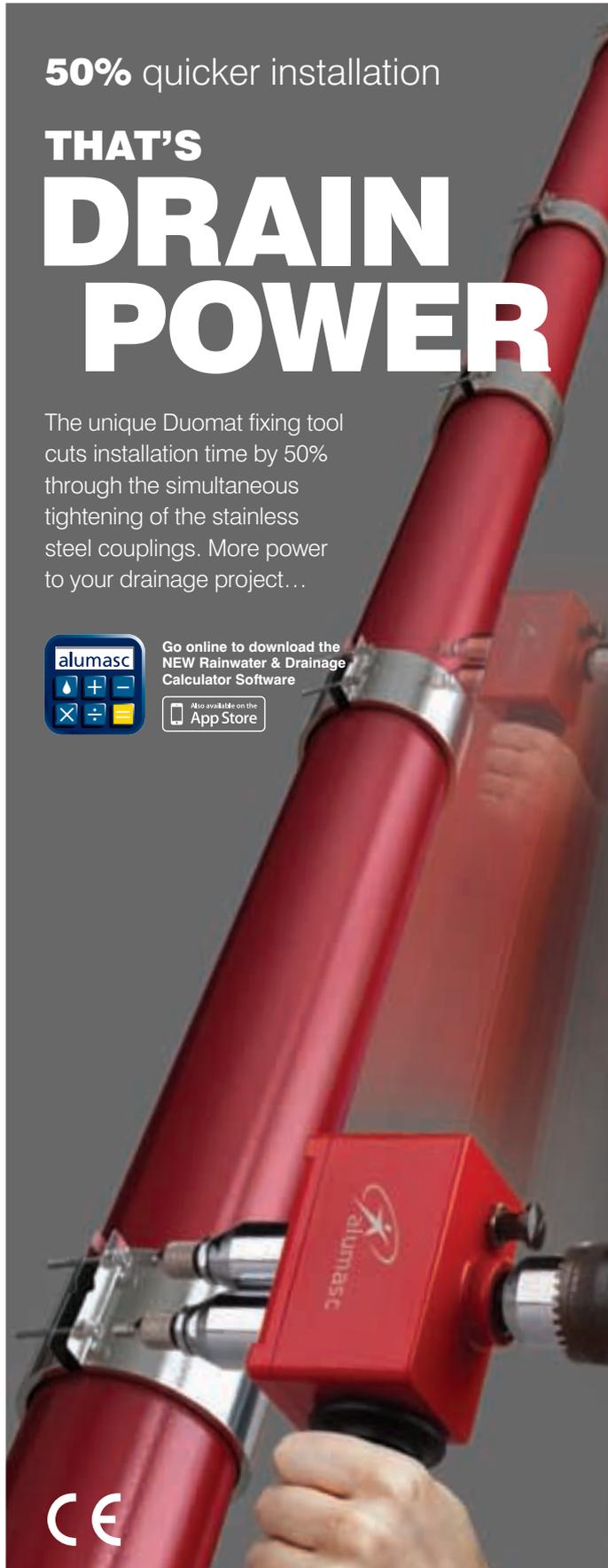
THAT'S DRAIN POWER

The unique Duomat fixing tool cuts installation time by 50% through the simultaneous tightening of the stainless steel couplings. More power to your drainage project...



Go online to download the NEW Rainwater & Drainage Calculator Software

Also available on the App Store



CE

To request a brochure please telephone: 0808 100 2008

www.harmerdrainage.co.uk  /HarmerDrainage  @HarmerDrainage

HARMER

SML SOIL & WASTE

 **alumasc**
EXTERIOR BUILDING PRODUCTS



Say goodbye to flanging, threading, pipe grooving and welding with:



Axilock-S

Join plain end pipe with Teekay Axilock-S
Seals and locks the pipes together
Two Pipes... Two Screws... Two Minutes

tel: +44 (0)1494 679500

www.teekaycouplings.com

 **AquaTech
Pressmain**

LEADERS IN FLUID PUMPING EQUIPMENT AND CONTROLS



- **Water Pressure Booster Sets**
for increasing the pressure in wholesome and grey water systems
- **Pressurisation Units**
for maintaining pressure in sealed heating or chilled systems
- **Water Storage Solutions**
one-piece, two-piece and sectional GRP water storage tanks
- **Tank Level & Temperature Controls**
monitoring the level & temperature of fluid in tanks

Other products include Hydraulic Shock Control, Pressure Vessels and a Bespoke Design Service



To discuss your project please call:

Head Office: 01206 215121 Manchester: 0161 226 4727

email: info@aquatechpressmain.co.uk www.aquatechpressmain.co.uk



Way TO FLOW

Daniel Gontermann explains how the latest design tools and pumping technology can cut energy use by more than 10%

6 The industry offers a variety of technical options that allow energy consumption to be influenced via speed control. There is no need to add tolerances and safety margins when sizing the pump

Against a background of rising energy prices and the need to reduce CO₂ emissions, it is becoming increasingly important to consider pump systems' energy consumption. A European study has concluded that improved product configuration could facilitate a 10% energy saving. Using pumps and motors with high efficiencies could save another 3%.

However, there is no universal solution for exploiting this potential. Basically, four different technical approaches are available that can help lower a pump system's energy requirements. Manufacturers can:

- Provide pump selection software
- Match the impeller diameter to actual operating conditions
- Offer variable speed pump sets
- Use extremely energy-efficient motors

The first step in optimising the hydraulics of a planned system is to avoid the common mistake of oversizing. This is where pump

selection software plays a crucial role. It allows the user to access expert know-how in order to choose the correct pump, and to select systems according to commercial or technical parameters. Specialised IT tools, developed through practical experience, allow other details to be taken into consideration: for example, the consultant can calculate a piping system using a special module that takes into account not only energy costs, but also criteria such as price and efficiency.

Correct sizing is vitally important when it comes to the impeller. Compared with a pump whose impeller has – for commercial or manufacturing reasons – a fixed standard diameter, one with a diameter that has been matched to its operating point can achieve energy savings of several thousand pounds, as its performance is tailored to system needs.

Up to speed

Pump speed control offers by far the greatest savings potential. Something that is perfectly normal in other fields of application – matching power input to actual demand – is far from standard practice in many branches of industry. In practice, a detailed analysis of



▶ a pump's operating behaviour often reveals that it is not running at its optimum, energy-efficient operating point. A common cause of this is that the system is not operating under design conditions, either because of system oversizing or due to normal temporary variations in flow rate arising from system processes. If power input is not adjusted to demand via some form of system control, valuable energy is wasted.

Altering the speed means the pump's power input can be matched to the system's precise requirements. The industry offers a variety of technical options that allow energy consumption to be influenced via speed control. There is no need to add tolerances and safety margins when sizing the pump.

In the case of closed-circuit systems, energy savings of up to 60% can be achieved, depending on load profile.

Specific solutions

A way in which motors can be made more energy-efficient is to use standard frequency inverters, which can be employed in all kinds of applications and offer a variety of settings. They are typically used in systems that employ three-phase motors as drives.

Matching such devices to the characteristics of a pump requires in-depth knowledge of the hydraulic behaviour of centrifugal pumps. For example, energy-saving operation of variable speed motors is dependent on the ability to set the frequency inverter's voltage-frequency

curve to meet the system's requirement. After all, operating a conveyor belt loaded with gravel, which requires a high torque directly after the system has been switched on, is different from running a centrifugal pump which has a very low starting torque.

This is why pump manufacturers offer specific solutions with fully mounted and operational speed control units, featuring menu options that are matched to pump applications. Commissioning then only involves entering a few parameters specifically related to the application, such as the controller's response speed. The pumps and systems are protected by additional hydraulic functions, such as "dynamic pipe friction loss compensation" or "sensorless dry running protection", and warnings that signal if the pump is operating under low-flow conditions.

One advantage of the motor-mounted system, which allows frequency inverters to be added to any electric motor, is that it can be retrospectively fitted – a solution not possible using ready-made integral motors. And this can be done regardless of manufacturer or efficiency class. In addition, the system's interface allows it to be integrated into a process control system.

Up to six units can operate in parallel via field bus lines in master/slave arrangement, without additional hardware. The master pump sets the operating point that the other pumps are required to reach. This role is not permanently assigned to any one pump, so if

the master pump suffers a power cut, a slave pump can take over.

The use of high-efficiency motors – meeting the IE2 or IE3 efficiency classes – has increased recently and is being promoted by the EU. However, the measures prescribed by European Commission regulation 640/2009 focus only on asynchronous motors, and only at the nominal point of operation.

Out of sync

For the past 30 years, more and more applications have been including frequency inverters. Wherever an asynchronous motor meets a converter, the direct-on-line starting capability of these induction motors is becoming superfluous. So there is no longer a reason not to use synchronous technology. Synchronous reluctance motors now constitute a readily available alternative.

The benefit of these motors, apart from their superior efficiency at rated load point – meeting IE4 level – is their stable efficiency at part load, while containing no permanent magnetic materials at all. With synchronous reluctance technology, the achievable savings, with allowance made for the machines' actual capacity, are well above 10%. In practical terms, however, if all aspects of the energy efficiency concept are considered, savings of up to 75% are achievable. **CJ**

DANIEL GONTERMANN is head of competence center automation at pump manufacturer KSB

CMR FLOWGRID AIR VOLUME SENSOR

- Accurate average air volume measurement
- Multiple differential pressure sensing points
- Averaging pressure tank of the impact pressure
- Averaging pressure tank of the static pressure
- Suitable for bi-directional volume measurement
- Low velocity detection from 0.5 m/s
- Frame made of galvanised sheet metal
- Standard mounting flange 20mm
- Height manufactured in 100mm increments
- Width manufactured in 50mm increments
- Works with all CMR Transmitters and controllers
- CMR standard 24 month warranty
- 30 Years field application experience



CMR FLOWGRID

The FGG Flowgrid has been designed to measure air volume in ventilation ducts. The Flowgrid consists of a standard duct section with a length of 200mm and is available with a 30mm or (20mm) duct connection flange to suit standard galvanised duct work

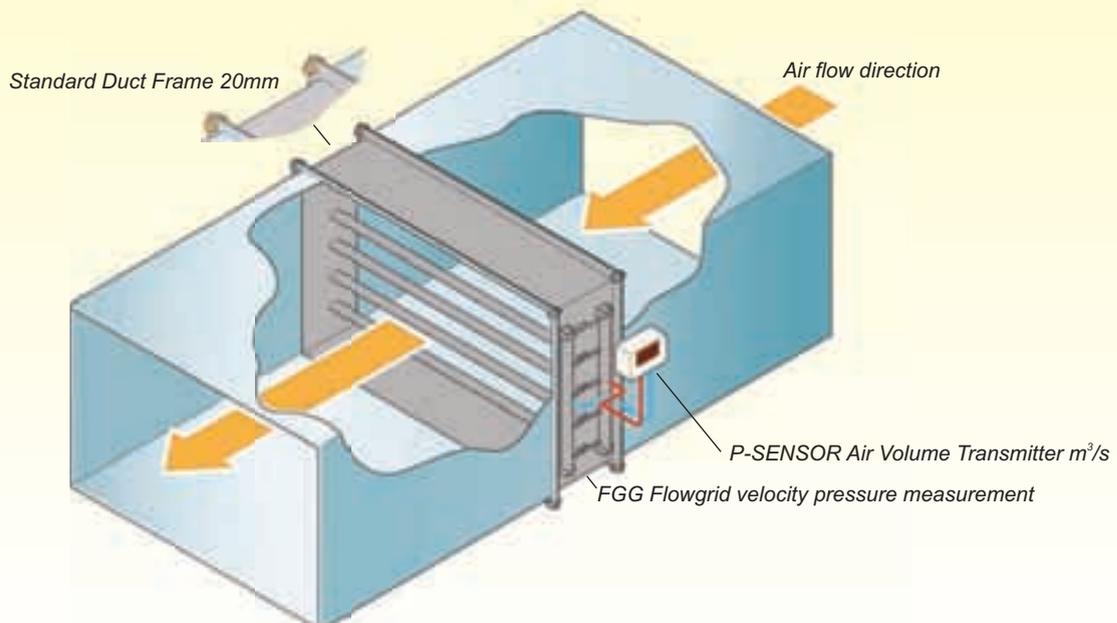
The CMR Ovalprobes are fitted across the internal duct frame area in predefined spacing. Each Ovalprobe has a number of pressure inlet points to measure the impact and static pressure at the same time and provide an average velocity measurement.

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

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

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

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





Many ventilation fans churn around for years carrying the extra weight of dirt built up on their surfaces

KEEP IT CLEAN

For too long, confusion has surrounded the issue of cleanliness in ductwork. A recently published British standard is set to change all that, says **Steve Liddiard**

The fact that 2013 is the European Union's 'Year of Air' has focused attention on the prevention of air pollution and, in terms of indoor air quality, placed the spotlight firmly on the need to address the dirty ductwork that blights many of our buildings.

A fresh, uncontaminated supply of air in buildings is crucial to a safe, comfortable and healthy working environment. Poor indoor air quality is estimated to be responsible for 2m 'disability-adjusted life years' (the number of years lost due to ill health, disability or early death) in the EU every year. Ensuring that ductwork is dirt-free can massively reduce this figure.

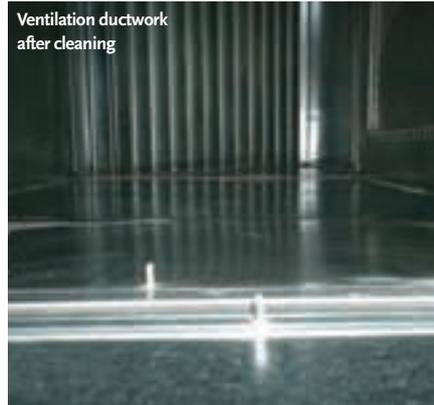
And ductwork cleaning is more than just a hygiene issue; done properly, it can also

save energy by reducing turbulence caused by the build-up of dirt and debris. Less turbulence means less energy is required to push air around the system. As contractors' organisation the Building and Engineering Services Association (B&ES) points out: 'Many ventilation fans churn around for years carrying the extra weight of dirt built up on their surfaces – once they are flowing freely again it takes up to 35% less energy to make them move. And clean equipment lasts longer because of reduced wear and tear on bearings.'

While all of this applies to existing ductwork, for complete protection it is also important to clean new installations. Too many new systems are handed over to building owners or occupiers in a sub-



Ventilation ductwork before cleaning



Ventilation ductwork after cleaning

standard state of cleanliness, leading to expensive and time-consuming remedial work.

The recently introduced standard BS EN 15780:2011 *Ventilation for buildings. Ductwork. Cleanliness of ventilation systems* tackles this by removing any ambiguity surrounding acceptable ductwork cleanliness. First published in November 2011, BS EN 15780 essentially standardises levels of cleanliness in systems, giving designers, installers, operators and occupants clear guidance, a published set of standards and a new vacuum test that can be applied to circular, as well as rectangular, ductwork. It details different classification levels for buildings depending on their intended use, and these determine the inspection frequencies for the ventilation systems within (see box, right).

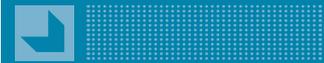
Despite the best efforts to protect ductwork from contamination on a construction site, it is impossible to guarantee that the ventilation system will remain clean in such a dusty environment. Extract systems are often left running during construction to remove the dust generated by the working environment. This is then deposited in the ductwork, where it combines with heat and humidity

in the ventilation system to produce an ideal breeding ground for germs that can then travel with impunity round the extract system.

That is why pre-commission cleaning is vital to ensure that a building's ventilation system is uncontaminated from the start. It is even more important in a hospital or other healthcare establishment. Before beginning a pre-commission clean, it is essential to survey the ventilation system to establish a baseline. After the cleaning, a second survey can ensure the ductwork has been cleaned to recommended levels.

The building services consultant has a crucial role to play here by stipulating in the specification that pre-commission cleaning is carried out, not only because of the practical considerations that have been outlined above, but also because it engenders good discipline on site and enhances the reputation of the entire construction team. As the B&ES points out: 'It is good to be clean, but it is even better to be seen to be clean.' **CJ**

STEVE LIDDIARD is managing director of System Hygienics. For further information about ductwork cleaning, please contact System Hygienics on 01323 481170 or visit our website at: www.systemhygienics.co.uk



THE NEW STANDARD IN A NUTSHELL

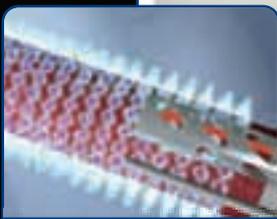
BS EN 15780:2011 applies to new and existing ventilation and air conditioning systems and defines the assessment criteria of cleanliness, cleaning procedures and validation of the cleaning's effectiveness. It outlines three standards depending on the use of the supply duct system:

- Low is for rooms with intermittent occupancy, such as storage and technical rooms
- Medium covers general offices, hotels, restaurants, schools, general working areas in hospitals, sport and exhibition buildings
- High is for high-quality offices, treatment areas in hospitals and laboratories

BS EN 15780 offers standards for newly installed ductwork by means of a vacuum test. The values it recommends for supply, recirculation and secondary ductwork are: low <math><0.9\text{g}/\text{m}^2</math>; medium <math><0.6\text{g}/\text{m}^2</math>; and high <math><0.3\text{g}/\text{m}^2</math>. For extract ductwork, it specifies: low <math><1.8\text{g}/\text{m}^2</math>; medium <math><1.8\text{g}/\text{m}^2</math>; and high <math><0.9\text{g}/\text{m}^2</math>.

The post-cleaning test cites an acceptable level of deposits as $0.3\text{g}/\text{m}^2$.

The standard also has newly defined limits set against trigger levels for existing ductwork. These differ from the guidelines set out in the B&ES's *Guide to Good Practice TR/19 – Internal Cleanliness of Ventilation Systems* (which is currently being updated). The values recommended by BS EN 15780 for existing ductwork are: low <math><4.5\text{g}/\text{m}^2</math>; medium <math><3.0\text{g}/\text{m}^2</math>; and high <math><0.6\text{g}/\text{m}^2</math>. For recirculation and secondary ductwork, it specifies: low <math><6.0\text{g}/\text{m}^2</math>; medium <math><4.5\text{g}/\text{m}^2</math>; and high <math><3.0\text{g}/\text{m}^2</math>.



High efficiency 360° burner

JS Humidifiers



Condair GS Gas-Fired Humidifier

- High steam outputs
- 65% less energy cost than electric humidifiers
- Low maintenance requirements

T: +44 (0)1903 850200
E: sales@jshumidifiers.com
W: www.jshumidifiers.com



Recognising the businesses, teams, products and projects that demonstrate engineering excellence in the built environment

Book your table

Winners announced on Tuesday 11 February 2014
Grosvenor House, London



- Celebrate achievements in building performance
- Network with over 700 high profile industry professionals
- Learn about the latest low energy innovations in building services engineering

Secure your place now to get the best seat

For more information and to book your table go to www.cibseawards.org



Headline sponsor



Sponsored by



Supported by





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. It will equally 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.

Providing safe fume cupboards while moderating energy costs

This module explores the application of variable volume fume cupboards and its energy reduction potential

Fume cupboards (also known as fume hoods) have a wide range of applications, from education through to research and manufacturing. But whatever the application, the function is the same – preventing airborne contaminants inside the fume cupboard from affecting the human operator. This is achieved by maintaining the positive direction of airflow away from the operator, as well as by diluting the contaminant in the cupboard. The movement and supply of conditioned air for fume cupboards consumes significant amounts of energy – several times more than that required for a similarly-sized general laboratory.

Increasingly, the designer and operator are seeking both to realise a safe environment and minimise the environmental and financial consequences of exhausting large volumes of conditioned air. This CPD will consider the application of variable volume fume cupboards as a means of reducing operating energy cost.

The fume cupboard

The fume cupboard is fundamentally a cabinet with a sash opening (a robust, transparent panel that traditionally slides vertically) on the front face for access, and an extract duct for removing contaminated air (Figure 1).

Typically, the user will have their body outside the working zone and their arms and hands within the fume cupboard, manipulating

vessels and materials that sit on a flat surface (often drained to a spillage tray) with a raised edge at the front. The measure of effectiveness is, in practice, quite straightforward – it is the ability of the user to operate in the fume cupboard while preventing any unwanted spill of the contents on the operator or the environment.

The successful operation of a fume cupboard is not only a result of appropriate design but also a direct result of the control and monitoring regimes. This is produced by a controlled flow of inward air, passing around the user, that is then removed through an extract system or

filtered and reintroduced into the space. The actual pattern of flow is affected by disturbances from the operator, draughts from within the room and other effects, such as jets from room supply air diffusers. ASHRAE¹ recommend that the velocity of any external disturbing air movement should be no more than half – and preferably kept to less than one third – of the design face velocity, to avoid interference with the proper operation of the cupboard. So a (fairly typical) operating face velocity of $0.5 \text{ m} \cdot \text{s}^{-1}$ could tolerate a maximum local disturbance air velocity of $0.25 \text{ m} \cdot \text{s}^{-1}$ before potentially affecting the inlet air flow regime.

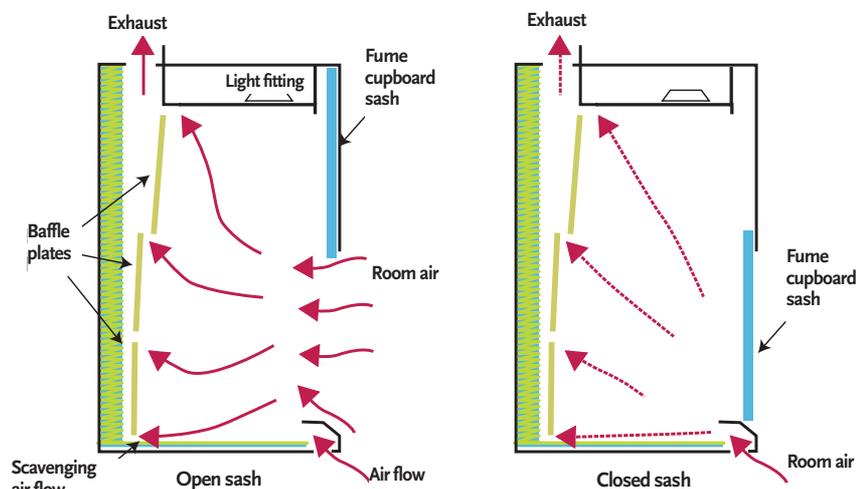


Figure 1: A variable air volume fume hood with vertical sash

➤ The fume cupboard extract must also work to scavenge consistently across the work surface, removing the contaminant; this is frequently assisted by baffle plates at the rear of the cupboard. The design and control must be such that, whatever the disturbance, the flow of air through the cupboard entrains the contaminant and removes it at a rate that prevents it spilling significantly into the occupied zone. The cupboards will be designed to draw air as smoothly as possible through the opening. The design of the cupboard itself (Figure 2) will be a specialist task, and whatever cupboard is installed, the flow patterns within it are likely to be complex – with eddy currents and flow reversal in places – but it is the inward flow that is key to maintaining the integrity of the system. BS EN 14175 *Fume cupboards* provides the standards appropriate for general use fume cupboards² but, as in this article, excludes those for specialised applications (for example, microbiological safety cabinets and those used for radioactive work). School laboratories are considered to have specific needs, and specific guidance is given in Building Bulletin 88, *Fume Cupboards in Schools*.³

The design of any fume cupboard installation requires properly integrated practices. It is not appropriate to design the mechanical ventilation system and then apply control packages with the hope of providing the desired environmental and safety control. The function and process of the system must lead the design, defining the control requirement (and eventual controls system) as well as other operational needs, including commissioning, maintenance and repair.

Make up air supply

The ventilation requirement to satisfy the occupants of a space in a typical laboratory is normally lower than the combined exhaust air requirement of the fume cupboards. To operate all the systems at constant volume would be inappropriate, as the demands from the fume cupboards are likely to be varying and intermittent, so it is both environmentally and financially unacceptable to run constant volume devices.

This is not only because of the fan power required, but also because any air that is drawn through the installation must be treated (heated/cooled/humidified and filtered) so that it maintains appropriate conditions in the occupied space. So, to reduce the supply volume flow rate, cupboards have been developed that use electronic controls to ensure containment while saving energy, by varying the supply flow rates to match the demand of the space and fume cupboards.

By incorporating exact positioning of the



Figure 2: Example laboratory VAV fume cupboard installation

baffles in the rear of the fume cupboard and horizontal sashes with sliding windows, variable air volume (VAV) fume extract systems can provide a far more energy-efficient method of control. The airflow rate is adjusted by measuring the face velocities across the open sash that will adjust the extract 'valve' (an air 'damper' – an example is shown in Figure 3) to maintain the integrity of the operating zone while allowing the face velocity across the opening to be at the required value. Such systems will typically allow set velocities of $0.35 \text{ m} \cdot \text{s}^{-1}$, adjustable up to $1.0 \text{ m} \cdot \text{s}^{-1}$.

Traditionally, it was not unusual to size the constant volume supply air systems based on a 60% operation diversity (to reduce the installation and operation costs). The air system was sized to supply this reduced amount to cupboards; this potentially meant that if more fume cupboards were in operation, the system may be starved of supply air. Consequently, the room static pressure could vary, causing problems with the integrity of the whole building ventilation system.

In conjunction with full variable volume supply, the extract flow rates of the active fume cupboard can be measured and added together to provide the set point for the supply air (with a small offset to keep the laboratory slightly negatively pressurised). Hence, the airside operating costs are directly related to the number of fume cupboards operational and their sash opening position.

When all sashes are in their closed position (with the system still providing a safe minimum extract volume), there is likely to be a requirement for minimum air change rate for ventilation in the laboratory, as well as to meet the requirements of heating and cooling. In this case, a general extract damper can be opened to increase the extract flow rate so that the supply air rate will rise to meet the requirements.

If, subsequently, the fume cupboards start to increase their extract rates, the general extract



Figure 3: A VAV valve complete with integral controller

damper will modulate to maintain the correct room pressure (and air flowrate).

If the room temperature control requires more air to meet the heating/cooling load, the general extract shall extract more – in turn, opening the supply air further to satisfy the requirement. At all times, the relative pressures are maintained to ensure appropriate air flow through the fume cupboards.

The low cost of variable speed devices (inverters) for fan control has encouraged the widespread adoption of VAV systems for fume cupboard installations. Having been designed and installed properly, successful operation is dependent on operator discipline and the fume cupboard control system.

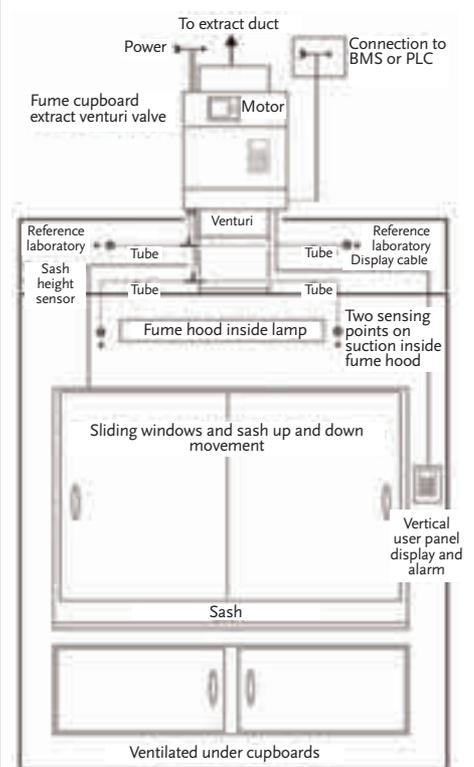


Figure 4: A VAV fume cupboard, with horizontal and vertical sashes

The schematic of the fume cupboard in Figure 4, read in conjunction with the overall system in Figure 5, provides an example of how appropriate control can be applied to provide a solution.

In this case, two air sampling probes are fitted inside at the top of the fume cupboard, adjacent to the light fitting, and two sampling probes are mounted on the outside top face of the cabinet.

The extract volume is measured with a venturi device built into the extract valve (damper) that provides a velocity pressure calculated to provide a volume measurement (in $m^3 \cdot s^{-1}$) using the venturi factor and the valve size.

The flow and, importantly, the velocity may be obtained from the simple flow equation for sharp-edged openings as:

$$Q = A C_d (2\Delta P \cdot \rho^{-1})^{0.5}$$

where C_d is a constant relating to the opening known as the coefficient of discharge

ρ is the density of air

ΔP is the pressure drop across the opening.

The average face velocity, v_f , across the sash opening area, A , is: $v_f = Q \cdot A^{-1}$ and so:

$$v_f = C_d (2\Delta P \cdot \rho^{-1})^{0.5} = C_d \Delta P^{0.5} (2 \cdot \rho^{-1})^{0.5}$$

and if the air temperature in the occupied zone remains roughly constant, the density, ρ , will stay constant, so this relationship may be rewritten as:

$$v_f = K_c \Delta P^{0.5}$$

where K_c is a constant that can be determined by testing the cabinet and measuring the flowrates when it is being commissioned.

The probes inside the cabinet are joined together to provide an average internal pressure signal and – used in conjunction with the pressure signal from the probes outside the cabinet and a knowledge of the cabinet flow coefficient and volume flow derived from the venturi – these are transformed into a velocity signal (by the controller) that is expressed visually on the control panel, and so adjustably controlled. This provides control over the face velocity without the requirement of a sash height position measurement or a sliding window opening measurement.

In the example system (Figure 5), to ensure fast system response to changes in sash position or required face velocity, the exhaust is drawn into an extract plenum that is maintained at a constant suction pressure by a constant speed extract fan and bypass damper. For example, if the sash was opened, the pressure would decrease in the fume cupboard control system, opening the extract valve to allow more air to pass through the fume cupboard. This, in turn, would create a decrease in static pressure in the extract plenum, so the fresh air bypass would close to maintain constant suction pressure. This would all happen within a few milliseconds.

At all times, the stack discharge velocity is kept at a preset value by varying the fresh air bypass.

The changes in exhaust air flow need to be balanced by the supply into the room. In this example, all extract volumes are measured and

added together to form the set point for the supply air (being monitored using a velocity grid – a fixed set of air static and velocity pressure probes) with an offset to maintain a slight negative room pressure relative to the corridor. As more supply air is required, the fan speed of the supply system is increased. If all the sashes are closed, then the supply system will be supplying the minimum requirement to ventilate the laboratory, so saving on heating, cooling, humidification and fan power.

There are requirements in BS EN 14175 for the clear, local, unambiguous indication of performance, together with appropriate alarms in the case of failure – this is integrated into the example system control panel.

Although simple in concept, the VAV fume cupboard system requires properly integrated and maintained sensing and control and, as with all proper HVAC design, should be designed holistically, taking the practical operating needs into account. The result should give a system that provides a more controllable cupboard face velocity and significant reduction in energy costs compared with a traditional constant volume system.

© Tim Dwyer, 2013.

References

- 1 2011 ASHRAE Handbook – HVAC Applications, Chapter 16, ASHRAE 2011
- 2 BS EN 14175-2003 Fume cupboards.
- 3 Building Bulletin 88, Fume Cupboards in Schools, Architects & Building Branch Department for Education and Employment, 1998

Turn over page to complete module ➤

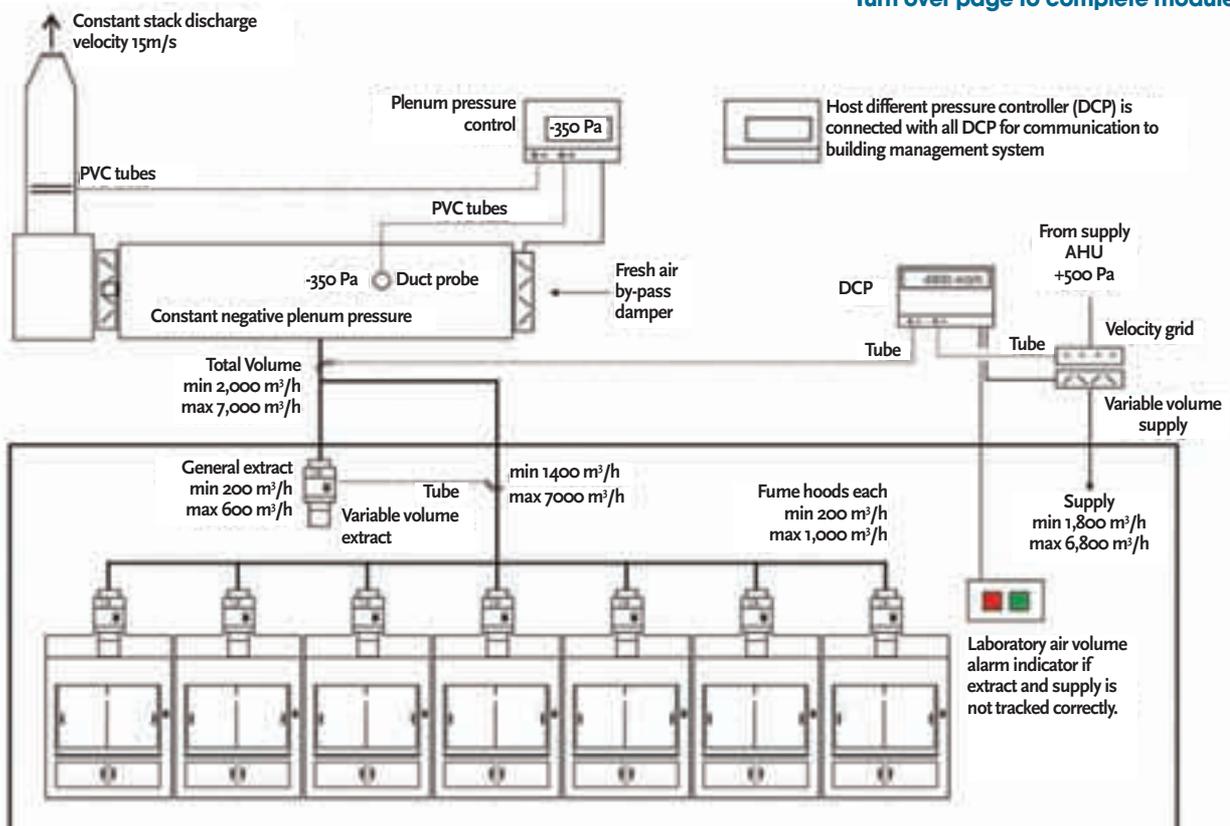


Figure 5: Example of VAV fume cupboard layout for a laboratory

Module 57

October 2013



1. What is the principal purpose of a fume cupboard?

- A To maintain a positive pressure in the laboratory
- B To provide specialist low-energy ventilation
- C To prevent contaminants inside the fume cupboard affecting the user
- D To ensure a minimum safe laboratory ventilation rate
- E To prevent contaminants from entering the external space

2. If the face velocity across the fume cupboard is $0.75 \text{ m}\cdot\text{s}^{-1}$, what is the limit of the local disturbance air velocity before the air flow regime may be adversely affected?

- A $0.05 \text{ m}\cdot\text{s}^{-1}$
- B $0.10 \text{ m}\cdot\text{s}^{-1}$
- C $0.15 \text{ m}\cdot\text{s}^{-1}$
- D $0.20 \text{ m}\cdot\text{s}^{-1}$
- E $0.25 \text{ m}\cdot\text{s}^{-1}$

3. Which current British Standard is the most appropriate to refer to when considering the proper design and selection of general-purpose fume cupboards?

- A BS 7258
- B BS EN 14175
- C BS EN 12469
- D BS 5726
- E BS EN ISO 7730

4. In the design of traditional constant volume fume cupboard systems, what was typically used as a diversity factor beyond which insufficient supply air may have been available?

- A 40%
- B 50%
- C 60%
- D 70%
- E 80%

5. In the example VAV fume cupboard, what sensors are used to determine and provide the signal to ensure correct face velocity?

- A Sash height positioning sensor and velocity grid
- B Two sets of pressure sampling points and extract venturi
- C Room pressure sensor and fan speed
- D Supply air velocity grid and extract venturi
- E Sliding window opening measurement

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 CMR, 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 Walsh, CIBSE, 222 Balham High Road, London, SW12 9BS

New B&Q store chooses Grundfos packaged fire suppression system

B&Q is the largest DIY and garden retailer in the UK with 350+ stores within its portfolio. The company is continuing to expand and recently opened a new store in Burgess Hill, Sussex. With a stock profile that encompasses around 40,000 lines – many of which are flammable – a state-of-the-art fire suppression system is a high priority for B&Q. This is why fire specialists Grundfos Pumps worked in conjunction with Alpine Fire engineers to develop a bespoke solution. They subsequently proposed a Grundfos Packaged Pump House solution that would meet the most stringent criteria. Grundfos introduced these systems in 2009 and each pre-packaged pump house is delivered to site complete with the pumps – in this instance, two LPCB high hazard diesel pumps – and with the necessary pipework, valves, wiring, heating, lighting and drainage, all packaged within an insulated steel enclosure and mounted on a structural steel baseplate.

● Email grundfosuk@grundfos.com, call 01525 850 000 or visit www.grundfos.co.uk



Atlantic boosts efficiency of university ring main system

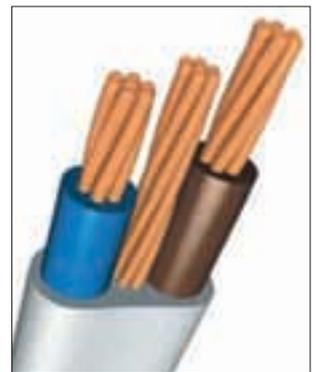
University College London has installed an innovative new boiler plant in its Torrington Place Building. The boiler house, supplied by Atlantic Boilers of Lancashire, operates throughout the year at 95°C flow and 75°C return, and contributes to the UCL ring main that serves scores of buildings, large and small. Normally these ring main temperatures do not allow condensing, but the Atlantic RT add-on condensing exchanger leads to year-round efficiencies of 92-97% GCV (102-107% NCV).

● Visit www.atlanticboilers.com or email info@atlanticboilers.com

Two decades of CableCalc Level P marked with a free version of new twin and earth calculations

To mark 20 years of CableCalc, Castline Systems has released a free version of its popular CableCalc program, which will calculate single-phase radial and ring circuits wired in twin and earth cable. It includes free technical support by email. CableCalc Level P is a fully working, unlimited-use version and provides far more than just simple volt drop calculations. CableCalc Level P can be downloaded from www.castlinesystems.com free of charge.

● Call 01293 871 751 or visit www.castlinesystems.com



The future is electronic balancing

Marflow Hydronics, partnering with Belparts, is bringing customers the latest innovation in water distribution systems – electronic balancing. Marflow Hydronics' new electronic balancing valve, called Dynamx, doesn't need the same high differential pressure to move the water around a system and instead lets water move where it needs to be in the most efficient way possible, all the time just controlling the flow, never requiring a large amount of pressure.

● Call 0845 643 9096 or email solutions@marflow.co.uk



Lossnay units offer easy-to-install single-room heat-recovery ventilation

Mitsubishi Electric has launched new members of the Lossnay family, with the VL-100(E)U5-E single-room fresh air units, which offer effective, energy-efficient mechanical ventilation with heat recovery (MVHR) in an easy-to-install system. The compact wall-mounted units are designed to answer the pressing need for fresh air in today's modern homes, now being built to stricter building regulations, which call for highly insulated buildings. These 'airtight' premises often need effective mechanical ventilation to combat the build-up of stale air. The Lossnay system helps achieve this, while recovering up to 79% of the heat energy from the outgoing air.

● Call 01707 282 880 or email ventilation@meuk.mee.com



Vaillant launches auroFLOW system

Heating technology manufacturer Vaillant has unveiled its brand new commercial Solar Thermal Drainback system, auroFLOW, which promises to improve the performance and lifetime of solar thermal systems, as well as reduce maintenance costs. Designed with commercial applications in mind (such as in hotels, schools and healthcare settings, which tend to require hot water throughout the day) the simple-to-install Vaillant Solar Thermal Drainback system consists of a collector array, pump, drainback vessel, heat exchanger and control.

● Visit www.vaillant.co.uk

Recycore reigns supreme at industry awards

Wavin has scooped top spot in the prestigious HouseBuilder Product Awards 2013 for its drainage products, manufactured using innovative Recycore



Technology. The company won the category for Best External Product and will now be put forward for the Best Overall Product award. The winning criteria included meeting cost and sustainability issues faced by housebuilders. Recycore Technology allows drainage products to be manufactured with at least 50% recycled content, while providing identical properties and performance to their 100% virgin material counterparts, and at the same cost.

● Email debbie.harber@leclick.co.uk or visit www.wavin.co.uk

Unique solution to service riser vents from Step on Safety

Service riser openings in buildings have long been the bane of the construction industry, as it is often unclear whether they are the responsibility of the main contractor or the mechanical/electrical contractor. Now, however, that no longer needs to be the case. Anti-slip flooring specialists Step on Safety, the UK's fastest-growing anti-slip flooring company, has developed Riserdeck, a unique lightweight riser floor system that uses the latest in durable and corrosion-resistant

composite materials, with high-strength, anti-slip GRP open mesh flooring.

● Call 01206 396446 or visit www.steponsafety.co.uk/products/riser-flooring/



Remeha launches bespoke rig system design and manufacture service

Building on the success of its existing rig system packages, Remeha Commercial has introduced a bespoke rig system design and manufacture service for its market-leading condensing boilers.

The new bespoke configuration service offers increased flexibility in floor-planning design through extended options that enable specifiers to match more accurately the desired heat output, whatever the constraints of the plant room.

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



LED High Bay with integrated power supply

Dialight's LED High Bay and Low Bay ranges for industrial applications are now available with new long-life power supply. With efficiencies up to 107 lumens per watt, the new power supply is available in 17,000-3,800 lumen output versions.

'This gives our customers up to a seven per cent increase in efficiency across the high bay and low bay portfolio and it's all backed by our comprehensive 10-year full performance warranty,' said Roy Burton, Dialight's group chief executive.

● Email sales-europe@dialight.com, call 01638 665 16 1 or visit www.dialight.com



Knauf Metal Sections simplify installing ceilings and partitions

Knauf Metal Sections are easily installed in any modern interior or refurbishment project to construct partitions and suspended ceilings in systems that are rigorously tested to meet a wide range of acoustic and fire protection requirements. Knauf Metal Sections offer designers a choice of configurations and performances that will fulfil the demands of the most complex projects and will be backed by a complete warranty as part of a compliant Knauf system.

● Email kd@web-response.co.uk or visit www.knaufdrywall.co.uk



Dynamic valve system can generate up to 50% energy savings for pumps

Dynamic valve specialist Frese is now on its third generation of pressure independent control valves, a solution which ensures heating and cooling systems have the correct balance during operation and precise temperature control. The valves, because of their precise control, can lead to up to a 50% saving on the energy a circulating pump consumes, and to a major reduction on energy bills for a building, as boilers and chillers work more efficiently.

● Call 01704 896 012 or email info@frese.co.uk



Perfect combination from MHS Boilers

Staff and customers at the new John Lewis at home and adjacent Waitrose supermarket in Ipswich, are benefiting from highly efficient heating and hot water, thanks to equipment supplied by MHS Boilers. The new purpose-built building has been installed with five 145kW THISION L boilers and a 3,000 litre INOX-MAXI calorifier – all of which have contributed to the building's BREEAM 'Excellent' rating. Stuart Watson, engineering manager at John Lewis Property Services, was responsible for the specification of the heating plant.

● Visit www.mhsboilers.com



Rehau Rauvitherm chosen for horse racing stables

Rehau Rauvitherm pre-insulated pipework has helped Sumcor Biomass to deliver a biomass-based district

heating system at one of Doncaster's leading horse racing stables. From a new central plant room housing a 200kW ETA wood chip boiler, 450m of Rauvitherm pipework is now distributing heat and hot water to three homes, a tack room, swimming pool, equine swimming pool and toilet/shower block. A valved branch in the pipework will allow for the system to be extended at a later date.

● Visit www.rehau.co.uk



Airflow launches enhanced online trade counter in website revamp

Airflow Developments has launched a new website that reflects its increased range of ventilation solutions and offers a new 'quick order' facility for trade customers. The new site takes into consideration the many needs of the UK ventilation market and demonstrates the breadth of Airflow's solutions. For example, the homeowner section looks specifically at the Green Deal and how vital ventilation is to the long-term success of highly insulated buildings.

● Email pradmin@cibcommunications.co.uk



Rinnai is top contender on the fitness scale

The newly built Hale Country Club and Spa in Cheshire chose a continuous-flow hot water system from Rinnai,

over all other types and makes and models. The five-star country club hosts all-encompassing health and fitness facilities, including luxurious indoor and outdoor wet areas, a selection of contemporary food and beverage offerings and a sumptuous spa. The 17 x Rinnai HDC1500i units feed executive soaker showers, poolside showers and changing room showers and the installation is a clear illustration of the sea change towards decentralised plant rooms.

● Visit www.rinnaiuk.com



Elta Fans involved in construction of 'outstanding' head office

UK fan manufacturer Elta Fans has supplied ventilation equipment for the highly sustainable and award-winning headquarters of The Co-operative Group in Manchester. 'One Angel Square' has received several awards for its striking aesthetics and is the most sustainable large office space in Europe. The building has been designed to deliver a 50% reduction in energy consumption, compared to The Co-operative's current Manchester complex and an 80% reduction in carbon. This will lead to a reduction in operating costs of up to 30%.

● Visit www.co-operative.coop, www.eltafans.com or www.eltaselect.com

Four-way boost for packaged plate heat exchangers

Commercial heating equipment manufacturer Lochinvar has launched a range of packaged plate heat exchangers (PHE). The LOK range comprises 11 sizes, offering hot water outputs from 872 to 9,544 l/h at 50°C temperature rise. Each model is available with either single or twin primary LTHW pumps. A key feature of the range is the enhanced four-port valve, which speeds up delivery of the hot water and improves system efficiency.

● Visit www.lochinvar.ltd.uk/LOK



Panasonic launches new wall-mounted PKEA unit

Designed to provide high-quality heating and cooling for offices and professional environments, including server and computer rooms (where inside room cooling is a necessity), Panasonic is pleased to announce the launch of its new wall-mounted PKEA units. Adding to Panasonic's successful domestic and commercial unit ranges, the new wall-mounted PKEA line-up delivers consistent heating and cooling through its technically advanced changeover system, even when outside temperatures reach as low as -15°C.

● Visit www.aircon.panasonic.eu



Remeha provides energy-efficient heating at Hendon Town Hall

Two Remeha Gas 310 Eco Pro condensing boilers have been installed at Hendon Town Hall – the Grade II listed pre-Renaissance building owned by the London Borough of Barnet and leased to Middlesex University – to reduce greenhouse gas emissions and fuel bills. The highly efficient Remeha Gas 310/610 Eco Pro range (outputs from 52 kW to 1,202 kW) delivers exceptional annual efficiencies of 109.35% NCV and ultra-low emissions of all harmful greenhouse gases, including NOx and CO₂. This is in keeping with the ethos of the University of Middlesex, which strives to minimise its impact on the environment and the local community.

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



Harmer SML chosen for M&S Flagship Store

Alumasc's Harmer SML cast iron soil and waste system has been installed at the new M&S flagship store at Cheshire Oaks Designer Shopping Outlet in Ellesmere Port.

Packed full of eco-credentials, Cheshire Oaks is the second-largest M&S store in the world, measuring in at more than 148,000 sq ft, spanning two floors. It was created using a number of low-carbon technologies, addressing several different areas of sustainability and helping the project achieve a BREEAM 'Excellent' rating.

The Harmer SML system forms part of a carefully considered rainwater management strategy that also includes an 80,000-litre rainwater management tank and sustainable urban drainage (SUDS). SML is a lightweight cast-iron system that is 100% recyclable, making it the ideal choice for the scheme, in which all of the materials used were either natural, or recycled.

● Visit www.harmerdrainage.co.uk



Next-generation ModuSat heat interface units

Evinox has recently announced the launch of their next-generation range of ModuSat Heat Interface Units for communal/district heating systems, designed and developed internally and manufactured in our new production facility. Building on the success of the existing ModuSat, the new range includes floor-standing units with 80-, 150-, 200-, 300- and 400-litre integrated hot water tanks, single and twin plate instantaneous units, and units that provide combined heating and cooling.

● Visit www.evinox.co.uk, call 01372 722 277 or email info@evinox.co.uk

The next big thing: Nextron from Ecoflam

Leading burner manufacturer Ecoflam has unveiled NEXTRON – a new range of monoblock commercial burners with outputs from 250kW to 11.2MW. Exclusively available through Ecoflam UK, the new burners are manufactured by sister company ELCO Burners, which has more than 80 years' experience in burner design and manufacturing. The new range is available in gas, light oil and dual fuel versions, making NEXTRON an excellent choice for a wide array of commercial applications.

● Call 01386 556 092



Big Foot Systems offers comprehensive solar support solutions for the most complex of solar projects

Big Foot Systems has expanded its comprehensive solar support range of non-penetrative frameworks, which provide a highly engineered solution for mounting photovoltaic and solar thermal panels on flat roofs. Reacting to the market's increased desire to be 'green', Big Foot offers frameworks for the most complex of solar projects and has the widest range of innovative solar support solutions available. In addition to its standard range Big Foot can tailor a bespoke solar solution to meet a project's specific needs.

● Email enquiry@bigfootsupport.com or call 01323 844 355



Klima-Therm becomes UK distributor for Rhoss

Klima-Therm has been appointed UK distributor for leading Italian air-conditioning manufacturer Rhoss. The agreement covers distribution of the manufacturer's full range of high-performance chillers, air handling units and fan coil units. Klima-Therm will also provide the factory-backed support for existing Rhoss installations. As part of the giant IRSAP group, Rhoss is a major European player with a revenue of £60m on chiller sales alone, employing around 400 people.

● Visit www.klima-therm.co.uk, email info@klima-therm.co.uk or call 020 8947 1127

New non-penetrative bridge for single ply membranes

Global fixings manufacturer EJOT is launching a new low cost multi-bridging system, developed specifically for flat roofs that are waterproofed with single ply membrane. The 'membrane friendly' EJObar has been designed to create a non-penetrative fixing base for an infinite range of applied systems – typically mechanical and electrical essentials, such as pipework and cable trays – through to lightweight solar PV and thermal installations. In general terms, almost anything that has to be secured to, or rest upon the roofing membrane, lends itself to this cost effective solution. EJObar comprises of a high quality membrane encapsulating a strong aluminium box insert. The profile is sealed tight by bonded endcaps and the product's strength has been fully Applitec tested. EJObar is available to buy off the shelf in five practical lengths: 0.15 m, 0.3 m, 0.5 m, 1.0 m and 3.0 m.

● Call EJOT UK's customer support team on 01977 687040 or visit www.ejot.co.uk



Get industry news from Ian's blog

Ian Harman, technical applications engineer at Marflow Hydronics, has introduced a new blog, using his wealth of experience to bring readers news relevant to them. With 25 years' experience in numerous areas of the construction industry, Ian has built up vast knowledge of how things work. He's responsible for providing the optimum solution for Marflow Hydronics' customer's projects, including liaising with co-suppliers, M&E contractors and the Marflow sales team.

● Visit www.marflowhydronics.co.uk/blog, email solutions@marflow.co.uk or call 0845 564 1555

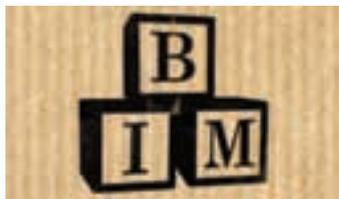


Remeha Commercial joins the BIM vanguard

A new added-value service has been launched by Remeha Commercial, offering its customers building information modelling (BIM) objects on all its condensing and 'super condensing' boilers. The free download is available from the company website, on registration, for easy integration into a specific model. The Revit files consist of 3D digital models of the products, with additional asset data on each boiler type, including heat outputs, carbon and NOx emissions, size and weights, service and maintenance areas and maintenance schedules.

'As a leading heating manufacturer, it is vital that we are embracing this level of design and customer service,' said Chris Meir, Remeha commercial's national sales manager.

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



Knauf rallies to the BIM revolution

Knauf is among the first to make Building Information Modelling (BIM) objects of its products available for download. BIM is set to revolutionise the way in which buildings are designed, constructed and maintained by assembling multiple data streams so that the design team can then generate a comprehensive virtual 3D model of a building. If the manufacturers' BIM objects are used at the concept stage when specifying, then many aspects of a project – such as its energy efficiency and thermal performance – can be analysed more accurately. From 2016, all government projects will have to use BIM to Level 2.

● Email kd@web-response.co.uk or visit www.knaufdrywall.co.uk

KE Fibertec is BIM-ready for 2016.

If you are looking to use fabric ducting on your BIM project, KE Fibertec has 1253 products to choose from in the MagiCAD database. The selectable products span the entire product range from low impulse systems for laboratories; through inject hybrid systems for classrooms all the way to Direjet long throw nozzle systems for swimming pools and warehouses. Fabric ducting is bespoke, so a range of lengths and diameters are selectable from the database. KE Fibertec is BIM-ready for 2016.

● Visit www.ke-fibertec.com or call 023 8074 0751

Titan Products launches TPZ-Net Zigbee wireless range to monitor a building's health

The TPZ-Net is a new range of wireless environmental products from Titan Products. Incorporating Zigbee wireless technology, the range creates extremely stable, self-healing mesh networking capabilities. The TPZ-Net range is designed to monitor temperature, CO₂, humidity, light and occupancy levels wirelessly, and to convey this information back to the Titan Products coordinator, where the information can be transferred onto a BACnet network or to other Titan product controllers, or I/O (input/output) devices.

● Visit www.titanproducts.com or call 0161 406 6480





SAV's CHP cuts carbon emissions for Caspian Wharf development

SAV Systems has supplied LoadTracker 15kW_e/30kW_{th} combined heat and power (CHP) units to several phases of the Caspian Wharf residential development in East London. Selected by MLM Consulting Engineers, a total of nine LoadTracker units have been installed across three central energy plant rooms and will deliver low-carbon heating to apartments and commercial units, as well as electrical power to landlords' areas at Caspian Wharf.

● Visit www.sav-systems.com, email info@mail.sav-systems.com or call 01483 771 910

Wieland Electric on-track at Birmingham New Street Station,

Wieland Electric has been a major contributor to the transformation of Birmingham New Street station by supplying its popular gesis 2, 5 and 6 pole pluggable installation system with integrated DALI to feed



lighting around the new concourse. The project has been more than three years in the making, with the first phase of the new concourse now completed and open to passengers. The regeneration project has seen a much-needed, bigger and brighter new concourse, with very much improved access to all platforms.

● Visit www.wieland.co.uk

Hamworthy heats up hotel on south coast

Hamworthy Heating's Purewell VariHeat boilers were the natural choice to enable a seamless heating upgrade at the Menzies Bournemouth Carlton Hotel, a four-star hotel on the east cliff of Bournemouth.



Cedar Green Projects Ltd installed seven Purewell VariHeat 180kW condensing boilers in place of the existing 16 Purewell Classic 70kW atmospheric boilers. The new boilers, plus five remaining calorifiers, provide the space heating and hot water for the entire 76-bedroom hotel and adjoining timeshare apartments, including a leisure club with indoor pool and spa and outdoor swimming pool.

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

Mitsubishi Heavy Industries Air Conditioning Europe launches a unique product to the UK and European markets

Q-ton is the only product of its kind capable of achieving hot water temperatures of 90°C with a coefficient of performance (COP) of four and above from ambient temperatures as low as -25°C. Launched by Mitsubishi Heavy Industries Air Conditioning Europe (MHIAE) the CO₂ technology heat pump is both cost-effective and eco-friendly (0% ODP). What really makes this product special is that it also maintains a COP above 2.3 at -25°C. Currently, MHIAE is the only manufacturer to supply this type of product in the UK and Europe.

● Email katelynn_sturgeon@mhiae.com or call 020 7025 2750



Domus thermal LABC approval

Polypipe Ventilation is delighted to announce that the approval criteria outlined by the LABC for the use of their Domus Thermal duct insulation solution has been extended. Domus Thermal is recognised by the LABC as an innovative (patent pending) system that radically improves the thermal insulation of ventilation ducting in domestic properties, preventing heat loss and contributing to a healthy-living indoor environment by eliminating the formation of condensation.

● Visit www.polypipe.com/ventilation or call 0844 3715 523



Mikrofill: a new addition to the Premiership

When their banqueting suite required a plant upgrade fit for the Premiership, Aston Villa FC turned to UK designer and manufacturer, Mikrofill Ethos Boilers. Wall-mounted stainless steel condensing

boilers, hot water loading cylinders and pressurisation equipment was supplied by Mikrofill and installed by leading mechanical contractor Lord Combustion Services. A bank of Rapide Extreme Loading cylinders were fed via three No Ethos stainless steel 60kW condensing boilers with a total modulation of 21 > 1 (270 > 12 kW).

● Call 0845 2606 020 or visit www.mikrofill.com

Danfoss celebrates 10 years of AB-QM valves with new High Flow models

Danfoss is celebrating 10 years since its AB-QM pressure independent balancing and control valve (PICV) revolutionised the HVAC industry with the introduction to the range of two new high flow models. The launch of 125mm and 250mm AB-QM valves means Danfoss now offers a complete collection of PICVs capable of handling any size of application from DN10 to 250.

● Visit www.heating.danfoss.co.uk or call 0845 1217 400



Air Conditioning



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 Handling



Manufacturer of high quality bespoke AHU's and fan coils.

Specialists in refurbishment and site assembly projects.

Expedient 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

CAD Services



CadEURO
Draughting Services

- Building Services Work Undertaken
- 2D Draughting
- 3D Autocad MEP
- Record Drawings
- Excellent Rates & Turnaround Service
- MEP BIM Services

Contact Stephen:-
T: 020 7043 7491
F: 020 7043 7493
E: cad@cadeuro.co.uk
W: www.cadeuro.co.uk

Controls/BMS/Controllability

Birling Consulting Ltd
Professional Services:

- BMS Design & Specification
- System design for controllable energy efficient operation
- Integration of Low Carbon Technologies
- Controllability Reviews
- PM, Reports, Guides, Advice, etc.

See: Taking Control - CIBSE Journal Dec 2011

Graham P Smith CEng MInstMC MCIBSE
T: 01548 830672
E: grahambirling@aol.com
W: www.birlingconsulting.co.uk

LST Radiators



Range of Low Surface Temperature radiator models to suit all budgets & applications

- Easy installation – ready assembled
- Attractive functional design
- BSRIA tested outputs and surface temperatures
- SteriTouch® antimicrobial surfaces as standard
- Energy efficient copper aluminium emitters

BSRIA
Call 01787 274135
www.autron.co.uk

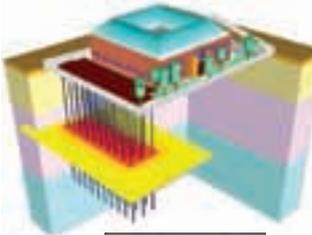
Energy Efficiency



Ground Source Heat Pump Installations

Meeting Renewables Targets

Tel: 02392 450889
Fax: 02392 471319
www.groenholland.co.uk



Certificate Number MCS 1201
Heat Pumps

Pump Packages



LEADERS IN FLUID PUMPING EQUIPMENT AND CONTROLS

- Water Pressure Booster Sets
- Tank Level & Temperature Controls
- Sealed System Pressurisation Units
- Bespoke Design Service
- Water Storage
- Energy Efficient
- Hydraulic Shock Control

Head Office: 01206 215121
Manchester: 0161 226 4727
www.aquatechpressmain.co.uk

Tenders



Retained Energy Management Service Contract

Expressions of interest

The University of Hertfordshire is seeking an energy management consultancy to provide a Retained Energy Management Service covering the following broad scope:

1. General energy management advice and support;
2. Utilities management;
3. Carbon reduction projects;
4. Legal and other compliance; and
5. Stakeholder awareness.

The University is committed to reducing its environmental impact and has a Carbon Management Plan, which sets rigorous targets for reducing carbon emissions from owned buildings. We are looking for a consultancy to work with us to deliver sustainable energy management over a contractual period of two years with an option for an additional year.

We are looking for a consultancy to provide one regular point of contact who will be a key member of the University's Infrastructure and Sustainability team within the Estates, Hospitality and Contract Services department. The regular contact will be expected to be on site a minimum of 7.5 hours for six days per month and for Monday to Friday remote telephone and email contact.

The University will be conducting a competitive tendering exercise of suitable service providers over the next few months. If you believe your company can deliver a high standard of service in all of the areas of work covered within the above scope please demonstrate your suitability by completing the pre-qualification questionnaire (pqq) documentation on the University's e-tendering site In-Tend, access details as below.

- Website URL: <https://in-tendhost.co.uk/universityofhertfordshire>
- Click on "Current tenders" link to view the project, express interest and register your company on the site (this is free)
- As soon as your registration details have been accepted you will receive login details to allow you to access the secure area of the site using the same URL as above.
- Click on "My tenders" to view the pqq documentation
- Completed pqq's and supporting information should be uploaded and submitted to the University via the In-Tend portal by the deadline of 12 noon on 18th October 2013.

Service providers deemed suitable will then be invited to participate in the tender process.

For an informal discussion of the role please contact Katherine Mayfield, Sustainability Manager, University of Hertfordshire, k.r.mayfield@herts.ac.uk.



For a confidential chat,
Call us **8am to 8pm**

Technical Recruitment Specialists

Senior Mechanical Design Engineer | Leeds
£37,000-£40,000 Plus Package

This UK based pure building services consultancy are currently looking for a Senior level Mechanical Design Engineer to join them, with a view to becoming the Associate Mechanical Engineer relatively quickly, due to retirement. The consultancy are renowned for employing only the best in the industry, and are known to be always "stretching the boundaries" of building services design. Candidates should have at least 7 years' experience within a building services consultancy, hold an HNC or Degree level qualification in a relevant subject and have experience within the commercial, education, healthcare and leisure sectors.

Senior Electrical Design Engineer | Buckinghamshire
£40,000-£45,000 Plus Package

Our client, a leading firm of Building Services Consulting Engineers working across a wide range of sectors, are on the hunt for a Senior Electrical Design Engineer to join their team. You will design and manage the implementation of Electrical Building Services to ensure they fully meet the client's requirement, and that projects are delivered within budget and on programme. The successful candidate will ideally be of degree caliber (electrical engineering or similar relevant discipline,) and have at least 5 years' of strong relevant experience in either the Residential, Retail or Leisure sectors.

Senior Mechanical Design Engineer – Associate Designate | London
£50,000 Plus Car Plus Package

We are representing a rapidly expanding international Engineering consultancy, whose office near Kings Cross in London is expanding after successive framework and project wins. The consultancy is currently looking for an Associate level engineer to lead small mechanical teams on Workplace/ Offices, Residential and Aviation. The practice has an enviable reputation for being a fun and exciting place to work, and projects are high profile and technically challenging. Once the successful candidate has demonstrated a good ability, you will be given the opportunity to build your own multi-disciplinary team. Candidates should ideally have: You must be able to demonstrate at least 7 years' experience working in a Consultancy / Contractor environment; You must have an HNC, HND, BEng or MEng degree in relevant engineering discipline, and be chartered or working to chartered status.

Contact: george@conradconsulting.co.uk | 0203 159 5387
Find more jobs online at www.conradconsulting.co.uk

Energy Engineer



Resources & Energy | London based

Strutt & Parker is an independent UK property partnership with a network of over 50 offices throughout the UK.

The Resources & Energy team is a multi-disciplined and relatively new business line within Strutt & Parker based in our City of London office but undertaking work across the UK. With steady growth within the industry and also within the team and client base we are seeking a further Energy Engineer with an electrical bias to support this growth.

Primarily the role will be to provide a professional service within the Resources & Energy team, advising on solutions for energy efficiency and renewable energy generation.

The work will focus on Mechanical and Electrical systems across a range of property types including rural property, residential property, offices both out of town and city centre, retail, industrial buildings and warehouses.

Project management experience in developing and implementing renewable energy and energy efficiency projects is essential. Experience of negotiation with District Network Operators is desirable.

Interested parties requiring further information should contact:

Angela Moffett

Strutt and Parker LLP, Resources & Energy

T: 020 7318 5116 E: angela.moffett@struttandparker.com



UNIVERSITY OF
LIVERPOOL



Facilities Management

Senior Project Engineer (Mechanical)

£37,382 - £47,314 pa

You will have relevant experience of designing and procuring mechanical building services, ideally with a strong basis in successful project management of new mechanical installations in complex and highly serviced environments, such as research laboratories.

You will lead a small in house team of multi-discipline consultants to co-ordinate the work of the University's Framework Consultants and Contractors ensuring all projects are completed within the agreed budgets and timescales and that they meet the initial design brief objectives. You should have a degree (or equivalent qualification) and professional experience in a relevant engineering discipline. The post is available for three years. Job Ref: A-504984/CIBSE

Project Engineer (Mechanical)

Job Ref: A-581685/CIBSE

Project Engineer (Electrical)

Job Ref: A-581686/CIBSE

£31,331 - £36,298 pa

Working as part of the in-house Design Group, you will have considerable experience of designing and procuring either mechanical or electrical building services, ideally with a strong basis in successful project management of new mechanical/electrical installations in complex and highly serviced environments, such as research laboratories. The ability to establish effective working relationships with a wide range of stakeholders and to foster a culture of project delivery excellence is essential. You will co-ordinate the work of the University's Framework Consultants and Contractors by ensuring that all projects are completed within the agreed budgets and timescales and that they meet the initial design brief objectives. You should be educated to NVQ4/HNC level (or equivalent professional experience) in a relevant engineering discipline and preferably be a member of a professional institution. The posts are available for three years.

Closing Date for all posts: 31 October 2013

For full details, or to request an application pack, visit www.liv.ac.uk/working/job_vacancies/ or e-mail jobs@liv.ac.uk Please quote job ref in all enquiries.

COMMITTED TO DIVERSITY AND
EQUALITY OF OPPORTUNITY





Mott MacDonald

Shaping city skylines

We've created some of the most commercially successful and iconic structures of the 21st century. We're currently recruiting talented and experienced mechanical and electrical building services engineers to join teams in:

**Aberdeen | Bristol | Cambridge | Croydon
Edinburgh | Glasgow | London | Newcastle**

Our innovation and excellence has secured us numerous awards, including Building Magazine's Engineering Consultant of the Year 2013.

To find out more about our career opportunities, visit www.careers.mottmac.com

Mott MacDonald is an equal opportunities employer

BNI.RECRUITMENT@MOTTMAC.COM

MOTTMAC.COM



Mechanical Design Engineer | West London | to £35LTD | ref: 4045

A busy, medium sized M&E consultant requires a contract Mechanical Design Engineer to work on a variety of prestigious projects. Previous large scale commercial office experience is essential. Long term opportunity!

Electrical Associate/Associate Director | West Mids | to £58K | ref: 3988

A world renowned multi-disciplined consultant requires an Electrical Associate with excellent leadership and management skills. Ideal candidates will be Chartered and have experience working on labs and healthcare projects. Excellent opportunity for career progression!

Snr/Prin Mechanical Engineer | London/Hamps | to £32LTD | ref: 4041

Our client is a busy blue-chip M&E contractor. Candidates will join their open-plan, vibrant office and work on a variety of projects including schools and data centres. This is a client facing role.

Electrical Design Engineer | London | to £35LTD | ref: 4013

Our client is a leading M&E consultant working on a number of hotel and private residential developments at stages D-F. Candidates will have proven experience working on projects at detailed design stage. Long term contract opportunity!

Project Director | London | to £65K+ | ref: 4138

Our client, an award winning consultant, is looking for a Mechanical Project Director to work on a major stadium project based in the UAE. Ideal candidates will be Chartered and have experience working on Middle-Eastern projects. Some international travel is anticipated.

Principal Electrical Design Engineer | London | to £50K+ | ref: 4167

A market leading M&E consultant with a full order book of major rail projects is looking for a Principal Electrical Engineer to join their established team. You will need previous hands on design experience working to Network Rail or LUL standards and be Chartered, or working towards.

t: 02392 603030

**e: cv@blueprintrecruit.com
www.blueprintrecruit.com**

b-a-r beebey anderson recruitment

Contract Senior M&E Design Engineers

£30 - £32 p/h, London

Our client is currently involved in multiple CAT A & CAT B commercial office fit out projects, and are looking for senior level mechanical and electrical engineers to take lead roles on projects, manage design teams, and attend design meetings. The successful candidate should possess a minimum of 3 years commercial fit out experience, including delivery of CAT A or CAT B commercial schemes. BAR 1402/JA

Mechanical Design Associates

£58k + Benefits, London

Our client is a global multi-disciplinary consultancy to the built environment that are currently seeking 2 x Mechanical Design Associates on a permanent basis to join their flourishing London division. You will be required to drive innovative and environmentally focused design on a variety of projects primarily ranging across the commercial & residential sectors. You will be a chartered engineer and have a proven track record in managing design teams, leading large scale multi-million pound projects, delivering them on time and within budget. BAR1408/TA

Electrical Associate

£55 - £65k + Benefits, London

A multidisciplinary consultancy established for over 40 years are seeking an Electrical Associate for a central role within their Building Services Engineering division. You will be recognised at Principal / Associate level and demonstrate extensive experience leading projects, developing design from concept, and managing engineers from graduate to senior level. You will be responsible for managing clients, developing relationships with external architects and contractors whilst consistently delivering design and consultancy services. BAR1404/CB

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

Thinking of your future

www.b-a-r.com



Critical Services Technicians

Accelerate your career in an exhilarating environment

Johnson Controls Global WorkPlace Solutions is a leading global provider of integrated facilities and corporate real estate management.

We are recruiting new opportunities for Critical Services (Data Centre) Technicians in Cumbernauld, Manchester, Warwick, Bristol and West London.

If you are interested in joining an organisation where ingenuity and excellence are welcome or know someone who could be interested in looking for their next challenge, please visit our website to apply online at www.johnsoncontrols.co.uk/careers. Alternatively email your CV to ukcareers@jci.com quoting the job title and location.



8281a0713

ALL GOING TO PLAN 'A'

Marks & Spencer has cut energy use in its stores by a third, and has just opened the first LEED Platinum high street shop in India. **Munish Datta** explains how the retailer's plans are coming together



Marks & Spencer's Plan A sustainability programme has led the retailer's buildings to become 31% more energy efficient and 27% more water efficient, while all of its waste is now diverted from landfill. Over the past six years, M&S has become an industry leader in sourcing sustainable materials and launched award-winning sustainable retail stores in Sheffield, Stratford, Cheshire Oaks and recently New Delhi.

How much have you saved during Plan A?

There are two major programmes: the retrofit energy efficiency scheme, introduced in 2007, which has made us 31% more energy efficient – against a 2006/7 baseline – and saved us £70m cumulatively; and our focus on the carbon attributable to refrigerant gas emissions, which we've reduced by 60% since 2006/7.

What energy-saving initiatives have been most successful?

At the start of the programme in 2007, we undertook several experiments to test technologies, including lower energy lighting, improved building control systems, recommissioning of refrigeration and upgrading variable speed drives. We quickly established 50 low-energy stores, which enabled us to group these technologies and apply them efficiently.

With renewables, while we have a number of biomass, CHP and solar thermal installations, our very prominent urban high street estate gives us a feasibility challenge, as onsite generation works best in big, out-of-town warehouses. Our strategy has been a mix of onsite and offsite

Our very prominent urban high street estate gives us a feasibility challenge, as onsite generation works best in big out-of-town warehouses

generation, with 23% of our 100% green energy coming from small-scale offsite generation. We want to grow that considerably by 2020 and, as part of that mix, we want some of our energy to come from our own sites.

How do you monitor energy use in M&S stores?

All our buildings have meters, which measure our energy use on a half-hourly basis. Our store colleagues have access to this information as they are best placed to influence consumption downwards. They are also incentivised to reduce energy use. Some of our stores are sub-metered in great detail so that we can analyse forensically where energy is used and influence better energy management.

How is Plan A communicated to M&S employees?

We established the role of our store 'Plan A champion' in 2008 and these individuals are great at galvanising their colleagues. Another successful initiative has been our 'Captain Energy' internal communications campaign, which has made the relatively dry subject of energy efficiency relevant to our 70,000 store employees.

How do you ensure suppliers meet performance targets?

We have integrated Plan A requirements into all of our pre-qualification, supplier selection and supplier KPI measurement processes. We have also developed a suite of guidance programmes, ranging from sustainable construction to community engagement. On a macro scale, our annual Plan A Conference

gathers 1,200 delegates from our global supply base to exchange best practice. This year we were lucky to have former US vice-president Al Gore as a guest speaker.

What are the environmental drivers in India?

The property industry and government legislative landscape in India is regional and relatively immature in terms of its approach to sustainability, which puts a lot of pressure on clients like us to drive the agenda.

The emphasis on energy management is also different – the issue in many shopping malls and hotels is about energy security due to hugely growing demand not being matched by supply. However, more and more clients are demanding sustainable buildings, with 1.45b ft² of green buildings completed in India. Last year, the second M&S store to be LEED-certified opened in New Delhi and achieved Platinum status – the first high street store to do so in India.

Have you looked at achieving resource efficiency in building services?

We have been focused on resource efficiency in architecture and are now starting to look at what this means for services, too. There are many untapped efficiencies to go after. There is also an intrinsic link between sustainable building design and resource efficiency in services, which will require a joint approach from architects and engineers.

● **MUNISH DATTA** is head of Property Plan A at Marks & Spencer

Events & training

NATIONAL EVENTS AND CONFERENCES

What colour is your building?

3 October, Manchester
Don't miss the chance to see David Clark, Cundall's global sustainability partner and author of *What Colour is Your Building?* speaking on the whole carbon footprint of buildings.
www.cibsenw.co.uk/events

CIBSE Young Engineers Network National Ball

5 October, Nottingham
The annual Young Engineers Network National Ball, with drinks reception, sit down dinner and after dinner entertainment.
www.cibse.org/yen

CIBSE Young Engineers Awards 2013

9 October, London
The winners of the CIBSE ASHRAE Graduate of the Year and Employer of the Year awards are announced at the Institution of Mechanical Engineers (IMechE).
www.cibse.org/YEA2013

Membership evening

14 October, Berkshire
A membership workshop hosted by the HCNW region, giving advice for preparing or enhancing your applications,

as well as informing mentoring services.
www.cibse.org/events

CIBSE Annual Lecture and half-day seminar

31 October, London
The ever-popular event returns, guest speaker Peter Madden discusses 'Innovating for the city of the future'. A half-day technical update seminar runs before the lecture.
www.cibse.org/lecture2013

CIBSE GROUPS AND SOCIETIES

For more information visit
www.cibse.org/events

Legionella Control: Public Health engineering design considerations

1 October, London
An evening technical event with a presentation from David Harper.
www.cibse.org/sophe

WIBSE workshop pilot

2 October, Liverpool
A workshop event from the Women In Building Services Engineering network, delivered in conjunction with Construction Equality.
www.cibse.org/events

SLL Lighting Code 1 (LG1) - Lighting the industrial environment

2 October, Birmingham
An evening event from the West Midlands region.
www.cibse.org/events

Part L Update

8 October, Newcastle
A free event from the SLL with a Part L 2013 update delivered by Paul Decort from Departments for Communities and Local Government.
www.cibse.org/events

Sustainable Materials in Buildings

9 October, Leeds
CIBSE Yorkshire region hosts a technical event teaming up with CKE and Green Vision to examine sustainable materials in buildings. The event features presentations from Skanska, Mott MacDonald and UCL.
www.cibseyorkshire.org

The Shard 'How the building services were made to disappear'

10 October, London
Featuring a presentation from David Healy, Arup's associate director and MEP team leader for the Shard. David will share the ground-breaking techniques used on the Shard's mechanical services.
www.cibse.org/events

Museum and Gallery Lighting

15 October, London
The SLL, in preparation for the new *Lighting Guide 08: Museums and Galleries*, gives an overview of the changes brought about by the new guide.
www.cibse.org/events
2013 International

Lighting Symposium

18 October, Kowloon, Hong Kong
A symposium, organised by the Hong Kong branch, for International experts and industry participants to discuss key issues and new trends in lighting technology.
www.cibse.org.hk

The Green Deal

22 October, Colchester
The Energy Performance Group host an event featuring guest speaker Dr Andrew Geens
andrew.saville@armville.com

CPD TRAINING

For more information, visit www.cibsetraining.co.uk or call the events team on 020 8772 3660

Introduction to Combined Heat and Power (CHP)

2 October, London
Sanitary and rainwater drainage design: BS EN 12056
8 October, London

Developing facilities management skills

9 October, London
Implementing an energy management system to ISO50001
10 October, London

Fire sprinkler systems: Design to BS EN 12845
17 October, London
Air Con 1: Comfort, climate and heat gains

18 October, London

Applying for the RHI, what you need to know
22 October, Manchester

Metering requirements - RHI
23 October, Manchester

Introduction to Electrical Services in Buildings
24 October, London

Delivering operationally ready buildings
28 October, London

HSE Guidance on Legionella Control
6 November, London

Legionella Control: Role of the Responsible Person
7 November, London

ENERGY ASSESSOR TRAINING

For more information visit www.cibsetraining.co.uk/energyassessor

CPD - EPC conventions
1 October, London

ISBEM Training
2 October, London

CPD - Writing a comprehensive and compliant A/C report
8 October, London



CIBSE Annual Lecture and Seminar

31 October 2013, London

As detailed in the September *Journal* (page 13), the CIBSE Annual Lecture takes place on 31 October with guest speaker Peter Madden, the newly appointed chief executive of Future Cities Catapult, speaking on the subject of cities and the impact of climate change.

Ahead of this lecture, CIBSE will also be delivering an important seminar featuring the latest building services technical updates and innovation in building performance.

Case studies from Max Fordham (The Hive in Worcester) and Buro Happold (1 Angel Square in Manchester, left) will demonstrate best practice and innovation in low-energy buildings. This presents an opportunity to learn how Max Fordham delivered a challenging brief, which required 50%

reduction in carbon emissions on the 2006 Part L Building Regulations. Buro Happold utilised energy models to show 1 Angel Square's potential to achieve a DEC A rating and how 3D BIM technology is being adapted for post occupancy use.

The seminar concludes with guest speaker Mark Bew, chairman of the UK BIM Task Group. Bew will provide an introduction and update to the UK government BIM Strategy and what the future holds for BIM within the building services industry.

Both events promise to deliver a lively debate and offer fantastic networking opportunities.

For more information and to book a place, please visit www.cibse.org/lecture2013



DEEP GREEN ENGINEERING

Elementa Consulting is a member of Integral Group, which is an interactive global network of design professionals collaborating under a single deep green engineering umbrella. We provide a full range of building envelope, system design and energy analysis services, with a staff widely regarded as innovative leaders in their fields. Located in two offices within the UK and supported by eight offices across North America, along with an international network of affiliates, our passion for sustainable design runs deep.

Far from being ordinary, we foster a **dynamic work environment** where you can build your career or lead within your area of professional expertise. Our team is dedicated to creativity and innovation a key part of this being our staff development and **on-going career development**.

Interested in becoming part of a global deep green focused engineering consultancy delivering high quality integrated built environment and system design?

Elementa are looking to bolster our core staff at both our London and Oxford offices with **immediate and long term vacancies**.

We're looking for:

- **Principal & Senior, Mechanical and Electrical Sustainability Engineers**
- **REVIT designers**
- **CAD Technicians**
- **BREEAM Assessors**

That said if you feel you can add something to our growing organisation please get in contact.

Visit: www.elementaconsulting.com or

Email: careers@elementaconsulting.com

No agencies please

22 23 24 25 26 27 28 29 30



WE CAN HELP YOU FIND YOUR PERFECT JOB

JOBS BY EMAIL

- Be the first to receive your perfect job straight to your inbox. To sign up simply;
- Enter your name and email address
 - Choose the sector, salary and location you would like to work in
 - Create up to 5 different tailor-made alerts

CV UPLOAD

Upload your CV and complete your jobseeker profile to increase your chances of being found for your perfect job. No need to go through hundreds of job adverts, just fill in your profile and let employers do the work.

www.cibsejournal.com/jobs



We are Recruiting....

Are you a motivated and enthusiastic engineer?

Kaizenge is a dynamic team of consulting building services engineers, who continually strive to improve and apply technological solutions within the built environment.

Mechanical and Electrical Engineers, London/Bristol - Permanent

We are seeking engineers with between 3-10 years experience that are keen to develop and broaden themselves. The selected candidates will assist in the preparation of engineering solutions for a range of national and international projects, taking forward a high analysis approach for low energy solutions. Our multi-sector projects range from pre-planning advice to detailed design and construction stage services.

BIM/CAD Manager, London - Permanent

An exciting opportunity for a highly motivated applicant to develop BIM and CAD standards for a growing dynamic company. The role will include training of our design engineers to produce their own BIM models with the aim of the models being used by our FM company. Applicants are to have management, Autodesk Revit MEP and AutoCAD experience. An engineering background will be advantageous.

We offer competitive salary and benefits, along with a number of development opportunities.

Visit our website for further information.
Apply to recruitment@kaizenge.com

www.kaizenge.com



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.

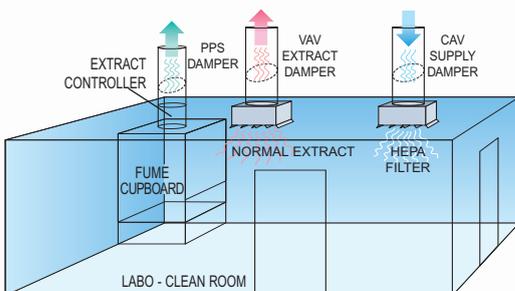


DPM PRESSURE SENSOR

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.



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



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-propylene 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