

CIBSE JOURNAL

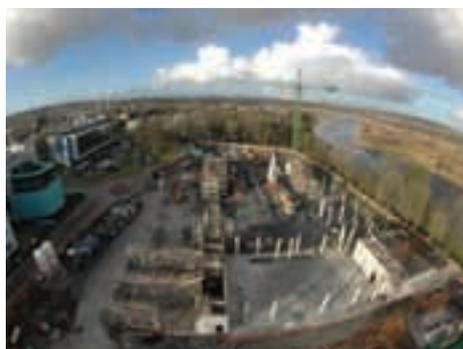
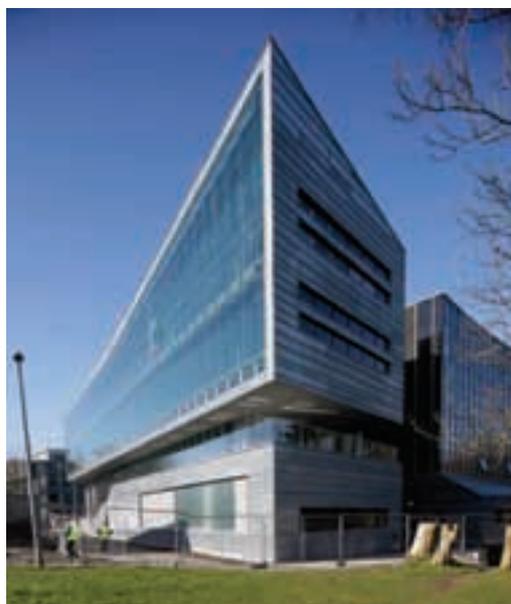


The official magazine of the Chartered Institution of Building Services Engineers

January 2012

AN IRISH EDUCATION

ENGINEERING STUDENTS LEARN FROM ON-SITE INNOVATIONS



CIBSE BUILDING PERFORMANCE AWARDS 2012

TO FIND OUT THE SHORTLISTED ENTRIES AND BOOK A TABLE AT THE AWARDS NIGHT, TURN TO PAGE 16

SEEKING FURTHER DIMENSIONS
BUILDING INFORMATION MODELLING

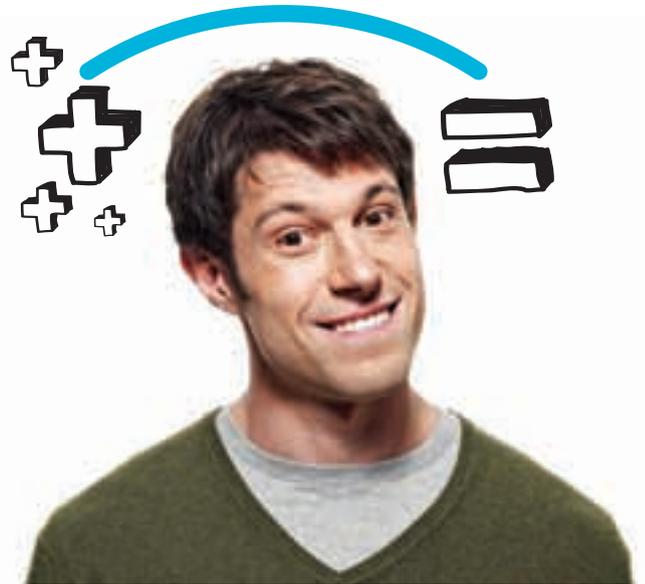
AIRING THE TASK FOR SCHOOLS
CHALLENGES OF NATURAL VENTILATION

THE RISE AND RISE OF BIOFUELS
FLUE DESIGN AND INSTALLATION

I've seen how to build efficiency into my buildings



If I save energy, I save carbon and save money



I've found 100's of new energy efficient solutions



I'm not sure how to make my buildings more energy efficient



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'Too often, key decisions are made with little consideration of how these will affect actual building performance'

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A momentous 12 months awaits

Was 2011 the year when Britain had the 'greenest government ever', to quote ministers? Between them the departments for business, communities, and energy and climate change worked hard at taking the energy-efficiency agenda for the built environment forward – only to be undermined by the Treasury, which let the whole construction industry down by refusing to include commercial Display Energy Certificates in the new Energy Act.

This omission – along with other policy let-downs – prompted an angry pre-Christmas open joint letter from several industry leaders, including the CIBSE president (see News, page 10).

The concerns raised in this stinging missive are enough in themselves to consign the government's 'greenest ever' claims

to the dustbin. But it is also important to recognise that there are many key policies still to be brought to fruition, and that this will offer the industry some scope for pushing the changes in the right direction.

As well as the Green Deal – which needs much fleshing out in coming weeks and months before its autumn launch – a consultation on possible revisions to the Building Regulations in 2013 is due shortly.

Further changes being brought in this year under the European Performance of Buildings Directive will also have an impact.

There's no doubt that these developments will affect the whole built-environment supply chain, including manufacturers, contractors and clients, among others. So this really does need to be a year when institutions, groups and leading professionals across the sectors work together to collaboratively shape this fast-moving policy landscape.

The joint letter mentioned above is one small but significant sign that this is already happening. And, with Part L 2013 waiting in the wings, there's no doubt that 2012 could prove to be a momentous year, although it is unlikely to be the greenest.

Bob Cervi, Editor

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In Brief

REFURBISHMENT FUND

More than £35m in government funding has been allocated for the refurbishment of older homes. Housing Minister Grant Schapps scrapped Pathfinder, Labour's housing market renewal programme – which led to many Victorian houses being demolished – when he came to power. Councils will have to match the government funding on offer.

www.communities.gov.uk

BOOST FOR RENEWABLES

The government has allocated £125m to help low carbon manufacturing and renewables, as well as more advanced industries such as aerospace and chemicals. The Advanced Manufacturing Supply Chain Initiative is also aimed at helping suppliers to relocate their manufacturing operations to the UK.

www.bis.gov.uk

ARCHITECTS' CONFIDENCE UP

The Royal Institute of British Architects (RIBA) trends survey for November showed that, overall, workloads appear to be becoming more stable, but confidence remains fragile. The RIBA Future Trends Workload Index stood at -4, up from -7 in October and -10 in September.

ONLINE PROCUREMENT

Cabinet secretary Francis Maude has announced a shake-up of the government's procurement strategy, with £50bn worth of contracts being placed online in an effort to encourage small firms to bid for them. The initiative is aimed at cutting the time it takes for the government to procure goods and services by as much as 40%. There will also be an online list of work, with a confidence rating to indicate the likelihood of a project going ahead.

www.data.gov.uk

New infrastructure cash in Autumn Statement

● Funding allocation criticised by business and green pressure groups

The government's Autumn Statement has drawn fire from business chiefs and green pressure groups.

The Chancellor, George Osborne, promised a £250m package to help mitigate the costs of the EU Emissions Trading Scheme and increase climate change levy relief for energy-intensive businesses.

He also pledged an 'extra' £1.25bn for the capital costs of new school buildings, which he said would pay for around 100 'free schools' (independent state-funded institutions).

'I am worried about the combined impact of the green policies adopted, not just in Britain, but also by the European Union, on some of our heavy, energy-intensive industries,' he said.

However, many business leaders believe he is missing the point about sustainability and the ability of energy efficiency to contribute to future economic growth.

Jim Woods, a director at Green Monday, the network for corporate sustainability chiefs, slammed the Chancellor's lack of vision.

'Mr Osborne does not seem to realise that sustainability drives better businesses,' he said. 'According to the Harvard Business Review, sustainable companies outperform that market by 4.8% per annum. Sustainable businesses are better-run businesses.'

He pointed to Marks & Spencer, whose Plan A strategy delivered £70m profit this year, as an example



More funds will be allocated for new schools

of how big energy users can reshape their operations to deliver lower costs and better performance.

Friends of the Earth said that 'throwing billions of pounds at roads and dirty energy will increase our dependence on gas, coal and oil and lock cash-strapped homes and businesses into spiralling fuel bills'.

Executive director Andy Atkins accused the Chancellor of 'rewarding lobbying by some of the world's biggest businesses with a £250m licence to pollute'.

'I fear they must be talking to the wrong people if they want to be seen as the "greenest government ever",' said HVCA head of sustainability David Frise.

For more information visit:
www.hm-treasury.gov.uk/as2011

Housing strategy 'lacks wide appeal'

The housebuilding sector has welcomed the government's new strategy to stimulate the market for new build homes, but remains unhappy about the lack of action in other parts of the market.

Michael Newey, of the Royal Institution of Chartered Surveyors (RICS), welcomed the New Build Indemnity Scheme, which will provide government guarantees of mortgages for

mostly first-time home buyers.

But he said that 'care must be taken to ensure it does not distort the market or lenders' affordability calculations'.

A number of observers are concerned that the focus on new build will not free up chains and may reduce demand for second-hand property, putting those with little equity at a disadvantage.

'Limiting funding to niche

areas of the market does not solve the wider need for adequate levels of funding in all parts of the market,' said Mr Newey.

Small to medium-sized developers welcomed the Get Britain Building Investment Fund. However, they warned that projects must be properly analysed to avoid creating 'white elephants' that do not satisfy demand.

Minister tries to reassure industry over cut to FiTs

● Government responds to concerns as industry predicts major job losses

Greg Barker, the Energy Minister, has sought to reassure the solar industry that the feed-in tariff (FiT) for domestic photovoltaic (PV) installations will not be cut again in April – and could even be raised. The government has come under sustained criticism since it slashed the tariff by more than half to 21p per kWh. It also issued a consultation paper on FiTs.

Many in the solar-panel industry were concerned that a further cut might take effect in April when further changes are brought in. From this date all new domestic PV sites will be required to meet 'minimum efficiency standards'.

'There are industry reports that thousands of planned PV installations have been cancelled'

However, Barker told a meeting with the Solar Trade Association (STA) last month that a further cut in the tariff would not happen, and that the tariff could be actually be higher than 21p, according to a statement from the STA.

There are industry reports that thousands of planned PV installations have been cancelled since the tariff fell in December, and it is claimed that 25,000 jobs could be at risk.

One major construction firm, Carillion, last month warned 4,500 UK staff that their jobs could be affected as a result of the expected fall in the solar PV market.

Meanwhile the legality of the FiTs cut is being challenged in the High Court. Last month the court agreed to hear applications for a judicial review of the



Barker: 'no further cut to PV feed-in tariff'

tariff change. The applications were brought by the environmental group, Friends of the Earth, and some solar panel firms.

The government was also considering a number of revisions to the FiTs scheme to make the money go further, including a 'capacity trigger' that reduces the level of payments as the cost of installations falls in line with a growing market. This would mean that future consumers were not receiving a 'disproportionate' amount of tariff, a government spokesman said.

For more information visit:
www.decc.gov.uk

SOLAR ENERGY 'ONLY AT FRACTION OF POTENTIAL'

Solar energy could become a competitive energy source within 20 years, according to a new report, *Solar Energy Perspectives*, from the International Energy Agency (IEA). It says some solar technologies are getting close to competitiveness in some circumstances and for some uses. However, it adds that only 'a limited number of countries have been supporting the effort'.

'While solar energy resources are abundant, their use currently represents only a tiny fraction of the world's current energy mix,' says IEA report author Cédric Philibert. 'This is changing rapidly and is being driven by action to improve energy diversification and security, mitigate climate change and provide energy access.'

www.iea.org



Doubts raised over new cash for Green Deal

The government has announced an additional £200m of funding for the Green Deal home efficiency scheme when it starts in October.

The 'new and additional' funds will be part of an 'introductory' offer to boost early take-up of the scheme, which will allow householders to borrow up to £10,000 to improve the efficiency of their homes.

'This big injection of government funding delivers on our promise to ensure the Green Deal hits the ground running, and make it as attractive as possible so that people start to benefit from day one,' said Energy Secretary Chris Huhne.

The government is still to announce detailed

plans on how the scheme will work, but has said it expects it to generate around £14bn of private investment in home energy efficiency over the next 10 years.

However, some industry observers are sceptical: 'I think the funding model is all wrong,' said George Adams, engineering director at SPIE Matthew Hall. 'This is not a subsidy; it is an additional cost to the householder because they have to pay the money back.'

'We also have to look very carefully at what the government thinks will happen in practical terms. What happens if energy bills actually go up because of a change of occupancy or because

people leave their windows open with the heating on? Who picks up the tab? The consumer is most likely to blame the company who carried out the work if they do not get the savings.'

Others pointed out that householders were suspicious of the claims, and many local authorities are even finding it hard to get residents to accept free loft insulation.

'Consumers don't believe the energy saving figures,' said Tony Day, energy services director at TEAM Energy. 'This is hardly a good time to be suggesting to people that they take on another debt. It is a woolly concept that has not been properly thought through.'

Gas and CHP 'still have big futures'

The government's recent Energy Statement has confirmed that gas will remain a key part of energy policy in the future, according to the Combined Heat and Power (CHP) sector.

The Energy Minister Chris Huhne stated that 'energy saving is now an equal priority with energy production' and that 'gas will continue to feature strongly in our energy mix'.

The CHP Association (CHPA) estimates that CHP could provide up to 13% of the UK's total electricity supply and displace 5% of its primary energy consumption in the next decade.

It is calling for the government to back up its policy statements with a series of practical steps, including exempting fuel used for heat production from the carbon price support levy and retaining climate change levy exemption certificates (LECs) for CHP until the introduction of an alternative feed-in tariff incentive.

The sector also wants to see the introduction of a tariff for micro-CHP of at least 15p/kWh and for this to be extended to include plant up to 50 kW capacity.

Energy Minister Greg Barker has stated that there would be 'a new ambitious role for CHP'.

Bioenergy's role in cutting carbon 'still controversial'

● Tighter regulations needed for biofuels says Committee on Climate Change

The role of bioenergy in reducing carbon emissions remains 'highly controversial', according to a new expert review, which has said no public subsidies should be paid for biomass power generation.

The Committee on Climate Change – independent advisers to the government – believes more bioenergy will be needed to meet carbon targets, and that its share of total energy production should rise from the current 2% to 10%. However, it says that the regulations around biofuels need to be strengthened because some of the ways it is currently used actually create more emissions.

It recommends that bioenergy be used with carbon capture and storage (CCS) to achieve higher reductions in emissions than are currently achieved.

A 10% share is feasible, but any higher than this could be unsafe 'given sustainability concerns', the review says.

'There is a crucial role for bioenergy in meeting carbon budgets, but within strict sustainability limits'

Even at the 10% level, there may need to be trade-offs with wider environmental and social objectives.

David Kennedy, chief executive of the Committee on Climate Change, said: 'The extent to which bioenergy should contribute to economy decarbonisation is highly controversial. Our analysis shows that there is a crucial role for bioenergy in meeting carbon budgets, but within strict sustainability limits.'

He pointed out that it was hard to account fully for all emissions resulting from the use of bioenergy, and that life-cycle emissions are often excluded.

See the biofuels feature, page 42

For more information visit:
www.theccc.org.uk

Some key recommendations

- Regulatory frameworks should be strengthened, including reducing the emissions benchmark for the use of biomass in power generation from 285g CO₂/kWh to 200g CO₂/kWh.
- CCS should be demonstrated as a matter of urgency.
- The government should delay setting any new targets until new regulatory arrangements have been put in place.
- Subsidies should not be provided to new, large-scale biomass power generation projects under the Renewables Obligation – because they are costly and unsustainable.
- Other low carbon options should be developed, including energy efficiency improvements.

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HARD ON THE SHARD?

The Shard, London's highest building, has come in for criticism from a surprising source – the Lord Mayor of London. David Woolton told the *Times* newspaper he believes the £425m building, due to be completed in the spring, is a sign that the property industry had 'gone slightly too far' and is out of keeping with the spirit of the times. This image shows a crane that was recently installed to help provide the finishing touches to the main structure.

Shutterstock

BIM adoption may boost prefabrication

● Conference raises concerns over cost and ownership of design tool

The adoption of building information modelling (BIM) will increase the use of off-site fabrication of building services, according to a range of industry experts.

The project director responsible for delivering the Leadenhall Building, or 'Cheesegrater' – currently under construction in the City of London – said BIM was the critical integration tool needed to produce the efficiencies demanded of the industry.

Andy Butler, development director for Laing O'Rourke, said that 85% of the 224 metre, 47-storey giant will be built off site to ensure 'surety of delivery' using BIM as the integrator.

He added that the BIM model was used as

part of the briefing at every health and safety meeting on site.

He was speaking at a Buildoffsite conference hosted by the Royal Institution of British Architects (RIBA), whose president, Angela Brady, said BIM would play an increasingly important part in new methods of procurement.

'Current procurement is incredibly wasteful and is the bane of all our lives,' she told the conference.

'We are behind other parts of the world in harnessing BIM, but we now have a huge opportunity to use it to integrate our teams and deliver better value to clients.'

Richard Ogden, chairman of Buildoffsite, said the government was now demanding 'more and more for less', and the only way to achieve this was to use integrated models and more offsite fabrication to cut waste and speed up delivery.

'We are behind other parts of the world in harnessing building information modelling, but we now have a huge opportunity'

'People laughed when [Education Secretary] Michael Gove said new schools needed to be 30% cheaper, but still look good,' said Ogden. 'Now there are people out there doing it and nobody's laughing.'

However, delegates reflected a wider industry concern about how much BIM costs and who pays the bill; and also who would have ownership of the BIM model during and after construction. Ogden agreed that these issues needed to be resolved before it could be adopted more widely.

See BIM feature, page 34



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In Brief

CALL FOR MORE ENERGY EFFICIENCY

Keeping a global temperature rise below 2C by 2020 is theoretically possible, according to a study by the UN Environment Programme, if measures such as improving energy efficiency are followed. The report recommends an accelerated take-up of renewable energy, fuel switching and increased energy efficiency, as well as greater use of public transport. www.unep.org/newscentre

CARBON CAPTURE TEST

Energy Secretary Chris Huhne has launched a test programme for carbon capture and storage. The £20m project is a partnership between industry partners Scottish and Southern Energy (SSE), and Doosan Power Systems and Vattenfall. The equivalent of 100 tonnes of carbon emissions a day will be captured from SSE's Ferrybridge coal-fired power station.

SHALE GAS USE ROW

Pursuing domestic shale gas would see the UK miss its environmental targets, says a new report from the Co-operative. Extracting and burning the gas from UK reserves would use up too much of Britain's allowances for carbon emissions, not least because evidence is emerging that gas derived from shale may have a significantly greater carbon footprint than previously thought.

CO2 REDUCTION RECOGNISED

Six companies have been named as global leaders in reducing carbon emissions. The best-in-class winners of the Gigaton Awards were Tesco, Phillips, Schneider Electric, Swisscom and Centrica – while the top prize went to the Chinese solar panel manufacturer Suntech. The winners were announced as part of the United Nations climate summit in Durban, South Africa, in December. www.gigaton-awards.com

Industry leaders lambast low carbon policies

● Letter says government is 'disincentivising' take-up of energy efficiency initiatives

CIBSE and several other leading institutions have accused the government of potentially undermining its legal commitment to cutting carbon emissions.

They have also attacked Chancellor George Osborne for claiming that regulations relating to the environment are a 'burden' on business.

The comments were made in a letter to the *Daily Telegraph* from industry thinktank, the Edge. The online version is signed by 25 individuals including CIBSE president Andy Ford, RIBA president Angela Brady and IStructE president Roger Plank.

The letter cites government policies, including omitting commercial Display Energy Certificates from the 2011 Energy Act and the abrupt reduction in feed-in tariff payments, as being

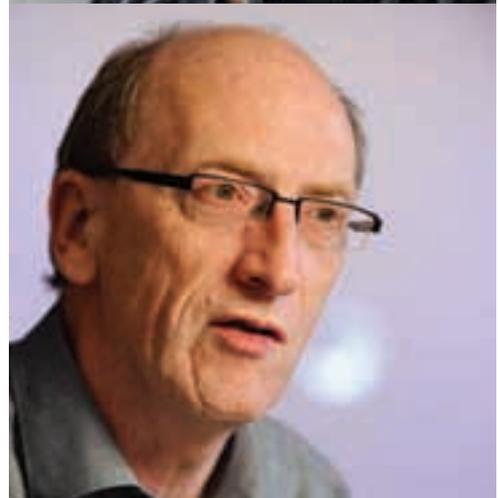
'Government must deliver credible and integrated policies'

'disincentives' to investment in low carbon solutions. 'Such decisions damage businesses gearing up to deliver low carbon buildings... and undermine industry confidence in the longevity of future carbon-reduction programmes,' the correspondents write.

They also claim that, contrary to Osborne's statements, 'well-targeted environmental regulation helps British businesses to find ... cost reductions [and] develop expertise with export potential.'

The letter concludes: 'The government must demonstrate its Durban commitments by delivering consistent, credible and integrated policies to make a low-carbon economy a reality.'

Other signatories of the letter include Edge convenor and architect Robin Nicholson, former RIBA president Sunand Prasad, consultants Bill Bordass and Paddy Conaghan, and Professor Bill Gething.



Angela Brady of RIBA and Andy Ford of CIBSE were among 24 signatories of the letter

For more information visit: www.telegraph.co.uk

RHI scheme faces meter challenge

Concerns have been expressed by the energy regulator, Ofgem, over the metering arrangements for the Renewable Heat Incentive (RHI), which has been in place since the end of November.

Commercial heat pump, biomass and solar systems installed since July 15 2009 are now eligible for payments of up to 8.5p per kWh for solar thermal, 7.9p per kWh for biomass boilers and up to 4.5p per kWh for heat pumps through the scheme.

Medium and larger installations will receive lower rates of 4.9p per kWh and 1p per kWh respectively for biomass boilers and 3.2p per kWh for large heat pumps.

All RHI-eligible systems – such as heat pumps and biomass – must be attached to a heat meter in order for Ofgem, which administers the scheme, to assess the amount of tariff the user should receive.

'Heat meters are the key, but currently they are quite

expensive,' said Ofgem's Jacqueline Balian at a recent CIBSE seminar. 'Hopefully the cost will start to come down as more are installed.'

'They are quite difficult to install properly and we also have some concerns about how often they are calibrated. Currently, calibration is only required every 10 years, but that will almost certainly have to change in order to get the accuracy of readings that the scheme demands.'

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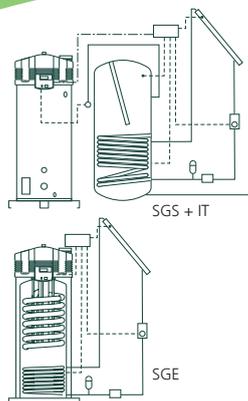
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AO Smith

Innovation has a name.

Time to consult

● A raft of consultations are launched by government

As the *Journal* went to press, it was understood that the consultation on the 2013 review of the Building Regulations is expected to be released early in the New Year. We also await a consultation on the implementation of the recast Energy Performance of Buildings Directive.

Elsewhere, government consultation activity seems unaffected by Christmas. Indeed, it appears to be seen as a good time to publish consultations. Consultation on implementation of the Green Deal ends on 18 January. There is a workshop at Balham at 5pm on 10 January to develop the CIBSE response; contact cbreslin@cibse.org for details.

The public health sector has a consultation and a White Paper on the water industry. *Water for Life* describes a vision for future water management in

which the water sector is resilient, in which water companies are more efficient and customer focused, and in which water is valued as the precious and finite resource it is. And it explains that we all have a part to play in the realisation of this vision.

The White Paper sets out proposals for reform of the water abstraction licensing system and demand management measures. It is notable that demand reduction is of greater priority in the water sector than it seems to be in the energy sector. For full details of the consultation, see www.defra.gov.uk/environment/quality/water/legislation/whitepaper

The EU has issued a *Stakeholder Consultation on Water Performance of Buildings*, seeking views on ways to reduce water use in buildings, in response to the growing pressure on water resources in parts of Europe, and concerns about water scarcity and droughts. For the background paper go to http://ec.europa.eu/environment/consultations/pdf/background_water_efficiency.pdf

Plenty to look forward to in new year

As our diaries and calendars move to 2012, it is quite natural to review 2011, both highs and lows – and to ponder on what the new year has in store for us.

Certainly, from a CIBSE perspective, 2011 was both demanding and rewarding. The *Journal* remains a key membership benefit and, as I write this piece, I hope you will agree that, although not perfect, it tries to cover the broad spectrum of our members' activities and their interests, while also being informative and educational. The Technical Symposium was re-launched in 2011 and, while being important in its own right, it is also a signpost to our future development: freely sharing information in order to raise the standards of the profession.

Next year will not only see even more improvements in the *Journal* and further development of the Technical Symposium, but also the emergence of our Knowledge Portal, which has been reported in earlier editions of the *Journal*. Let us be in any doubt, this project represents a step-change and considerable challenge to CIBSE.

We are making all our publications available online, free to search and download to our members. It remains to be seen how it will affect hard copy publication sales, but already we have seen 3,500 members in more than 89 countries access the Knowledge Portal to view or download CIBSE publications.

Moreover, prospective affiliate members can join online and have almost immediate access to

the Knowledge Portal. Above all, we believe that the Knowledge Portal should encourage membership growth and be another strong argument that CIBSE is the Institution to be a member of – and hopefully an active one at that.

So, over the new year, as we shall no doubt read of further financial and commercial uncertainty and pundits will be forecasting dark clouds, CIBSE believes in a strong future and taking risks in order to benefit our members.

When you are making your new year resolution, please make two: one, to use the Knowledge Portal; and secondly, to introduce a new member to CIBSE. Wishing all CIBSE members a very happy and prosperous new year!

Stephen Matthews
Chief executive

Search for 2012 Young Engineers is ON!

Hays Construction & Property, in association with the Institution of Civil Engineers (ICE), the Institution of Structural Engineers and CIBSE, is searching for two professionals to win the 2012 Young Engineer Award in the south west.

There are two awards, one within civil and structural engineering and another within building services engineering. Each winner will be recognised as one of the best young engineers in the south west and will also receive an Apple iPad as a prize.

The judges are looking for young professional civil, structural or building services engineers who can demonstrate a passion and enthusiasm for the industry, and show how they have used innovation, creativity, safety and sustainability in their designs. Young engineers are encouraged to enter now if they think they have what it takes to win this title. They can also be entered into the competition by their employer or colleagues.

Trish Johnson, regional director of the Institution of Civil Engineers South West, commented: 'This award will help recognise and celebrate the work of our young, talented professionals in the region who demonstrate passion for the industry and innovation and creativity in their work.'

The winners will be presented with their award on the 10 February, followed by a winners and runners-up lunch in Hotel du Vin, Bristol, on 24 February. The closing date for entries is 17 January.

To enter the award, call Natassa Vekris on **0117 929 7308** or email natassa.vekris@hays.com

Travel and Learn with Ken Dale Travel Bursary 2012

The Ken Dale Travel Bursary is now inviting entries for its 2012 award.

The bursary makes an award of between £1,500 and £4,000 to a CIBSE member in the developmental stage of their career, to research an aspect of building services outside their home country. The research should be of interest to CIBSE, the entrant's employer, clients and the profession. Research that aligns with CIBSE's concern for the environment is particularly encouraged.

Through the bursary, the winner will have the opportunity to experience technical, economic, environmental, social and political conditions in another country, and to examine how these factors impact upon building services engineering.

Last year's winner, Anderson Barcellos, of Reading University, used the award to travel to China and Japan for four weeks investigating buildings – including offices and schools – to evaluate the steps in the design process that are being taken to achieve energy efficiency. He also looked at new approaches and technologies that are being used.

For further information and to download an application form, visit www.cibse.org/bursaries. Applications for the bursary close on 29 February.

Diversity on the curriculum

● The future's female, says CIBSE president Andy Ford

Schools have a big part to play in career choices – and in making sure the construction industry is not dominated by men in the future.

That was the message from CIBSE president, Andy Ford, when he spoke at an event for Institution members within the Construction Industry Council (CIC), organised by the CIC Diversity Panel.

Ford discussed the Institution's activities with schools, stating: 'Schools have an enormous part to play in career choices and that enjoyment of a subject is as significant as attainment in a pupil's likelihood to pursue a subject further.' Ford's two overall messages to the audience were: 'Respect is the process and diversity is the result', and 'the future is not male'.

The CIBSE CIC diversity panel representative Dr Dorte Rich Jørgensen, supported by CIBSE and YEN's Karen Settle, collated feedback to give a voice to women on their views on what can be done to empower and inspire women to be recruited, retained and to progress in the construction industry.

Dr Jørgensen said: 'The survey gave some good news stories and clear evidence that much more proactive efforts need to be embedded in our industry if we are seriously committed about having a diverse workforce in it sooner rather than later.'

The event examined how Institutions and key stakeholders are influencing positive change in attitudes to diversity, with reference to the February report by Lord Absersoch on *Women on Boards*, which has given FTSE 100 companies the target of having women making up at least 25% of their boards by 2015.

The delegates were asked to identify, in workshop groups, the barriers facing women, from secondary school through to senior management, as they strive to progress in a construction career. The wide-ranging ideas from the workshop will be used by the CIC Diversity Group to create an action plan to increase the female membership of the institutions.

Dr Jørgensen concluded: 'The vision is that an action plan working across the institutions would be an effective vehicle for positive change.'

For more details about the action plan and the work of the CIC, contact lreading@cic.org.uk

Annual dinner in a good cause

The south west region is holding its annual dinner in February – and hopes once more to raise a significant amount of money for good causes.

At the 2009 dinner, £1,000 was raised for the Precious Drops Milk Bank at Southmead Hospital, Bristol. Liz Meddings, vice chairman of the region's committee, attended the opening of the Milk Bank in November and was able to see how they had used the money. The milk bank provides a way to safely store donated breast milk for feeding premature babies, giving them the best start in life.

She said: 'It's great to see how the money we raise at our dinners can make a real difference to someone's



life, and I hope that our members take inspiration from this and donate even more at our next dinner – or at their local event.'

To buy tickets for the south west region's dinner, to be held on 10 February, please contact dougwheeler@blueyonder.co.uk

Building systems and services for the 21st century

The second CIBSE Technical Symposium, this year held in association with the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE), is set to take place on 18-19 April at Imperial College, London.

Entitled 'Building Systems and Services for the 21st Century',

the two-day event is designed to bring to the fore the latest practice and research in the sector.

More than 50 peer-reviewed papers and posters from both industry and academia will be presented in sessions. Topics currently planned include 'passive' building systems,

renewable and sustainable energy systems, building information modelling, Display Energy Certificates and design for future climates.

Delegate fees for this event will be kept as low as is practicable to ensure accessibility.

For more information visit www.cibse.org/symposium2012

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Rewarding

excellence

It's the second year of the CIBSE Building Performance Awards and there has been no shortage of talent, as our shortlist of contenders shows



Winners at the 2011 awards

The long-awaited shortlists have finally been revealed for the 2012 CIBSE Building Performance Awards.

Rewarding excellence in sustainable and aspirational buildings, the CIBSE Building Performance Awards aim to raise industry standards by celebrating the best performance, innovation and practice in building services.

The awards will be presented on 8 February 2012 during a ceremony at Grosvenor House in London.

This is the second year that these

particular awards have been staged, following their debut in February 2011. They replaced the CIBSE Low Carbon Performance Awards, which ran from 2007.

This year saw an increase in entries, with a wider variety of organisations entering than previously, a clear sign that the reputation of the awards is gaining strength. What sets the awards apart from others in the industry is the requirement to prove that buildings are actually performing, so entries that make the shortlist

have provided evidence that their buildings are performing to a high standard.

Among the most popular categories this year is the **New Build Project of the Year (public sector)**.

This award is open to teams and will be presented to the building that most effectively combines construction materials with low carbon and renewable technologies, to improve building performance and reduce carbon emissions throughout the life of the building.

At the same time, the building must >

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AWARDS THE SHORTLISTS IN FULL

CIBSE BUILDING PERFORMANCE AWARDS 2012

NEW BUILD PROJECT OF THE YEAR (PRIVATE SECTOR)

Sponsored by Amtech



- KPMG, 15 Canada Square, London (AECOM)
- PricewaterhouseCoopers, 7 More London Riverside, London (BDP and Grontmij)
- Solar House, Kings Langley (Green Structures)
- One New Change, London (Hoare Lea)
- Brockholes Visitors Centre, Preston (Max Fordham)

NEW BUILD PROJECT OF THE YEAR (PUBLIC SECTOR)

Sponsored by Amtech



- The Apex, Bury St Edmunds (AECOM)
- Pool Innovation Centre, Redruth (Aedas)
- Whittington Park Sports Pavilion, London (ArchitectsNetwork)
- Castlewood Primary School, Coventry (Couch Perry & Wilkes LLP)
- John Hope Gateway, Royal Botanic Garden, Edinburgh (Max Fordham)
- Maelor Sports Hall, Penley, North Wales (URS Scott Wilson)

REFURBISHMENT PROJECT AWARD

Sponsored by Vaillant



- Royal Shakespeare Company, Stratford-Upon-Avon (Buro Happold)
- The Service Personnel and Veterans Agency, Gloucester (Debut Services (South West))
- GE Fogg Building, Queen Mary University, London (Fraser Brown MacKenna Architects)
- The Student Centre, University of Bath (Hoare Lea)
- Angel Building, London (Norman Disney & Young)
- The Percy Gee Building, University of Leicester (Shepherd Epstein Hunter)

BUILDING OPERATION AWARD

Sponsored by Gratte Brothers



- British Land
- Cavendish Engineers
- MITIE
- The Building Centre
- Transport for London (TfL)

CLIENT ENERGY MANAGEMENT AWARD

Sponsored by Lochinvar



- ABS consulting
- British Land
- Debut Services (South West)
- Harrods
- Cooperative Insurance Society

CLIENT OF THE YEAR

Sponsored by Imtech



- Buro Happold
- Cynergis
- Debut Services (South West)
- Harrods
- University of Bradford

BUILDING SERVICES CONSULTANCY OF THE YEAR

- AECOM
- Hoare Lea
- Hurleypalmerflatt
- Max Fordham
- Mott MacDonald
- URS Scott Wilson
- WSP Group

CONTRACTOR OF THE YEAR

In association with the HVCA and sponsored by Elta Fans



- DSL
- Imtech Aqua
- Michael J Lonsdale

COLLABORATIVE WORKING AWARD

- Buro Happold
- Harrods
- Imtech Aqua

ENERGY-USING PRODUCT AWARD

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- Universal CHP unit (ENER-G Combined Power)
- Unity CV2GIP (Greenwood Air Management)
- Turbomiser III Adiabatic Advantage Chiller (Cool-Therm and Klima-Therm)
- HSV Thermal Store (Lochinvar)
- COOL-PHASE low energy cooling and ventilation system (Monodraught)
- Lo-Carbon Temptra Range (Vent-Axia)

PASSIVE (ENERGY-RELATED) PRODUCT OF THE YEAR

- EMOTR (ABS consulting)
- RACUS Ceiling Tile (Datum Phase Change)
- Hitachi 'Natural Circulation' Products (Hitachi Europe)
- SoundScoop (Passivent)
- Tracker Plus (Southfacing Services)
- CCM204/NV BACnet (Titan Products)
- Passive Heat Recovery Ventilation Unit (Ventive)

COMMISSIONING PROJECT OF THE YEAR

In association with the CSA and sponsored by CMR



- One New Change, London (Dome Consulting)
- John Hope Gateway, Royal Botanic Garden, Edinburgh (Max Fordham)
- The Darling Quarter project, Sydney (Norman Disney & Young)

TRAINING FOR BUILDING PERFORMANCE AWARD

Sponsored by SummitSkills



- CCL Consulting
- Norland Managed Services (Energy Matters Training)
- Nuaire
- TACE
- University of Bradford



The judging... choosing the winners always proves to be a difficult task for the judging panel

► achieve the high levels of comfort and performance (such as lighting levels) required by the occupants.

The **Energy-using Product** award seeks to recognise outstanding new and/or innovative products that will make significant contributions to improving building performance. Energy-using products are classified as building services products that use delivered energy themselves to deliver services such as heating, ventilation, cooling or lighting.

In contrast, the **Passive (energy-related) Product of the Year** seeks to identify outstanding new and/or innovative products that will make significant contributions to improving a building's performance, which do not directly use delivered energy, though they may generate their own energy. Examples of such products include solar and photovoltaic products, façade systems and sun pipes.

In terms of designing and delivering the most aspirational and sustainable buildings, the **Building Services Consultancy of the Year** category aims to reward those firms that demonstrate

The judges

BUKKY BIRD

Tesco



Bukky is head of environment at Tesco Property. She is an experienced environmental engineer with a background in mechanical building services.

PADDY CONAGHAN

Hoare Lea



Paddy is a member of the *Journal's* editorial panel and a partner at mechanical and electrical consulting engineers, Hoare Lea.

HYWEL DAVIES

CIBSE



Hywel is the judging panel chairman, and CIBSE's technical director, responsible for the technical development of CIBSE's publications, guidance and policy for engineers.

ANDY FORD

Mott Macdonald



Andy is this year's CIBSE president and the technical director at management, engineering and development consultancy, Mott Macdonald.

DAVID HUGHES

Consultant



David is member of the *Journal's* editorial panel, a past president of CIBSE and a consultant in the building services industry.

DOUG KING

King Shaw Associates



Doug is a contributor to the Masterclass series in the *Journal*, and a founder member of low carbon consulting engineers, King Shaw Associates.

IAIN MACRAE

Thorn Lighting



Iain is head of global lighting application management at lighting company, Thorn Lighting.

RICHARD PARTINGTON

Richard Partington Architects



Richard is a director and founding member of architectural practice, Richard Partington Architects.

PETER RICKABY

Rickaby Thompson Associates



Peter is director of specialist energy and environmental consultancy, Rickaby Thompson Associates.

Rewarding excellence in sustainable and aspirational buildings, the awards celebrate the best performance, innovation and practice in building services

the best overall performance. The consultancies shortlisted have demonstrated that they are engaged in the design of projects where aesthetics, comfort, sustainability and commitment to client satisfaction are combined to produce buildings that please and satisfy users from handover and throughout the life of the building.

The **Refurbishment Project** award has attracted a healthy number of entrants this year, which is open to teams whose project most effectively demonstrates outstanding design and construction to deliver an energy efficient building, with improved building performance and reduced carbon emissions throughout its life. At the same time, the building should still deliver the high levels of comfort and performance – such

as the lighting levels – desired by the occupants.

However, the CIBSE Building Performance Awards aren't just about the building's fabric and services. They also aim to reward those whose job it is to make these structures work comfortably and efficiently.

The **Building Operation** award aims to recognise the achievements of the building operator who delivers outstanding building performance from an individual building, a campus or a building portfolio. This includes delivering the comfort levels and working conditions required by the users or occupants, and demonstrating substantially reduced energy consumption and carbon emissions, without compromising overall user satisfaction.



Celebrating the brightest industry talent... the CIBSE Building Performance Awards 2011

But much of the industry's aims would not be possible without the input of the client themselves. The **Client of the Year** award celebrates outstanding client-led initiatives to improve the performance of existing buildings, as well as delivering high-class performance in new or refurbished buildings. It will be awarded to the client who, in

the judges' view, has done the most to facilitate an outstanding project during the year.

All 13 categories will showcase the very best in low carbon and building performance, achieved by some of the best consultancies, contractors, clients and staff in the business. To book your table visit www.cibseawards.org

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CRITICAL FUNCTION



Building maintenance is moving up the construction industry's agenda, with more recognition of the need for new engineering roles and standards, writes **Rob Farman**

If I recall correctly, former Labour Education Secretary Charles Clarke got his budget bid to the Treasury wrong one year, and so simply decided to chop maintenance to save teacher posts. When times are hard, building projects are often the first budget item to be cut, closely followed by maintenance. However, for sound health and safety reasons, much of maintenance is statutory. This is partly because, if such requirements aren't followed and someone dies as a result, there are serious consequences.

In one of many examples of such consequences, in 2002 Barrow borough council halted weekly statutory legionella tests at a leisure centre to cut costs. Subsequently, 180 people caught Legionnaire's disease and seven died; it was the UK's worst outbreak of the disease. In 2006, the council was fined £125,000, with £90,000 costs, and an employee was fined £15,000. Had the Corporate Manslaughter and Corporate Homicide Act 2007 – with unlimited fines, remedial orders and publicity orders – been in force, the council's fate could have been worse.

Maintenance of business-critical systems is highly important, too. In a single day, major financial institutions can have hundreds of billions of pounds worth of transactions flowing through just one data centre. A false fire alarm can see hundreds of traders turfed onto the street, potentially incurring vast losses for their companies.

Regulators regularly scrutinise the design resilience and maintenance of financial data centres. Mission-critical systems are found in transport networks, aerospace systems and hospital operating theatres, to name just a few.



Lisa F. Young/Shutterstock.com

The top priority for maintenance is the uninterruptible power supply (UPS) and its back-up standby generators (since UPS lasts only 15 or 30 minutes). The third priority is the air conditioning system which, if it is off line for a few hours, will force servers to be closed down to prevent overheating and failure. The fourth priority is the firefighting system, where the main problem is false alarms.

The rising demands for a comfortable, creative workspace – and for IT operations to run 24/7 – are producing increasingly sophisticated buildings. These require proficient maintenance providers, supported by several dozen specialists, including manufacturers. The level of complexity is comparable with aviation (where I started my maintenance career), including detailed, step-by-step maintenance procedures.

There will be a need for more engineers – especially in the Middle East and Asia – who can understand these sophisticated buildings and manage their resilience and energy usage. Some may have done an apprenticeship, HNC or HND, and some may have started in design as graduates.

But either way they will need both broad, sound engineering knowledge

Poorly-maintained air-conditioning systems can have major knock-on effects

Clients are increasingly recognising the value of protecting their functions, data and employees through proper maintenance

and to be highly skilled in managing clients, suppliers and their own people. Technicians in the industry may have grown up with data centres, or may have come from the electricity-generating, nuclear or maritime industries or the armed forces, where the safety, reliability and maintenance requirements of sophisticated mission-critical machines are paramount and clearly understood.

Maintenance engineers and technicians are also needed for the very diverse estates we have in this country: thousands of telephone exchanges; government estates each comprising hundreds of buildings; major offices; manufacturing, and so on.

The CIBSE Maintenance Task Group is revising *CIBSE Guide M: maintenance engineering and management*, one of CIBSE's bestselling publications. We are reviewing *Guide M* at present and aligning it with work done by RICS, the HVCA and BSI, in order to develop a suite of national standards to enable, for the first time, the calculation of the costs of maintenance and life-cycle replacement at the start of both refurbishment and new-build projects. The days of Barrow council and Charles Clarke may not be over, but they could be drawing near.

So there is plenty of work to keep maintenance issues high up on the agenda. And it is not just CIBSE and other organisations such as the British Institute of Facilities Management that continue to take maintenance seriously. Clients are increasingly recognising the value of protecting their functions, their data and their employees through ongoing maintenance.

• Eur Ing **ROB FARMAN** is secretary of the CIBSE Maintenance Task Group. *CIBSE Guide M* is available free online for CIBSE members via the Knowledge Portal, where printed copies can also be purchased (with discounts for members): www.cibseknowledgeportal.co.uk

Your letters

Clients often to blame for poor performance

Ian Stuart has repounded to my earlier letter on the need to measure actual building performance (July *Journal*, page 22, and November *Journal*, page 19). I proposed that the building owner should take responsibility for post-construction energy performance because they are the only party in a position to do so.

Many building owners may be desperate to achieve the desired energy efficiency, but that desperation does not extend to insisting on full and complete commissioning of the building and demonstration of its performance prior to occupation.

A client will be advised that their building is incomplete and should not be accepted, but will move in anyway. With building contracts framed the way they are, the contractor then has a 'get out of jail free' card and feels little obligation to even complete the job, let alone fine-tune the energy performance.

As a designer, I feel the same frustration as the owner at incomplete buildings that do not perform as designed; unlike the owner, I have no method to enforce better performance. The person who lumbers the client with a problem is frequently the client themselves.

Peter Hill

FiTs attack hits resource

The government's premature and savage slashing of the feed-in tariff for solar photovoltaics (PV) will not only damage a fledgling industry which is creating jobs, profits and tax revenues, it also ignores the many advantages of embedded low or zero carbon energy generation (December *Journal*, pages 5 and 6).

This form of generation cumulatively displaces remote, high-carbon generation that is grossly inefficient and polluting. The embedded location reduces distribution losses and does not add to the growing problems being experienced by the national grid.

Linking future tariffs with the energy efficiency of the building upon which the PV panels are mounted is an irrelevant diversion, seemingly designed to further limit the deployment of such technologies. PV and other such technologies should be deployed as widely as possible, and energy efficiency should be vigorously encouraged by other means.

Brian Edwards

Regs set tough solar test

Reading the article on the updated SBEM design tool ('Model performer', September *Journal*, page 29), I feel the greatest impact is in the often-overlooked Criterion 3 changes.

The 2006 Building Regulations unintentionally levied a disadvantage on naturally ventilated buildings, because of the exemption of air conditioned rooms in the 2006 Criterion 3 overheating test. The significant changes to Criterion 3 in the 2010 regulations (limiting the effects of solar gains in summer) take a much fairer and more rational approach, which in many instances will be easier to comply with.

However, those designing air conditioned offices with high levels of glazing need to beware that compliance is going to be a tougher challenge, and dynamic simulation (DSM) may offer the only route to compliance, due to its ability to accurately take into account a wide range of solar shading measures.

Michael Pollock

MANUFACTURER'S VIEWPOINT



Collaboration is at the heart of good specification, writes **Martin Fahey** of Mitsubishi Electric, sponsor of this column

 Meeting the UK's energy challenges head on demands more integrated thinking from everyone supplying heating, cooling, ventilation, power and associated technologies to buildings. What is needed from manufacturers, consultants, specifiers, installers and building operators, is an approach that addresses the whole product life cycle, from pre-purchase to end of life.

Key to all of this is the realisation that no one person or company can possibly solve all of the issues to do with emissions targets, fuel poverty, rising costs and fuel security on their own.

We therefore all need to engage in the debate about the best ways of providing comfortable buildings for us to live, work and play in. And we need to start that debate now.

Since the launch of our Green Gateway philosophy four years ago, and the introduction of Phase Two in September 2011, we have sought collaboration with all parties involved in procuring, constructing and managing buildings, as we see this as the best way to ensure needs are translated into the right solutions.

We believe that this is not only the most sustainable way to do business, but also the right way to do business, and we are already making inroads with central and local government, the construction industry and consultants.

Now we are nurturing all relationships – including those between manufacturer, installer, architect, specifier and end user. In this way, our ECR principles (Efficiency, Carbon and Renewables) can be embedded throughout the whole process from conception to delivery and beyond. We have to start this engagement with what may be the

most important part of the whole process – the pre-purchase phase.

Today, the functionality and energy use of a building are key to any decisions relating to its services, and if we get things right at this stage, it will help to dictate the way energy is consumed throughout the life of the building and the equipment – and put energy efficiency at its heart.

The manufacturers, designers and installers then need to ensure systems are fully optimised. Gone are the days of increasing capacity to overcome deficient building fabrics.

New builds must now meet tighter thermal guidelines from the start; leaky old structures need to batten down the hatches, too.

More and more, it's realised that a building should anticipate – at design stage – the heating, cooling, ventilation and power-generating technologies to be used in it. To meet

wider considerations, the types of energy utilised need to be reviewed, too.

At the final stage before purchase it's essential to understand how people will use the building and ensure the proposed solution or combination of solutions meshes with other systems required on site.

Ensuring that energy efficiency, carbon reduction and renewable energy integration are at the very heart of the specification process helps everyone to arrive at the right solution for each specific application. If you would like to join the debate, visit:

www.greengateway.mitsubishielectric.co.uk

 Gone are the days of raising capacity to overcome deficient fabric



A (COMPETING) INSPECTOR CALLS



Could failings in the school exam system teach us something about the operation of the building-inspection regime? Hywel Davies applies his slide rule

You may recall the pre-Christmas scandal of the exam board executive who was secretly filmed advising a seminar of teachers on the likely wording of upcoming school exam questions. This exposé, by a leading daily newspaper, prompted a national debate about the rights and wrongs of exam boards competing to win over schools, and schools seeking out exams, and examiners, most likely to help them deliver the good results that everyone expects and OFSTED demands.

Of course, concerns over the examination system are far from new. The late Dr Richard Pyke, a chartered scientist and engineer who was chief executive of the Royal



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Society of Chemistry and of the Institution of Mechanical Engineers, was outspoken on this matter. His Five-Decade Challenge in 2008 set 1,300 of the brightest UK 16 year-olds a two-hour chemistry exam. 1960s O-level questions were mixed with later

Competition in the building-control regime could be dumbing down inspections

questions, the most recent being a 2005 GCSE question. Most of the teenagers were stumped by the earlier questions; this was seen as providing hard evidence of declining standards in science teaching in schools, and a flawed national science curriculum that was too focused on 'hoop-jumping'.

Dr Pike had little doubt that perverse incentives give politicians, examining bodies, quangos and schools a vested interest in keeping standards low, creating a disastrous 'race to the bottom'. He claimed that MPs had admitted they had no interest in making exams tougher and upsetting middle-class parents, who expect their children to achieve strings of A grades.

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Dr Pike called for radical reform: 'this is not a broken system that has to be fixed: it is a corrupted edifice that must be razed to the ground and rebuilt,' he declared. It is now clear that competition does not drive exam standards up; on the contrary, it undermines standards. In our industry this is a live issue when it comes to the local authority Building Control service.

For some two decades there has been competition in the provision of this service. The local district surveyor competes with approved inspectors for responsibility for confirming that works meet the Building Regulations. Clients can choose to use an approved inspector or the local authority. The choice will be influenced by money and a perception of how tough the inspector will be.

When deciding which of the competing building-control bodies to buy their inspection services from, developers have one eye on the cost of working with the inspector. They may be less likely to choose the body that does the most rigorous inspections, and

might insist on full compliance with a specific regulation that others disregard, but instead use the inspector most likely to help them claim compliance.

What incentives does that create? Does it promote firm and fair enforcement, without fear of losing work if an inspector suggests that work does not comply? Does it encourage inspectors to ensure that clients are fully aware of changes to the regulations, and comply with them in a timely way? Would Dr Pike call for a fix, or rebuilding?

And what would he make of Regulation 47? This regulation says that 'contravention of certain regulations [is] not to be an offence'. That is, if you do not give various notices to the building-control body, there is no enforcement power available to the building inspector. That is actually what our current Building Regulations say. It is like adding a new law for Rugby Union that says that even if the scrum feed is crooked, the ref cannot whistle! A consultation on the latest round of changes to Building Regulations is due



We need a dispassionate debate about how effectively market provision of building control delivers compliance with Building Regulations

shortly (see panel). Let us hope that it addresses this Regulation in particular. The building-control system faces the same pressure to race to the bottom as the exam boards. Perhaps we need a dispassionate debate about how effectively market provision of building control delivers compliance with Building Regulations. And whether perhaps there could be a better way to ensure that our buildings meet the regulations and deliver healthy, safe, and energy efficient buildings – a reasonable trio of objectives for our built environment, surely? Perhaps the forthcoming consultation on the 2013 revisions to the Building Regulations might start the debate.

Email your comments to cbreslin@cibse.org

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

As *CIBSE Journal* went to press, the government consultation on the proposed 2013 changes to the Building Regulations was expected to appear early in the new year. This column will be reporting on the proposals, and CIBSE will be organising events to explain them and prepare a CIBSE response to the consultation.

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AIRING THE TASK AHEAD

Ventilating schools naturally is desirable but is hard to do well. Ewen Rose reports from a CIBSE conference

Schools remain a key business priority for the building services sector despite the cancellation of the Building Schools for the Future (BSF) programme. The James Review on the procurement of education buildings, published last autumn, has focused minds on how school projects could be delivered more efficiently via streamlining and better use of standard solutions.

The review also points to the direct link between the quality of school buildings and academic attainment. This connection was discussed at a recent conference staged by the CIBSE Natural Ventilation and Schools Design groups, at University College London (UCL).

Speakers agreed that where the management, governors and other stakeholders took an active interest in the delivery of the building and its services, academic results improved. Derek Clements-Croome of Reading University said that years of research had also established the link between ventilation and academic performance. Students will not perform at their best unless relative humidity is between 40 and 60%; and temperature is between 20C and 22C, he said.

He reported that the amount of CO₂ in classroom air was above the recommended level in eight out of 10 schools: while 1,000 parts per million is acceptable, levels above

5,000 ppm had been recorded in a number of schools. The solution is to ensure that eight litres per second of fresh air is provided for each classroom occupant, according to Croome.

'True FMs [facilities managers] are very hard to find in schools these days,' said Croome. 'So we need to intervene. However, this does not mean increasing complexity, but doing basic systems well.' He pointed out that, although CO₂ monitoring and control is not mandatory under the Building Regulations, it should be urged as 'good practice', to ensure the quality of indoor air.

He suggested putting CO₂ monitors at the heart of the ventilation strategy so that when levels rise above 1,500 ppm, ventilation rates could be increased, either via mechanical or natural methods; it might just require the teacher to open a window, he added.

However, most naturally ventilated schools do not provide 8 l/s for their pupils. Ben Jones from UCL, who chaired the conference, pointed to a study across eight separate countries that revealed the median level for a naturally ventilated school was 3 l/s – the minimum allowable in the



Tim Spar

The City Academy in Hackney, east London, was New Project of the Year in the 2010 CIBSE Low Carbon Awards. The school was praised for its use of natural ventilation (see *CIBSE Journal Schools Supplement*, February 2010)



The City Academy, east London (see previous page)

design template for schools Building Bulletin 101. The same study showed that mechanically ventilated international schools achieved a median of 8.5 l/s.

‘A temperature-based control strategy is not adequate for natural ventilation,’ said Jones. ‘Lots of companies are claiming that louvre-based, roof-mounted systems will deliver the desired result, but they can’t claim that unless they can give the design engineer specific figures about pressure loss coefficients.’

To get this required level of accuracy into their designs, engineers need to carry out detailed computer modelling before putting the system together, according to Malcolm Cook of Loughborough University. Factors such as the orientation of the building, thermal mass, shading and the size of the openings in the building fabric need to be fed accurately into the model to get a clear picture of how natural ventilation will perform.

He also called for the ‘three Cs’ to be employed on every project: client, commissioning and control. The conference discussed the potential contradiction between the government’s enthusiasm for natural ventilation to meet energy and carbon reduction targets, and teachers’ worries about the impact of background noise, poor-quality outside air, and security implications of open windows or louvre systems.

Overheating

‘The fact is, schools have always been naturally ventilated and passively cooled – by using their windows,’ said Martin Liddament, managing director of Veetech. ‘Overheating was minimal in the past. If you seal up your building and use filtration, you will have difficulty getting chemicals out.’

He agreed that noise was a problem – urban levels are around 60-70dBa, which will disrupt teaching – but Liddament said the use of sound barriers and acoustic vents would overcome this problem. John Palmer of AECOM added that recent tests carried out by the Department for Communities and Local Government (DCLG) showed that the perception of noise did not always match reality.

‘It is an operational fact that schools have windows, but don’t necessarily use them.

Most of those tested said it was because it was too noisy, but the tests showed outside noise was not as bad as they assumed.’

Buro Happold’s Mike Entwisle said the BSF programme had been helpful in giving the industry experience of these issues and allowing engineers to establish ‘what works and what doesn’t’. ‘The less money you have, the more you need good design,’ he told the conference. ‘Classrooms are now filled with students and computers, but can still be ventilated naturally – but it is vital that we get our calculations right.’

The use of weather data and design models based on previous experience should allow engineers to design a classroom that would rarely rise above 25C, according to Entwisle. Night-time cooling is an excellent strategy for schools, he believes, but site managers are often reluctant to leave windows open at night because of security fears. There are a number of ways round this, he said, including the use of louvres and only using

windows at high level to provide the night cooling.

‘Simple solutions are best,’ added Entwisle. ‘If schools weren’t so densely occupied there would be a case for

mixed-mode ventilation with heat recovery, but it doesn’t always work and schools are risk averse.’

However, simplicity is not what has been delivered in many cases. Schools have suffered from design-and-build teams piling on complexity, according to Rod Bunn of BSRIA. He outlined the results of several post-occupancy surveys of school buildings, and condemned the control strategies employed in most.

‘Buildings are getting too complex,’ he said. ‘The ventilation strategy is usually left to a specialist ventilation provider at the tail end of the contract chain, so the design team has lost control of the detail. Design and build is the norm, and means that the designer can’t talk to the client and can’t involve the occupants in the design.’

Complexity

As a result, according to Bunn, teachers are occupying buildings with little or no idea how they work or how to operate the ventilation systems in their classrooms. He said, in many cases, there were too many layers of bespoke control packages,

School facilities managers are hard to find, so we need to intervene by doing basic systems well but not increasing complexity



Academy/Max Fordham

and the greater the complexity, the more likely things wouldn't work properly and energy costs would rise.

'For some reason, we seem to assume that an automated natural ventilation system will work better than a window, and be commissioned correctly.'

Bunn revealed several examples of schools that had been designed to allow for natural ventilation, but were not operating successfully because they had never been properly explained to the occupants or shortcuts had undermined the strategy.

In one case, all the chains on the motorised windows had broken because the sub-contractor had changed the motor specification to save money. He also found control panels obscured by shelves or positioned where teachers couldn't see them.

'It is easy to find examples of classrooms with the lights on, blinds down, and the windows open, even with trickle ventilation in place – and there's nobody in the room,' he added. Engineers need to provide clearer instructions and think about usability when fitting switches, and so on, he said.

'We must ask ourselves if it is the solution the user wanted or what the designers thought the user ought to want,' said Bunn. 'We are very good at providing the feature, but not so good at the function.'

To get the controls right, there must be good integration in the project team, according to Nick Huddleston of SE Controls. 'The natural ventilation strategy

will determine the controls hardware so the M&E specification must co-ordinate with the architect's specification – but they often don't and this leads to spiralling operating costs.'

Control experts at the conference stressed the importance of monitoring wind pressure as the key influencer on natural ventilation followed by temperature and building shape. Window openings need to be finely controlled so they can open to appropriate distances, based on over or under pressure created by wind movement around the building.

'The first 5cm of an opening is the most important for natural ventilation,' said Carl Sutterby of WindowMaster. 'So the controls need to be dynamic and able to adjust settings at regular intervals. However, they must also be easy for the user to understand. If they are too complex, they will not be used and the school staff will revert to manual control, which will undermine the whole natural ventilation strategy.'

So, complexity is to be avoided, but we do need clever control strategies; beware product-based solutions that lack detailed operating data; and, above all, make sure the teaching staff know what you are trying to achieve and how. It could just work, but the designers, project managers and specialist suppliers will have to be properly integrated and singing from the same song sheet if they are not to end up in detention for failing to deliver again. **CJ**

Loxford School in the London Borough of Redbridge, which was New Build Project of the Year runner-up in the CIBSE Building Performance Awards 2011, uses natural ventilation with night-time cooling from exposed concrete soffits (see the *Journal*, March 2011, page 42)

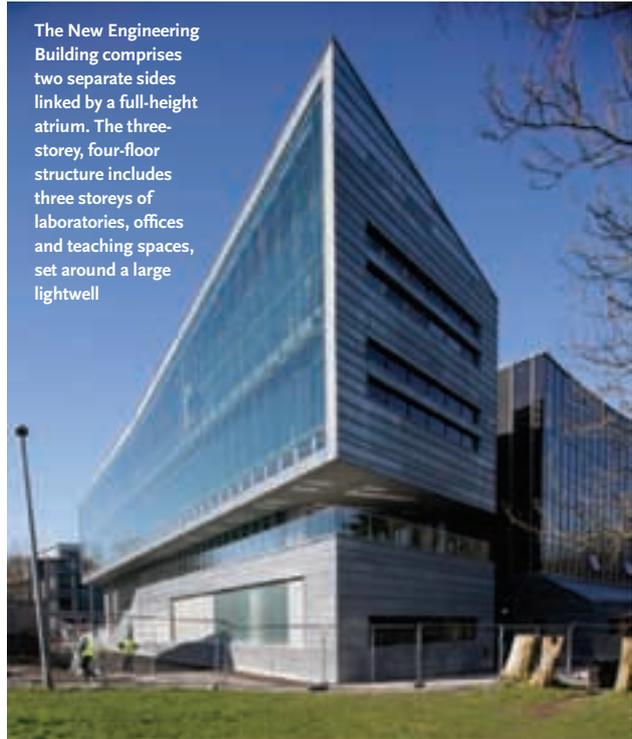
The glass and aluminium-clad New Engineering Building at the National University of Ireland in Galway was conceived as a teaching tool for the 1,100 engineering students who now occupy its 400 rooms and laboratories. Opened in July last year, the structure is intended to be a living laboratory, with a wide range of sensors and exposed features to show students how the building lives and breathes.

Moreover, many of the services are on show to the students and staff. Glass panels in the building's energy centre give views on to the working biomass boiler and combined heat and power (CHP) units. Labelled services, exposed in the corridors, challenge students to understand the engineering principles behind the scheme's design. And a dashboard in the entrance atrium informs the occupants of the building's performance by means of real-time data on energy and water consumption.

This design concept is unusual. It was developed to demonstrate a host of different technologies and passive thinking, including natural ventilation, thermal mass, ground-source heat pumps, solar panels and CHP systems to inspire the engineers of the future. However, in addition to showcasing the various technologies, the building also had to be designed to be energy efficient and environmentally sustainable.

'As a building for teaching engineering, it was designed to be as sustainable as possible,' says Lorcán Mooney of PM Group, which designed the building services for the project. It is an ambitious task, given the

The New Engineering Building comprises two separate sides linked by a full-height atrium. The three-storey, four-floor structure includes three storeys of laboratories, offices and teaching spaces, set around a large lightwell



ON-SITE LEARNING

An Irish university's engineering department has a new building that was designed to operate as a 'living laboratory' of sustainability for students. **Andy Pearson** takes stock of its complex heating and cooling systems



14,250 sq m size of the building, the number and variety of systems present and the fact that many of these include manual override options. As a result, the final solution is far from straightforward and the task of integrating the various engineering systems into an energy-efficient solution should provide a challenging, hands-on learning experience for staff and students alike.

Ventilation strategy

Most of the rooms are naturally ventilated as part of the low-energy design (see box on page 30). According to Mooney, the designers have gone to great lengths to ensure a comfortable environment, while also empowering the students. 'It is critical the occupants are in direct control of their environment,' he says. Rooms without windows are also naturally ventilated. The single-storey, high-bay laboratories in the centre of the ground floor utilise a series of

chimneys and opening roof lights. Penthouse louvres on one side of the laboratories supply fresh air, drawn from the lightwell above. Air is exhausted through a series of chimneys on the far side of the room and discharged, four floors up, at roof level.

Modulating dampers in the supply and exhaust ducts independently regulate the amount of air entering and leaving the laboratories, based on room temperature and CO₂ levels. Both dampers are fitted with a manual override switch. In addition to the supply and exhaust chimneys, the high-bay labs have rooflights that open under control of the building management system (BMS); again these have a manual override.

On days when the natural ventilation system is ineffective, the supply and exhaust chimneys are fitted with booster fans, which are under individual control of the BMS. Students, however, can override the speed controller using a wall-mounted switch in

order to modulate the fans' speeds.

The laboratories on the ground, first, second and third floors of the western elevation are too deep to be ventilated using windows alone. Instead a hybrid solution of opening windows and stack ventilation is used. The windows ventilate the area of the room closest to the façade, while the area furthest from the windows is ventilated using stack ventilation through chimneys positioned to draw air across the laboratories. Air flow rates are controlled by modulating dampers in the chimneys, operated by the BMS. On the top floor, where stack ventilation is limited, the chimneys are also fitted with booster fans. 'This scheme proves that by spending a little more money you can be energy efficient,' says Mooney.

To minimise winter infiltration load, additional air is drawn into the laboratories from the circulation corridor. This in turn draws air from other labs and from the



The boiler plant, calorifiers, chiller and CHP plant are housed in an adjacent energy centre

➤ building's atrium through transfer grilles set in the doors. A different natural ventilation solution is used for the classrooms on the second and third floors of the northern elevation. These rooms back on to a circulation corridor. Because the rooms are too deep to be ventilated by the façade alone, ducts have been installed above the corridor to form a link with the central lightwell to encourage air movement. The ducts are fitted with modulating dampers controlled by the BMS.

For the postgraduate areas occupying the top two floors on the building's southern elevation, the natural ventilation solution has been combined with an air conditioning option to provide a mixed-mode solution. For the bulk of the year these are naturally ventilated using what Mooney describes as 'a climate façade'. This is an 800 mm-deep, triple-skin glazed façade, with a double-glazed inner leaf and a single-glazed outer leaf covering the building's southern elevation. The cavity between the inner and outer leaf is ventilated by louvres at the top of the façade.

In winter, with the louvres closed, the south-facing façade preheats the fresh air before it enters through windows opening

into the cavity. In summer, the louvres open to allow air to rise up and out of the cavity, preventing it from getting too warm before it enters the room. Switches in the window mullions allow the occupants to override the BMS and open and close the windows accordingly. The climate wall also features an automated external blind fitted on the outside to minimise solar gain.

The natural ventilation system for the postgraduate areas operates until the internal temperature rises above 25C, at which point the displacement air conditioning system will kick in, with air supplied through the floor void. Openings in the dividing wall help to draw air across the postgraduate rooms and into the atrium.

Mooney describes the atrium as 'the building's lungs'. Smoke ventilators mounted in the atrium roof open and close under control of the BMS to ventilate the area (the BMS also prevents the smoke extract fans running in this mode). Air is also drawn from the atrium into the building's corridors where it provides tempered make-up air for the laboratories.

The building includes several large lecture theatres. These are kept comfortable using a displacement ventilation system, with fresh air supplied at 19C through swirl diffusers beneath each seat and extracted at high level. Mooney says the low-velocity swirl diffusers 'create a microclimate around the occupants'. Additional mechanical cooling is provided by a packaged, air-cooled chiller. 'During normal term times, mechanical cooling is not expected to be needed because the outside air temperature does not normally go above 19C from October to May,' says Mooney.

Cooling is also provided to groups of specialist laboratories tucked into the northwest corner of the building on the first, second and third floors. These rooms house experiments that need stable conditions throughout the year and are comfort cooled using active chilled beams. Some of the computer rooms are also provided with cooling and heating using chilled beams. Like the postgraduate areas, these too have a mixed-mode servicing strategy.

'The building is complex due to the number of mixed-mode strategies; if you were designing a commercial building with a focus on preliminary installation costs, you would only design for one HVAC system to guarantee a comfortable environment throughout the year,' says Mooney. 'The mixed-mode strategies will enable a reduction in the building's environmental footprint.'



Ventilation Building management system

The natural ventilation strategy is helped by the exposed concrete soffits, which add thermal mass. In its basic format, the ventilation strategy is based on two rows of opening windows, one above the other. The high-level windows open and close under control of the building management system (BMS), while the lower windows can be opened manually. For the offices and laboratories on the eastern elevation the

system is controlled as follows:

- As the air temperature rises above summer and winter operational settings, the BMS will progressively open the high-level windows.
- In winter (from October to the end of April), if the lighting passive infrared sensor (PIR) detector indicates a room is occupied, and when CO₂ levels exceed the zone set point, the BMS will open the high-level windows by 5%.
- The windows will remain open unless the wind speed exceeds a pre-set level, it starts to rain or internal air temperature falls.
- The occupants can override the BMS using a wall-mounted rocker switch to open or close the windows.
- In addition, the occupants can also open the lower line of windows manually.
- At night the windows will open to remove excess heat under a night purge strategy.

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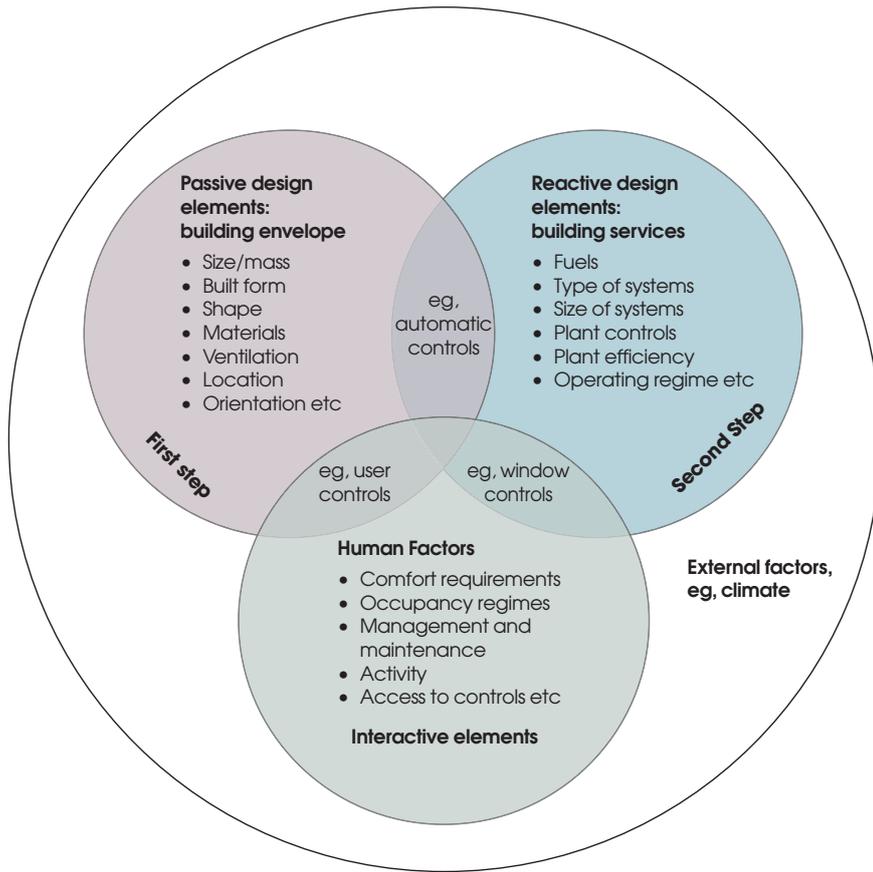
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➤ In summer, these rooms will be naturally ventilated until the internal temperature rises above 25C, then active chilled beams with mechanical cooling will operate and maintain the room below 24C. In winter, the windows have been designed to open by 5% to supply fresh air, while the perimeter chilled beam units will supply heat.

‘From our dynamic thermal modelling I think the space will be naturally ventilated for most of the year,’ says Mooney.

Heating strategy

Unsurprisingly, heat for the building comes from a variety of sources. A 350 kWe gas-powered CHP unit meets part of the electrical

load while generating 450 kW of heat. The CHP is set to run only when the electrical tariff makes it cost effective to operate. Heat from the unit is fed into the main heating header. When heat is not needed, surplus heat is fed to the university’s swimming pool through the campus heat network.

Additional heat for the hot water calorifiers comes from a small solar thermal system, installed as a teaching aide. ‘We looked at the possibility of meeting the hot water demand for 1,300 people entirely from solar, but it was not cost effective in Galway,’ Mooney explains.

However, when combined with the CHP unit, the solar system will generate sufficient heat to meet the (reduced) summer hot water demand.

In winter, the university’s 950 kW biomass boiler provides the main source of heat for the air handling units, chilled beams, hot water calorifiers and low-pressure hot water radiator system. The radiator circuit serving the teaching rooms and offices has been sized to run at a condensing temperature of 65C flow/45C return to maximise the energy efficiency of the system.

The biomass boiler is supplemented by two 1,048 kW gas-fired boilers generously sized to enable them to take over from the CHP when it is being maintained. In addition, a geothermal system connected to bore holes provides heat to an underfloor heating system in the building’s atrium. The cost of daytime electricity means the geothermal system will run solely at night to preheat the concrete floor.

‘In addition to the CHP and biomass systems, we investigated as many sustainable systems as possible, but the payback for the technologies was beyond our five-year threshold,’ Mooney explains.

The building has been designed to use about 54% less energy and to emit 37% less CO₂ than similar buildings, based on *CIBSE Guide F: Energy efficiency in buildings*. The students will be able to check the building’s performance through monitoring the power consumption of different electrical loads such as lighting, computing and HVAC equipment – which means that up to 1,100 students could be checking to ensure the building is performing as planned. CJ

● *CIBSE Guide F: Energy efficiency in buildings* is available online to CIBSE members for free through the Knowledge Portal. It can also be purchased in hard copy (by both members and non-members) at a discount of 75% by using the code GVFJAN. A new edition of the guide will be published in the first quarter of 2012. Visit www.cibseknowledgeportal.co.uk

CIBSE branch Republic of Ireland

The CIBSE Republic of Ireland branch, chaired by Derek Mowlds and comprising an active and dedicated committee, delivers a number of additional services locally to CIBSE members in Ireland.

The committee arranges a host of interesting CPD events throughout the year in a number of locations, covering a wide range of technical and related topics in engineering and the built environment. The branch also promotes

a philosophy of integration in design and, to that end, collaborates with other institutions on particular events, such as Green Building Week, with the Irish Green Building Council and the BIM awareness programme with CITA.

They host an annual conference in Croke Park, which attracts members nationwide, and includes speakers from the UK and further afield.

Recently, CIBSE Republic of Ireland collaborated with the Dublin Institute of Technology to publish the *Journal of Sustainable Research and Design*, which was formally launched on 24 November and is available for download at http://eleceng.dit.ie/sdar/SDAR_Journal_Sept_2011.pdf

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The UK urgently needs to move forward with the development of building information modelling across the supply chain if it is to avoid being left way behind the progress of other nations, writes **Tim Dwyer**

The quest for whole-life efficiency in construction projects points to the need to improve the integration of data across both the construction team and the supply chain. The aerospace and chemical-process industries are seen as exemplars of how information can flow from client concept through to design, procurement, construction, commissioning, operation and disposal.

By contrast, the world of the building services engineer has a more disparate and varying set of inputs, outputs and constraints; it will always have less order than a single-focused engineering project such as a European airliner.

However, tools are emerging that support the prospect of a more effective project-information life cycle for the construction industry: an integrated building information

model, which can be exploited and developed by the whole construction team and enables contractors and building operators to get earlier involvement in the process. This requires appropriate contributions from relevant parties throughout all stages of the project delivery. Construction and facilities management (FM) organisations also need to be involved earlier in a more integrated fashion than most traditional procurement processes permit.

Building information modelling (BIM) is seen by some as a simple 'add-on' to a 3D design to provide a data trove for subsequent interrogation and manipulation. For others it is just a fancy tool for creating 3D building models and accurate photo-realistic renderings.

But BIM should be seen as a process and an enabler, a catalyst for truly integrated working in a collaborative design and supply chain between all the stakeholders in a construction project.

In an ideal project BIM underlies a project from conception through design, manufacture and construction, to life-long operation and eventual decommissioning, demolition and recycling. But this is a world away from the 'lonely BIM' that exists in many of today's disparate individual applications.

Differentiator

By proper integration into business methods, BIM has the potential to speed up decision-making and remove unnecessary processes that don't add value – improving the cost-effectiveness of the construction process and increasing industry profitability. But the push for BIM by some clients, architectural and engineering firms, and forward-looking contractors can mean that other project members are chasing to catch up with BIM competencies so that they can work meaningfully – or, in some cases, so that they can work at all.

BIM is appearing as a differentiator between organisations in the supply chain. Sometimes, however, the result is marketing puff – or 'BIMwash' – rather than the real thing.

What is clear is that BIM cannot be an exclusive tool and still deliver the wide-ranging benefits that clients are increasingly seeking. BIM will drive the

whole construction chain towards reviewing and updating its processes and technology, as well as its methods of collaboration with its project partners. BIM presents a new opportunity for the whole industry to embrace and reap mutual benefits, but unlike the move from drawing boards to CAD seen over the last generation, BIM truly requires a paradigm shift.

It will prove a challenging task to try to

directly map BIM in terms of specific return on investment or productivity gains. But BIM is a global phenomenon, potentially providing opportunities in new markets. Early adopters of BIM can help others in the construction sector to get on board;

and there is a vital role to be played by the industry's institutions and associations to help their members get up to speed with the process.

Re-skilling

Increasingly there is a need for BIM capability within projects. But real BIM is not a simple add-on to the skill-set of existing building professionals: it requires significant investment in 'retooling' the teams with methods, skills and resources. Many larger contractors have seen themselves as bearing the brunt of early development costs. After the initial business costs, it is estimated that it costs around £12,000 per 'BIM-enabled engineer' for the software, training, set-up and support needed. This may be seen as a 'show stopper', especially for small businesses, but the real contention is that this is an upfront investment, not only to gain work, but also to unlock efficiencies of BIM workflows. And the training need not stop there: BIM will require new ways of working, and therefore training is needed in the new processes and attitudes – at all levels of the industry – to successfully adopt BIM.

To move forward there needs to be a top-down commitment by industry to re-skill the workforce, together with a can-do attitude from those developing and using the technology and processes at the grass roots. BIM will not thrive with small pockets of CAD users or engineers getting excited and trying to justify business cases driven by glamorous software purchases.

6 Ideally BIM should underlie a project from conception, design, manufacture and construction to life-long operation and eventual decommissioning, strip-out and recycling

UNFOLDING OF BIM 'ROADMAP'

In September 2009 the Department of Business Innovation and Skills commissioned an industry working group to provide a report on the potential future use of BIM.

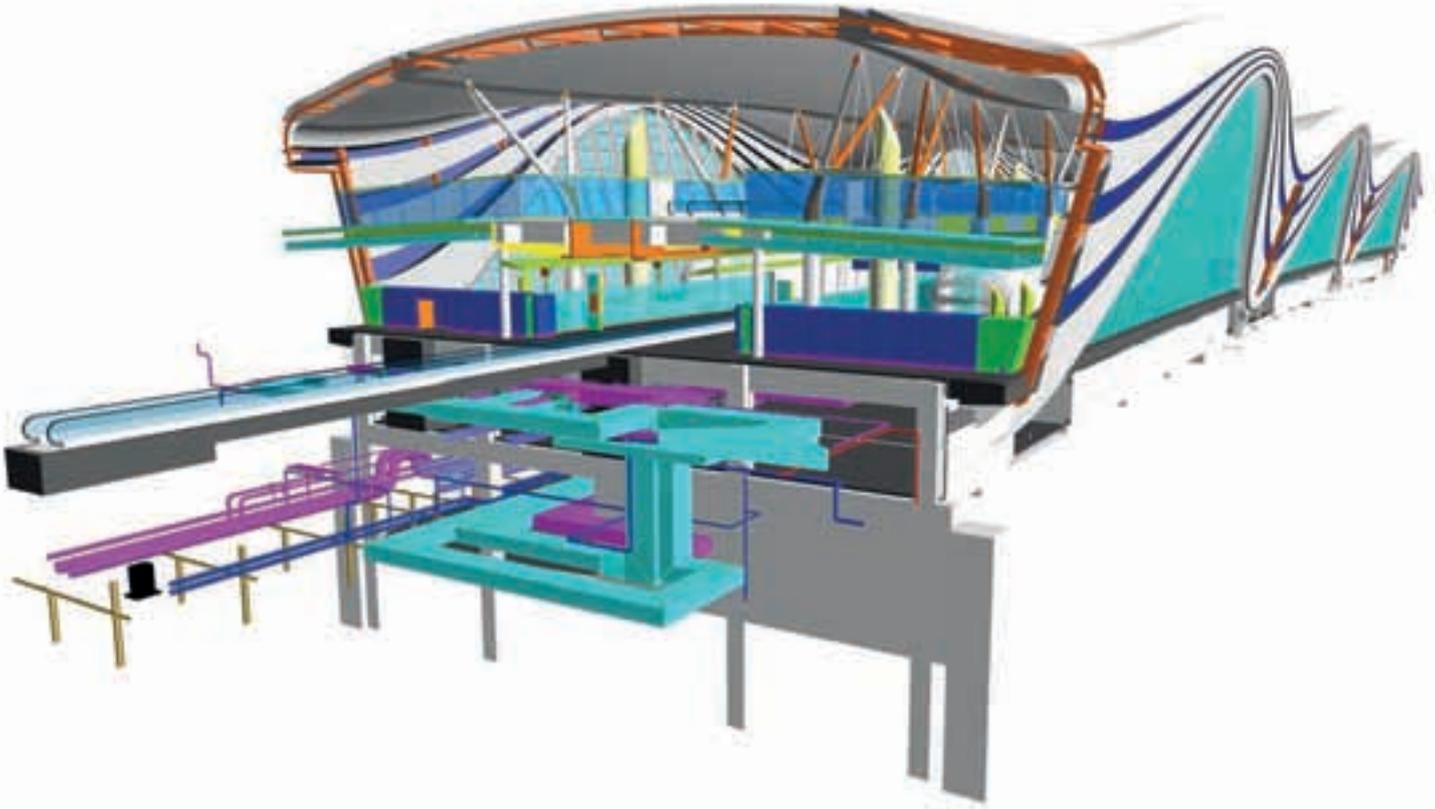
The Government Construction Clients board adopted the working group and agreed to receive its final report, which was presented in March 2011.

The report sets out a suggested roadmap and strategy to enable the progressive use of BIM on government building programmes, as well as providing a framework for procurement and delivery standards.

The report also considers the training and support required to enable the industry to rise to the BIM challenge.

The Government Construction Strategy, published by the Cabinet office on 31 May 2011, sets out the government's intention to require collaborative 3D BIM with fully digital data by 2016.

● To download the full BIM report go to <http://goo.gl/acAC8>



A 3D representation of Abu Dhabi international airport, designed by Arup Associates, which says it uses BIM at early-stage design (see *CIBSE Journal*, January 2011, page 22)

Although some cynics see BIM as being driven by commercial software developers, there are tri-partite client-designer-contractor pioneers who already see the long-term benefits of BIM. Large contractors are also increasingly demonstrating capability and influencing the BIM agenda.

In some parts of the world, mechanical-and-electrical (M&E) manufacturers have been quick to produce BIM representations of their products (known as 'objects') as a means of gaining a foothold in BIM –

although many UK manufacturers have been slow to make their equipment available as BIM objects.

This is partly due to the lack of standardisation of the defining framework for the software objects, and an absence of a clear policy direction from government and professions. Many have already built up large resources of simpler 'non-parametric' objects for use in existing drawing and fabrication software. And, indeed, some manufacturers have faced criticisms when producing over-complex, resource-hungry BIM objects.

Without appropriate standardisation, this is almost inevitable, as their objects are driven by commercial forces rather than the need for functional elegance.

'Objects': parametric and non-parametric

Non-parametric objects are components in a drawing or model of limited capability, so they will have no 'intelligence'. For example, in a traditional computer aided design environment these may come from a library of symbols or graphic representations of components that can be imported, visually resized, rotated and transformed. They may be quick to produce but, with little functionality and as 'image' objects, they can consume a large amount of memory, particularly when providing high-resolution visualisations. Any changes to a non-parametric object will require specific action on the shapes and lines that make up the object, and any resulting

variation in its functionality (such as light output from a luminaire) and the varying relationship with other components, would need to be established separately.

Parametric objects would typically be based on a set of rules and relationships that define its appearance and performance, allowing a range of unique instances of the object. For example, a simple light fitting could have rules that define the pattern of light output based on varying the shape, reflector colouring/reflectivity, and light source. And, as these parameters are altered, together with the relationships defined by the luminaire position and other room definitions, the profile

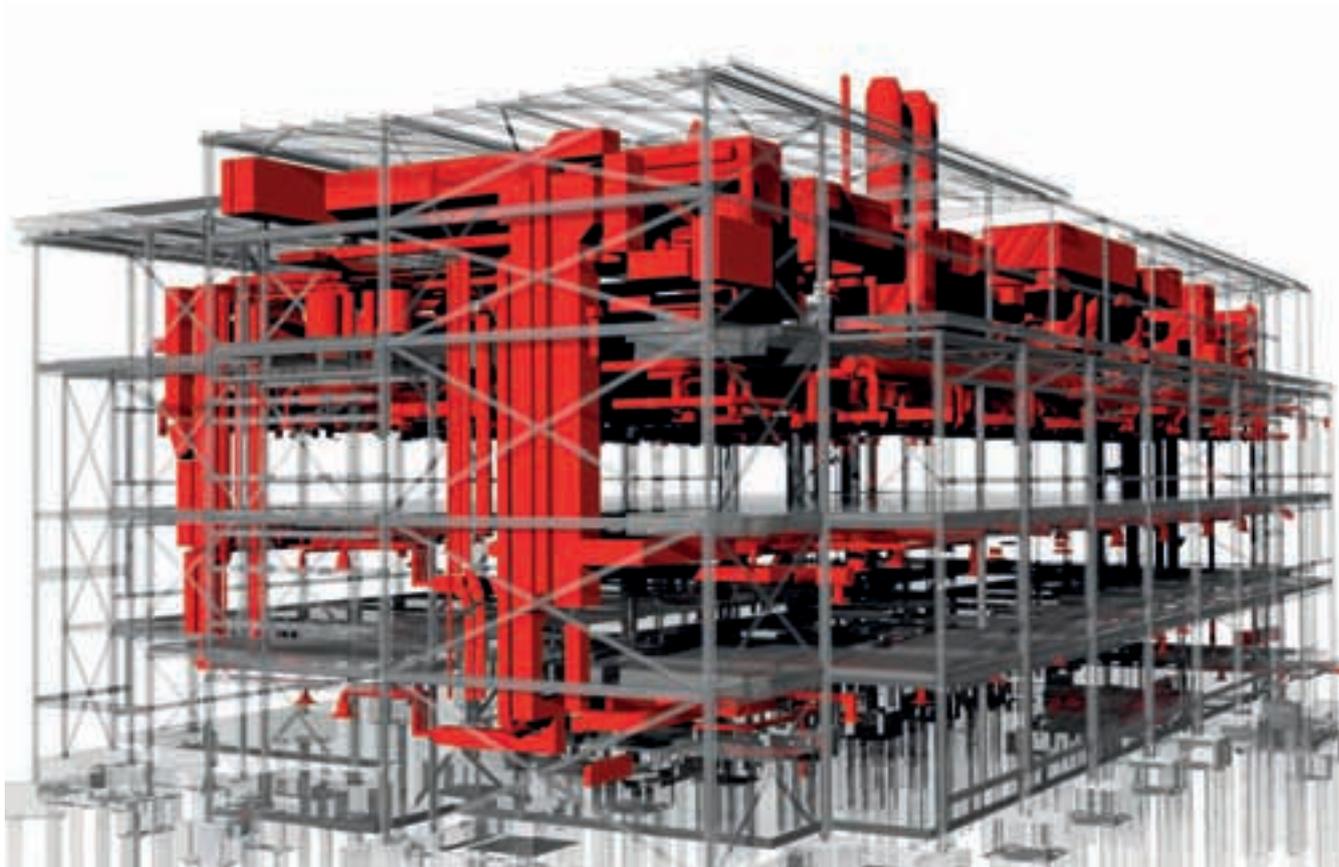
of the light output can be used to feed into a lighting visualisation.

Parametric modelling maintains relationships between different objects to feed data between themselves, and hence adapt and evolve the design. For example, if the walls in a room are moved (as well as other walls adapting automatically to maintain a consistent room) the number and/or size of luminaires can automatically adapt to maintain appropriate lighting levels. The parametric information can flow through integrated applications (such as energy models) and interoperable systems (such as procurement systems).

Procurement

UK-based building services consultancies are very conscious of competitors in Europe, particularly Scandinavia, Russia, Japan and China moving forward with BIM. National policy is key. Following the publication of the UK government BIM Strategy in July 2011, it is expected that all government-funded projects worth more than £5m will have to adopt BIM by 2016.

Such government procurement must also be accompanied by clear advice on how BIM will affect roles, responsibilities, as well as risk and reward in construction. The industry needs project and business implementation advice so that it can



measure the real benefits. A report commissioned by the Department for Business in 2008 to look at the benefits of BIM suggested that the net benefit of BIM to the UK, if extended to all major projects, would account for between £1bn and £2.5bn a year in the construction phase alone – the benefits in the operational life of the building are additional to this.

This is a critical period. Some anticipate that unless BIM is fully integrated into the UK construction process within very few years, much of the industry will be left behind international competitors.

The government is already seeking efficiency targets of 20% for the whole life of its assets through the adoption of BIM. This is seen as a realistic overall target if the industry is equipped with appropriate competencies.

But, because BIM is a ‘front-loaded’ process, M&E consultancies are likely to find that some of the work traditionally undertaken at later stages (for example, defining specific equipment during tendering and procurement) will require more detailed input earlier in the design process. Although this will result in downstream efficiencies – with less uncertainties, site alterations and ‘requests

for information’ – there needs to be some redistribution of project professional fees to reflect the changing roles and responsibilities that occur in a BIM project compared with a traditional contract process.

The development of BIM standards and protocols cannot be dominated by a single sector, professional institution or representative body. Instead they should

emerge from a true cross-industry discussion.

Leadership must be provided from the top down, from public and private sector clients, from institutions, and from leading-edge organisations.

The author thanks the following for their help with the article, which does not necessarily represent their views: CIBSE BIM Group and George Adams (Spie Matthew Hall), Peter Kinsella (AE Smith & Son Pty Ltd), David Churcher (BSRIA), Gary Ross (Capita Symonds), Carl Collins, Dan Clipsom and Colin Magner (Arup), and Paddy Conaghan, Andy Hill and Richard Vincent (Hoare Lea). **CJ**

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In an ideal world, BIM would be more than multi-dimensional rendering – it would be a catalyst for truly integrated working in a collaborative design and supply chain

WHAT IS YOUR EXPERIENCE OF BIM?

CIBSE has set up a BIM working group that includes consultants, manufacturers, contractors, software producers and key industry associations to ensure that the interests of the building services community are identified, and solutions moved forward that provide the industry with united methods and standards.

What is your experience and opinion of how CIBSE and the industry should be moving forward with BIM to aid your sector of the industry – let us know in the very brief survey at <http://goo.gl/W5lb8>

Knowledge sharers

Building designers – whether architects or engineers – rely on modelling to predict performance outcomes, but how effective and robust are these current IT systems? **Judit Kimpian** offers some answers

The magic bullet of our times, building information modelling (BIM), promises to speed up the design and evaluation processes by allowing consultants to access design information simultaneously, and carry out quantitative and visual analysis. Once adopted, design options are turned around rapidly and project teams can benefit from an output of well-coordinated production information. Moreover, key data about buildings can be handed over to facilities and asset managers, who can then link this directly to a building management system and to maintenance programmes.

This sounds almost too good to be true, so it is not surprising that there is already talk about a 'BIM bubble'. Have we been over-optimistic about the potential of BIM? Have we underestimated the effort that goes into making BIM work for us, and the need to use it in tandem with a number of other specialised tools? If so, how far are we from BIM's promise of a fundamental industry turnaround to embrace a whole-life approach to construction?

Architects and engineers aspire to develop design proposals based on evidence of performance benefits. Yet too often the feedback is far from instantaneous, and key decisions are made throughout a project with little consideration of how these will affect actual building performance. Building shape, floor-to-floor heights, occupant density, service types, zoning and so on, become very expensive to change down the line – yet all have a major impact on the final outcome.

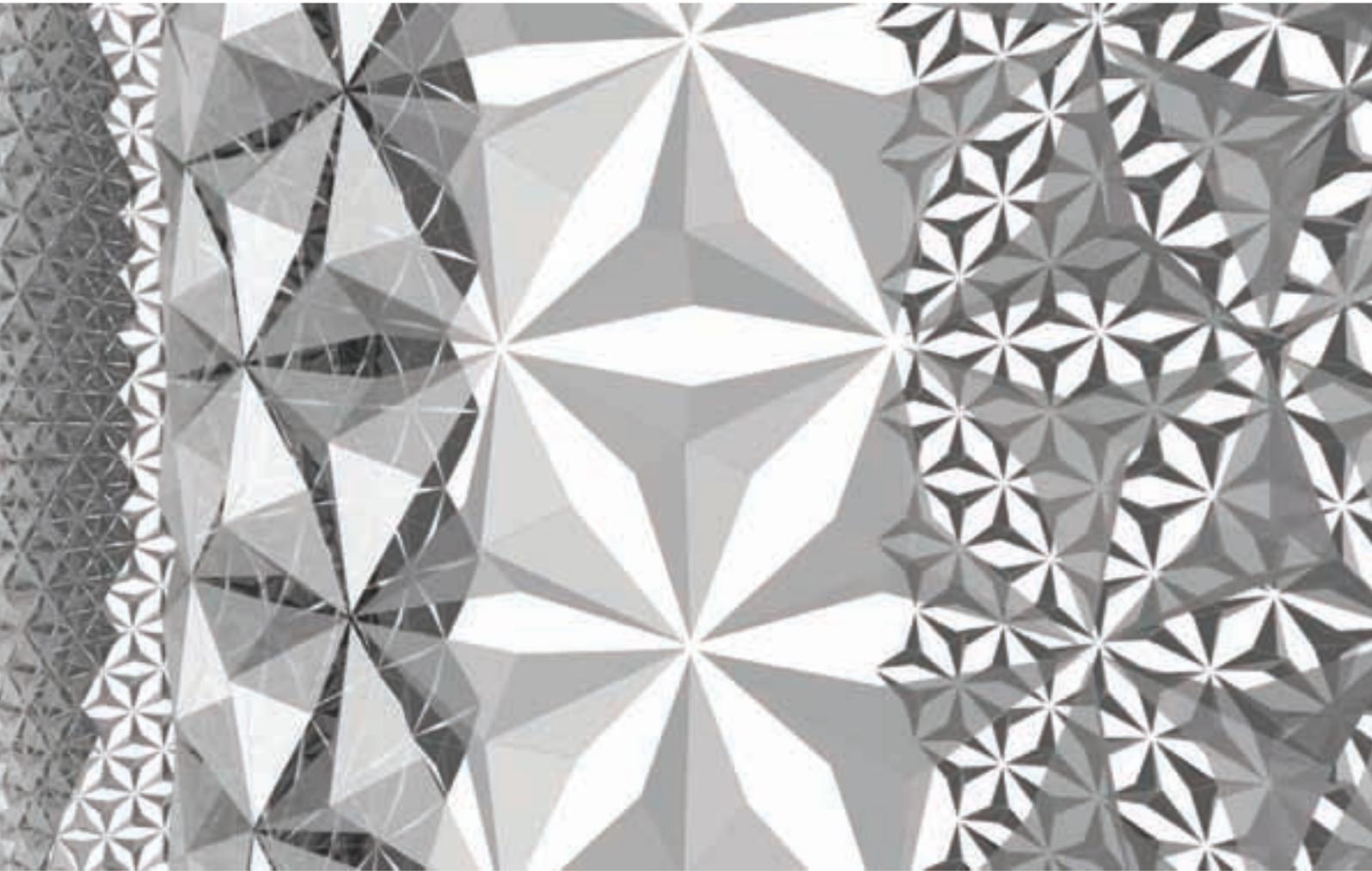
Even when a BIM model is shared amongst consultants as intended, precious time goes by while a proposal is evaluated in terms of structure, services and cost.

By the time the design team can integrate the outcomes of such analyses in a single, coordinated 3D model, the opportunity to demonstrate the benefits of one solution over the other is often lost. Optimisation of wall U-values is a typical example.

Improving these can reduce heating and cooling loads, but often results in thicker wall build-ups, which in turn lower the net-to-gross ratio. To argue that better insulation outweighs the higher capital cost and loss of net area, we need to present the whole-life benefit at the time this decision is made – which means we can't afford to spend weeks analysing the consequences. We need much faster feedback.

To address this problem, the firms Aedas, Arup, Hilson Moran and Davis Langdon have devised the 'tall building simulation' model (TBS), a demonstrator that is part of a new generation of virtual information models (VIM). VIMs allow designers to map the relationships between key design parameters (hence the term 'parametric model') and manipulate these interactively.

The TBS amalgamates early-stage structural, mechanical-electrical and cost analysis to provide instant feedback of the effects of early-stage design and briefing decisions. Changes to a tower's shape, height, façade specification, structural system type or occupancy can be made instantaneously. The model shows the relating quantities and efficiency indicators, as well as whole-life carbon and cost implications, on the fly. Timing is critical – to agree on the best option, key decision makers need to be aware of the quantitative implications of their decisions. Using such a model, experts from all disciplines can sit around the table and test massing and briefing options together, in real time.



With the help of Max Fordham, Aedas R&D built a similar model for Masdar, a zero carbon neighbourhood development in Abu Dhabi. The design team had to balance the embodied and operational carbon footprint with the cost of different fabric build-ups, shading strategies and cooling strategies in a very short space of time. Having a VIM model meant that the team was able to demonstrate the effects of briefing changes for different design options. Amongst others, the client was interested in the carbon implications of inferior U-values, greater small-power use, lower chiller efficiency and abandoning natural ventilation. By demonstrating the proportional impact of these changes across many design 'options', Aedas could agree on a way forward at concept stage, so that neighbourhood carbon and cost budgets could be adhered to.

In a VIM environment information is structured so that many scenarios can be tested collaboratively, as opposed to a BIM model, which is built for information to be extracted for independent evaluation by

specialists. A BIM model is effectively a 3D model with a database back-end. For it to be useful it needs many components with tables of properties attached – but the more components one enters, the more difficult it becomes to make changes.

A VIM model, on the other hand, captures the relationships that drive designs – it is as lightweight as possible. Component location and parameters, be these geometric or performative, can be driven by pre-defined relationships in such a way that objects can adapt to local conditions. For instance, as part of a design model of a building, one could change the facade build-up, core size, floorplates or building geometry and the location of columns update in real-time and room layouts adapt to accommodate. The opportunities for design are endless and Aedas R&D [www.aedasresearch.com] has gone a long way to explore these via customised parametric models, as well as bespoke software.

It is easy to think that the ideal platform would be one that lends itself to all these approaches. Yet designing with



Top: Simulation of the dynamic Mashrabiya screen of Al Bahr Towers, Abu Dhabi

Below: Recent Aedas tall building projects



The Darwen Aldridge Community Academy in Darwen, Lancashire. Aedas used building information modelling to deliver the project

relationships, as opposed to components, can also be tricky. Too many, and a model will stop being interactive even at today's computing speeds.

BIM or VIM, communication between platforms is notoriously poor, with people having to spend valuable time to remodel data already created somewhere else. Knowing what data is actually needed from a model is also critical – it is easy to spend weeks drawing nuts and bolts that no one will ever look at, while forgetting to enclose the control strategy at handover, without which a building cannot be properly operated.

As to the choice of modelling tool – whether this is off the shelf parametric

Too often, key decisions are made throughout a project with little consideration of how these will affect actual building performance

or bespoke – the key remains the interoperability between the different platforms available. At present, no single one can provide the programmability of GenerativeComponents (GC), the lightweight interface of Rhino, the data management of Revit, the robust parametrics of Catia, the solar feedback of Ecotect, the analysis of Energy Plus, IES or Robot, the versatility of Excel, the schedule structure of Cobie, the controls of Safe & Sound, or the benchmarking provided by the CarbonBuzz website.

The approach for now is likely to be two-fold: use the tools that are appropriate for the purpose, and try to come up with 'the mother of all' database templates, to exchange information in a platform-independent way. But we must not lose sight of the challenge we need to rise to as designers: to add long-term value to the built environment.

In the absence of strong government direction on interoperability, the question remains whether the economic climate, the developments in information technologies and modest legislation on climate change will provide the right combination of incentives for the industry to share data, collaborate more and use feedback systematically. For now, BIM is only getting us as close to a whole-life approach to design as current legislation and policies for best practice allow. **CJ**



CarbonBuzz Linking up on good practice

The CarbonBuzz industry initiative – in which a number of industry companies and bodies, including Aedas, CIBSE and RIBA, are involved – continues to champion the sort of collaborative effort needed to achieve a low carbon building in operation. Its work includes the sharing of design and operational energy use data online.

Around 300 project records are hosted on the website, which also helps users to close the gap between predicted and achieved energy consumption. The data collected goes beyond the Display Energy Certification data structure, and includes energy end-

uses to offer better risk management during design and to support diagnostics in operation.

Funded by the Technology Strategy Board, uploaded data will be used anonymously to inform the development of more robust prediction methods that help quantify occupant-related energy use. This can include occupancy, building management and equipment, as well as typical differences between design and as-built results.

CarbonBuzz is working with a broader steering group to meet the data-management and benchmarking requirements of architects,

engineers, local authorities, developers, landlords, facilities managers and others that benefit from greater intelligence on their built environment. One obvious area for attention is BIM, where much is said about carbon and energy use, but there is more to do to agree on industry standards to communicate energy use and contributing factors simply and easily.

Having developed its robust data structure, CarbonBuzz should complement government efforts to create a consistent data-sharing format via BIM. www.carbonbuzz.org

JUDIT KIMPIAN is director of sustainable architecture and research at Aedas R&D. www.aedas.com

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Amassing evidence

With the use of biofuels increasing, the particular requirements for flue arrangements need to be carefully considered, writes **Richard Parkhouse**

When considering how a flue works in terms of buoyancy, it is simple: warm air and exhaust gas rise because they are less dense than the surrounding air and are displaced by cooler air. However, the challenge of effectively removing the by-products of combustion is one of the key considerations to ensure the successful implementation of biomass boilers. Without proper assessment and application of appropriate flue techniques, the safety, efficiency and environmental impact of biomass boilers can be adversely affected.

Biomass fuels

Biomass is a term that is used broadly to cover a variety of fuel sources. These range from animal dung and grass to wood, processed bio-liquids and biogas. In UK domestic and commercial boilers, biomass fuels are typically wood, and used in the form of chips or pellets. There are also boilers (including dual-fuel boilers) that can burn waste materials, as well as other biomass materials that are used in applications within the built environment.

Bioliquids are usually produced from oilseed crops such as rape. The liquids can be used in conjunction with petrol products, green diesel for vehicles, and fuel oils for burners and combined heat and power (CHP) engine sets.

Biogas is created either by thermo-chemical (pyrolysis) or anaerobic decomposition (decay in an oxygen-free environment) of organic materials. The biodegradable matter comes from living, or once-living, organisms (plants, animals or their wastes). Biogas fuel may be used for heating processes and, if concentrated, for vehicle transportation as compressed natural gas (CNG).

Biogas plant includes sewage systems, landfill gas and site waste-recovery systems. Its constituents can vary greatly from plant



to plant and on a daily basis. Most systems generate a methane-based gas, with levels varying between about 40% and 90% (together with proportions of hydrogen, nitrogen and carbon monoxide).

For example, a biomass plant would generally produce about 74% methane, 25% carbon dioxide and 1% nitrogen, and has a distinctive odour. Its gross calorific value would be about 27.8 MJ/cu m, and this compares to typical natural gas gross calorific value (GCV) of 38.7 MJ/cu m.

Biogas often has a specific gravity approaching 0.9 and must be treated, for safety purposes, as a gas that can both rise and fall in air. This means ventilation must be considered for both heavy and light gases at the same time.

Biomass boiler

Although most modern wood-chip and wood-pellet boilers are designed to allow modulation of the output down to, perhaps, 30% of maximum output, biomass is not well suited to this mode of operation. And, if continuous, low-level output is routinely required, biomass may not be the optimum choice. This also means that it is very important not to over-specify biomass boilers, and in larger systems they may need to operate in conjunction with a gas- or liquid-fuelled boiler with modulating burners for faster response to load changes.

Biomass systems will also require fuel-storage facilities and, in almost all cases

With the burning of biofuels, a key issue is how to deal with the by-products of combustion



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when replacing existing plant, will require purpose designed flue systems due to the increased termination height requirements to be compliant with Local Air Quality Management (LAQM – see <http://laqm.defra.gov.uk>). This will be site dependent as local air quality will vary, depending on the proximity to other polluting discharges and site location.

The latest edition of the Institution of Gas Engineers' *Installation of flued gas appliances in industrial and commercial premises, IGE UP/10 Edition 3*, gives further advice on commercial systems operating in conjunction with gas-fired boiler plant, particularly focusing on natural and fan-assisted ventilation requirements.

Flue design

Because of the very varied nature of the fuel, the components of the exhaust discharge will vary greatly. The focus needs to be on where the biomass discharges occur; the height at which the flue terminates; and the area in and around the discharge position.

Some key considerations relating to discharges are:

- Biomass boilers have to comply with the Clean Air Act. This means that a submission has to be made to the local planning authority, which includes the exhaust gas volumes and constituents that can be established using the manufacturer's technical literature.
- In almost all cases, long horizontal

flue runs are not appropriate. They can cause particular problems when the system is under part-load conditions. For example, hot water supply boilers have been regularly observed as being placed furthest away from the vertical rise of a flue, and during summer months the boiler is not able to effectively overcome the flue resistance and so will not function correctly.

- When using biomass, each boiler should have its own flue and not combine with other boilers. Wood-burning biomass appliances should be located as close as possible to the vertically rising stack.
- Unless recommended by the appliance or flue designer/manufacturer, fan-assisted flue systems on biomass systems are not considered as best design practice despite calculations that show a system may require a certain amount of assistance during some low load periods. The interaction between the fans within the boiler (and in particular the induced draught fan, usually situated on the outlet of the boiler) is carefully controlled by the boiler's control system. Undue suction from external fan assistance may upset the carefully controlled combustion process.
- Despite the use of scrubbers/centrifugal cleaning of the exhaust gases, particular consideration must be given to cleaning and ease of maintenance access.

To compare the requirements to meet the flue needs, three sample calculations, each



STANDARDS AND REGULATIONS

All the Approved Documents (ADs) for England and Wales are available from the Planning Portal (<http://www.planningportal.gov.uk/buildingregulations/approveddocuments>). Of particular relevance are *AD Part J – Combustion Appliances and Fuel Storage Systems* and *AD Part L – Combustion Appliances and Fuel Storage Systems*.

The technical guidance for the Scottish Building Regulations is available. Of particular relevance are Section 3 - Environment (includes chimneys) and Section 6 (Energy) – www.scotland.gov.uk/Topics/Built-Environment/Building/Building-standards/publications

In Ireland, the technical booklets supporting the regulations (including the relevant amendments pamphlets) are *Technical Booklet F2:2006 – Conservation of fuel and power in buildings other than dwellings* and *Technical Booklet L: 2006 – Combustion appliances and fuel storage systems*, available at: www.dfpni.gov.uk/index/buildings-energy-efficiency-buildings/building-regulations/br-technical-booklets.htm

The Biomass and Air Quality Guidance for Local Authorities gives some excellent guidance that is useful to both developers and installers, available at: www.environmental-protection.org.uk/biomass

The requirements for chimneys are summarised as part of the *HETAS Guide* at: http://guide.hetas.co.uk/guide_chimneys.html



Richard Parkhouse

With flue design, the focus needs to be on where the biomass discharges occur

To determine the correct flue arrangements for biomass boilers is not only more demanding, but also less definitive than for fossil fuels

Gas Fired Plant: 1956 Clean Air Act Memorandum

Input	Uncorrected chimney	5U	Building heights	Height above roof	Height above
kW gross	Height - U (m)	Radius (m)	Within 5U - H (m)	0.6 x U (min 1.0m)	Ground Level
500	0.9	4.49	7.0	1.0	8.0

Oil Fired Plant: 1956 Clean Air Act Memorandum

Input	District	Uncorrected Chimney	5U	Building Heights	Height above roof	Height above
kW gross	Type	Height U (m)	Radius (m)	Within 5U - H (m)	0.6 x U (min 1.0m)	Ground Level
500	A	1.25	6.25	7.0	1.0	8.0

Districts A,B,C,D & E range from an 'undeveloped area' to 'heavy urban and industrial development'

Biomass Plant (up to 1000kW) - LAQM.TG(09)

Attached building*	Initial height	U	5U	Building heights	Preliminary height
Height (m)	above roof (m)	(m)	Radius (m)	Within 5U (m)	Above Ground (m)
4.0	2.0	6.0	30.0	7	9.0

*This is the structure that the flue is connected to, or rises through

for 500 kW boilers with 'adjacent' 7m high buildings, are given below, one for gas, one for oil and one for biomass. For gas and oil boilers, it is determined in accordance with the *Chimney heights - third edition of the 1956 Clean Air Act memorandum, 1981* and for biomass boilers the *Local Air Quality Management - Technical Guidance LAQM.TG(09)*.

In terms of the 'memorandum', U is the uncorrected chimney height that is determined with respect to gross kW, fuel type and sulphur content.

The radius is 5U, within which the height of any building should be taken into account in establishing the final height of the flue.

For biomass installations, *LAQM.TG(09)* determines U as the 'attached building height + initial height above roof' where the 'initial height above roof' is 2m for boilers under 1,000 kW and 3m for larger installations. The 'preliminary height' is the 'height of any building within 5U' + 'initial height above roof', but is also subject to any requirement by the local authority officer for a 'dispersal study'.

The key difference results from the biomass requirements needing to include the height of the 'attached building' in the assessment of the surrounding buildings' 'radius of influence'.

So, in this case, this could be any building within a radius of 30m of the flue. This compares with just 7m for the gas and oil boilers. And the resulting calculation produces only a preliminary height that must be checked with the local authority before proceeding with the construction.

Plant-room ventilation

One of the most important areas of consideration within the plant room is correct ventilation.

Where a biomass appliance is installed in the same space as a gas boiler, the additional natural ventilation provisions for the biomass-fuelled appliance shall be at least 6 sq cm per kW heat input at low level, and 3 sq cm per kW heat input at high level (approximately 8 sq cm per kW at low level and 4 sq cm per kW at high level, based on heat output).

Where a biomass appliance is installed in the same space as a gas-fired boiler, the additional mechanical ventilation provisions for the biomass-fuelled appliance should be as required for the gas-fired boiler and as detailed in *IGE/UP/10 Edition 3*. This requires a minimum inlet air supply rate (combustion plus ventilation) of 0.75 cu m/second per 1,000 kW boiler input power, with a maximum ventilation system removing 0.4 cu m/second per 1,000 kW.

To determine the correct flue arrangements for biomass boilers is not only more demanding but also less definitive than for fossil fuels. Increasing concerns over particle sizes and air quality are likely to make the requirements more demanding in the future but, in any case, the success of an installation will depend not only on appropriate knowledge and appropriate calculations being undertaken, but by also having a constructive relationship with the local authority from the earliest possible stage. CJ

RICHARD PARKHOUSE is technical director of A1 Sheet Metal Flues. www.a1flues.co.uk

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HOLISTIC APPROACH



Whole building design that includes structure, materials, façade and internal organisation, can provide a tool for delivering low-carbon performance



MASTERCLASS
Professor
Doug King

This month's article – the last for this current series – looks at the engineering of whole buildings to achieve low carbon performance

This Masterclass series has ranged widely over passive and active environmental design issues, human comfort and even the philosophy of engineering. This demonstrates the breadth of the profession – encompassing mechanical and electrical systems design, public health engineering, façade engineering, lighting design and, increasingly, building physics and carbon performance.

At times it can be difficult to coordinate the efforts of architects, structural engineers and building services engineers to achieve project goals. We must ensure that the industry does not become so fragmented that we cannot act coherently

to achieve the imperative of low carbon performance for buildings.

Given the existing disparities in the construction industry, in order to do anything meaningful in terms of moving to a low carbon society, we need a consistent framework within which we can apply knowledge embodied in a design team. In some parts of the world, building services engineers are referred to as systems engineers. I would say that this is apt, as the principles of systems engineering are inherent in much of what we do as building services engineers.

The systems engineering approach recognises that complex products such as buildings, aircraft or vehicles require

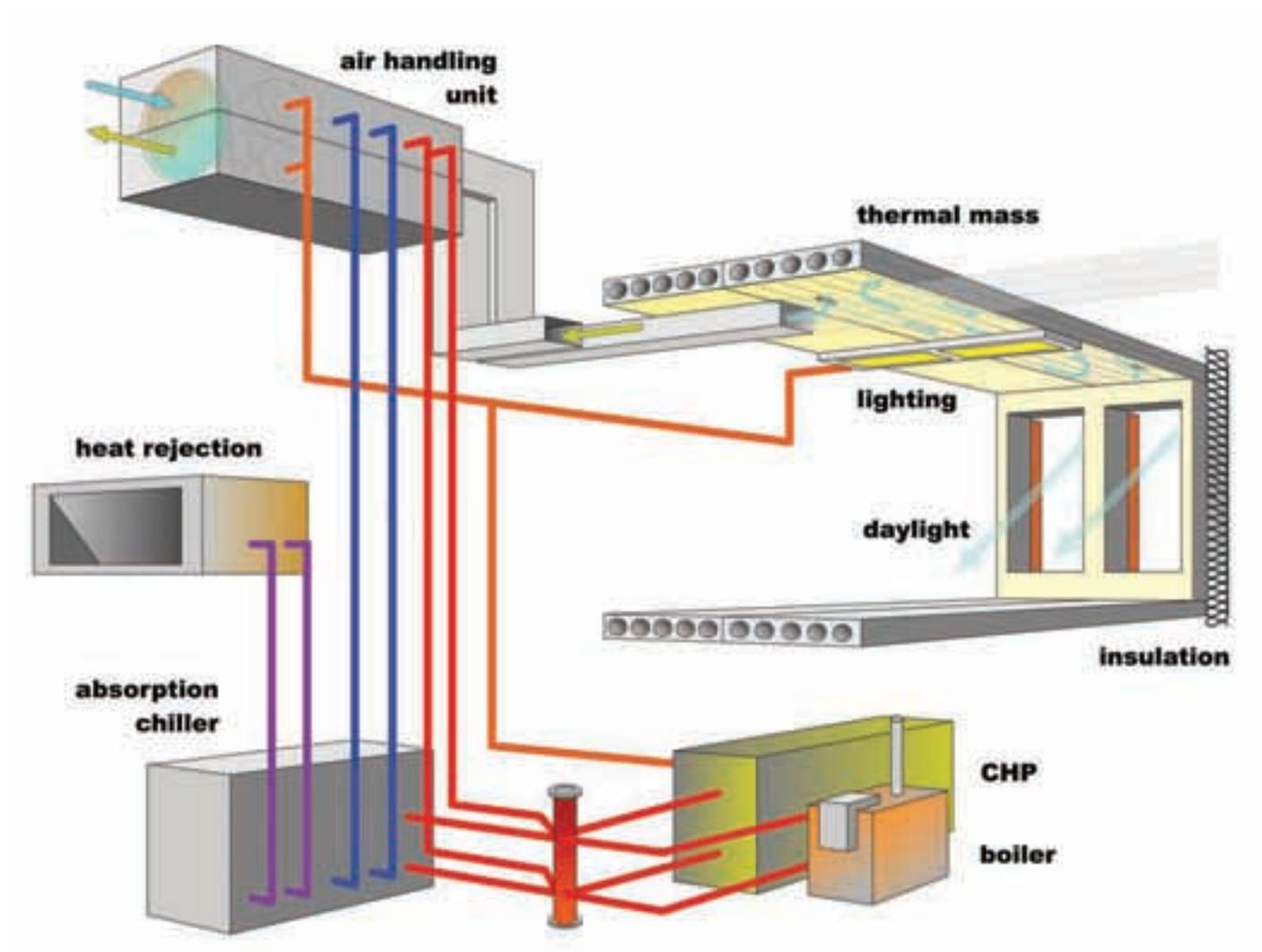


Figure 1: The comfort system for a building is likely to comprise elements of building fabric in addition to traditional heating, ventilation, air conditioning and lighting installations. Once low and zero carbon technologies are added – often with specific operating parameters – the total system can become vastly complex. In order to achieve the optimum performance for the building while ensuring the sub-systems and components all function in harmony, a rigorous approach to specification and verification of performance requirements at all levels of system integration are needed

► the contributions of many engineering disciplines to work in harmony. Systems engineering as a discipline sets out a methodology for ensuring that the many disparate component sub-systems are developed to deliver optimum performance in their own right while still contributing to the overarching performance goals for the completed product.

I believe that we need to look to the discipline of systems engineering for guidance on how building services engineers can take the lead role in delivering low carbon construction projects.

In our working lives we are already familiar with the issues of interoperability between particular parts of the building services installation. For example, when designing a heating installation using

a heat pump in place of a conventional boiler, we already understand the internal operation of the heat pump system and how this potentially interacts with the external heating distribution system. If we fail to match an appropriate form of heat utilisation to the limited temperature range of the heat pump, then it will fail to perform and so the entire heating system fails.

Systems engineering simply formalises the process by which we already make decisions about building services installations. The methodology suggests breaking down the design of a complex system, such as a building, into a range of manageable sub-system designs. Each of these sub-systems can then be designed for optimum performance. However, we should undertake the sub-system specification and design, not as an isolated project, but taking into account the interaction between sub-systems and their overall contribution to the final carbon performance of the building project.

Key to the systems engineering approach

is the specification of performance targets at each level of integration. Thus, at the highest level, the completed building, we will set targets for the carbon footprint in kgCo₂/SQ m, or a similar suitable metric based on occupancy and use. At the lowest level of systems integration we would aim to choose components, such as pump and fan motors, which deliver the maximum energy efficiency. Sometimes these targets are set for us: the Building Regulations stipulate the minimum allowable luminous efficacy for light sources, for example.

At intermediate levels of integration we would set targets, aligned with the overall performance objective, for the output of completed sub-systems. For example, legislation now dictates the maximum specific fan power for a ventilation system or the minimum coefficient of performance for chillers. However, in order to ensure that our overall performance goals are met, we should be setting appropriately aligned performance requirements for all the sub-systems and assemblies.

As the components and sub-systems are assembled to complete the product, the systems engineering methodology calls for testing at each increasing level of integration, referring back to the original component and sub-system specifications. Once again, building services engineers are completely familiar with this process. Components will undergo testing in manufacture as will sub-system assemblies such as air handling units. Sections of the system assembled on site, such as pipe and duct distribution, are all tested to ensure that they comply with the specified performance.

Once the systems are assembled, the building services specification calls for commissioning. During commissioning the systems are operated, tuned and their overall performance is tested. The introduction of mandatory air pressure testing in the building regulations now means that the building fabric is also included in the commissioning process, although not always integrated with commissioning of the mechanical and electrical systems.

However, it is still rare that we specify whole building commissioning or operational testing, an essential step in the systems engineering method,

and one that is necessary to complete the integration of the building services systems with the fabric and the building operation. When the occupant of a new building is uncomfortably cold and cannot rectify this by turning the heating up any further, then it is likely that the building services engineer will get a call, even if the failing turns out to be one of insulation or draught proofing. It is time, therefore, that the building services profession also took control of the building fabric and operational commissioning, in order to avoid these issues.

The final step in the systems engineering methodology is monitoring, feedback and continuous improvement. This step allows the user of the completed product to refine and optimise its operation for better performance over time. This step also allows the original design decisions to be validated against the final building performance, thus allowing learning from the project to be transferred to the next project to incrementally improve performance. The building services profession has, for many years, been calling for post-occupancy evaluation of buildings and publication of the data in order to permit this cycle of continuous improvement.

Building services engineers are already experienced in many aspects of systems engineering, even if they are not always able to see this approach through to fruition. If we could expand such a systematic engineering approach to encompass the whole building design, including the structure, materials, façade design and internal organisation, then we would have a very powerful tool for designing and delivering replicable and continuously-improving low-carbon performance.

When clients and other design team members are increasingly looking to the building services profession to deliver carbon savings as well as comfort, it becomes essential that we equip ourselves with the tools to manage the contributions of others, as well as the many disparate systems that we are responsible for designing. **CJ**

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DOUG KING is principal of King Shaw Associates and a visiting professor at Bath University.

The systems engineering approach recognises that complex products such as buildings, aircraft or vehicles require the contributions of many engineering disciplines to work in harmony



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Air source heat pumps

This module focuses on air source heat pumps and considers some of the current requirements and trends in this technology

If appropriately applied, the air source heat pump (ASHP) can be an effective means of providing heating energy for buildings in temperate climates, such as that of the UK. Although they do not currently attract any Renewable Heat Incentive (RHI) payments, the recent changes to the permitted development rights in England for ASHPs have eased the planning requirements for domestic installations (and some currently attract a one-off Renewable Heat Premium Payment¹). So they are increasingly likely to come under consideration as a means of providing heating and hot water. This article considers some of the current requirements and trends in their application.

Unlike other 'renewable' technologies, the application of ASHPs will still use electricity or gas to fuel them, so may not be seen as the purest form of renewable heat but, with appropriate application, they can effectively draw on the practically inexhaustible and freely available source of heat stored in the air.

Appropriate use of an electrically powered heat pump can be cheaper than using an oil-fuelled or condensing-gas boiler, as well as reducing operational carbon emissions. Based on data collected in real applications by the Energy Savings Trust, properly installed and operated systems can provide typical savings² in a

three-bedroom semi-detached house of £380 per year (or 4,440 kg CO₂ equivalent) when replacing electric heating, and £80 (or 810 kg CO₂ equivalent) per year when supplanting oil heating (and, with the better performing systems, this can rise to £610 and £310, respectively, and can even save £130 when compared to gas).

Operational efficiency

The efficiency, in terms of coefficient of performance (COP) (see *CIBSE Journal* October 2011, p51, for definition), is variable depending on the operating conditions and the refrigerant used, but can range from under 1 (when external temperatures are very low and the unit produces almost the same heat energy as the electricity it consumes) to COPs of 3 and above under spring/autumn conditions when supplying low-temperature heating systems.

The majority of heat pumps currently in the marketplace are best suited for use with low temperature systems, such as underfloor heating at 30-45°C, fan coils at 35-55°C, and radiators sized to operate at 45-55°C. Clearly, this is a temperature below that needed for the safe operation of domestic hot water where, to reduce risk from legionella, any hot water storage needs to be regularly heated to 60°C³. In

the case of a standalone heat pump system (known as a 'monovalent' system) that is being used to heat domestic hot water, this requires the use of a direct electric heater for brief periods to bring the stored water to an adequate temperature for legionella protection.

ASHPs are recognised in the England and Wales Building Regulations Approved Document Part L⁴ as being appropriate for heating buildings when they have a COP of not less than 2.2 when being used for space heating, and not less than 2.0 when also being used for heating domestic hot water. These are based on measurements being made at standard external temperatures of 7°C. This happens to be just below the average outdoor dry bulb temperature in southern England over the 'heating season' for housing, assuming that houses require some form of heating as outdoor temperatures fall below 15.5°C (the base temperature used in the degree-day energy estimation method). With improved standards of construction, the point at which modern housing needs heating will be somewhat lower than this (probably nearer to an outdoor temperature of 11°C). This means that the average temperature throughout the heating season will also be somewhat lower, at around 5°C or 6°C.

And, of course, the main weakness for ASHPs is that as the temperature of the outdoor air reduces (in winter), the COP will reduce – just when there is the greatest need for heating. So, any meaningful statement of performance should consider the operation over the whole working ‘season’. The seasonal performance factor (SPF) (see *CIBSE Journal* October 2011, p51, for definition), which considers the ratio of annual useful heat produced compared to the energy supplied, allows for the inevitable changes in COP as the evaporator and condenser temperatures vary due to altering external temperatures and internal load requirements. It will also account for other de-rating factors, such as the de-icing cycles required to keep the evaporator clear of ice at low outdoor temperatures, as well as accounting for parasitic power used in fans and control systems. For ASHPs supplying heating and hot water systems, Part L requires the SPF to be a minimum of 2.7 for new build and 2.5 for retrofit installations (this is in line with the requirements of the very useful BS EN 15450:2007 – *Heating systems in buildings – Design of heat pump heating systems*).

In 2010, the Energy Saving Trust⁵ (EST) reported relatively poor seasonal performance of retrofitted heat pumps in domestic applications, using a slightly different measure called ‘System Performance’ that also takes account of energy used in controlling and applying the heat to the building load. Half of the installations surveyed had a system performance of 2.2 or less – although there was no specific quality assurance in place when these heat pumps were installed. Future COPs (considering the ideal ‘Carnot cycle’ that determines the thermodynamic upper limit of ‘heat engines’) may theoretically reach towards seven and, indeed, European experience has shown SPF in their more mature, experienced markets to be significantly higher than the majority of those in the EST report.

Microgeneration Installation Standard: MIS 3005

As part of the Microgeneration Certification Scheme (MCS), and in an attempt to improve standards, the Microgeneration Installation Standard MIS 3005⁶ sets out the required procedure for contractors for the design, selection and installation of heat pumps up to 45kW heat output. This will range in application from domestic to small commercial premises. The products

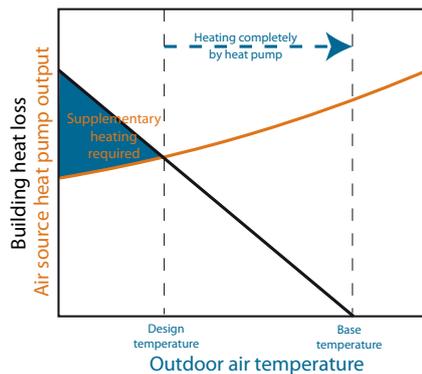


Figure 1: Monovalent heat pump installation sized at 100% of heating design load requires supplementary heating when outdoor temperatures are below design conditions

themselves are also certificated by the MCS as meeting appropriate standards. The objective of the government’s microgeneration strategy is an attempt to create conditions under which technologies, such as ASHPs, become a more realistic and acceptable alternative energy solution. As well as being evidence of good practice, MCS compliance is required if the installation is to take advantage of the recently introduced permitted development rights in England, or is being used to gain any government funding such as a Renewable Heat Premium Payment⁷ or, potentially, the Renewable Heat Initiative payments that could be commencing for ASHPs later this year.

The most recent revision to MIS 3005 (version 3, which comes into effect from 1 February 2012) requires that if the heat pump is the only source of heating (a ‘monovalent’ system) then it be selected so that it provides at least 100% of the calculated design building heat loss (determined using standard methods such as those given in BS EN 12831⁸ or *CIBSE Guide A*). The key impact of this new requirement is that this is the heat pump rating – excluding any supplementary



Figure 2: An air source heat pump with external evaporator unit, internal condenser unit and matched thermal store

electric heating – supplied as part of an integrated ASHP package. This will lead to larger (and probably more expensive) units being installed, but should ensure that there is less use of direct electric heating, which has been a concern in installations to date.

If the heat pump is sized to operate at 100% output at the design heat loss, then at times when the external temperatures fall below design conditions, additional heating will be required (as in Figure 1). Using MCS-recommended design conditions, this could be in the order of 90 hours per year and, in a monovalent system, this heating is likely to be provided by an associated electric heater. An alternative is to ‘oversize’ the ASHP to satisfy the extreme conditions, but because the COP drops as the outdoor temperature reduces, there is likely to be a disproportionate increase in heat pump size for the relative short period during the year that the additional load will be used. Oversizing is likely to increase on/off cycling at moderate loads, which may reduce the SPF. For the majority of traditional installations, there is a supplementary heat source that will also be required to satisfy top-up loads for the domestic hot water requirements.

For bivalent systems (those that have an alternative heat source, such as a gas or oil boiler) the combined installed design load should satisfy the full design heat loss – again, without including the output of an electric heater.

To maximise the SPF, and reduce cycling, there should be some storage element within the system, as is frequently offered in a package such as that shown in Figure 2.

ASHPs are also regularly used to provide cooling in commercial applications using ‘reversible’ systems (the function of the evaporator and condenser being reversed), which frequently uses variable refrigerant flow and building zoning to allow controlled concurrent heating and cooling across the building. Where there is a consistent diverse heating and cooling load, there can be a strong case for using cooling by effectively moving the heat from the overheated areas to the areas with a heating need, using the heat pump technology. However, the use of cooling on its own, in both commercial and domestic premises, can normally be – and, for environmental and energy use reasons, should be – avoided in all parts of the UK. However, if cooling is used, the removed heat should – wherever possible – be applied to domestic hot water storage.

Figure 3: MIS 3005 Heat Emitter Guide for Domestic Heat Pumps, showing part of the matrix to establish appropriate heat pump/heat emitter design criteria, based on room heat loss and heating flow water temperature

Guide for domestic heat pumps

To size heat pumps for heating systems requires some fairly standard calculations that should be within the capabilities of design engineers. However, to assist in the appropriate application of heat pumps to both new and retrofit applications, a supplementary guide to the MIS 3005 has recently been published. *The Heat Emitter Guide for Domestic Heat Pumps* attempts to provide a relatively simple (paper-based) tool to establish, prior to installation, the capability of both existing and new heating systems (excluding domestic hot water) to employ heat pumps.

The document is particularly useful when assessing the potential for existing heating systems to be reused when installing heat pumps. It provides a simplified method to assess the suitability of different heating emitter systems, including radiators and fan convectors, in existing properties when replacing gas or oil boilers. Since ‘traditional’ systems were typically designed with mean heating water temperatures of around 76C (far higher than is currently available from heat pumps), the guide determines the opportunities for using lower heating flow temperatures by examining the degree of oversizing in the existing heating distribution system. The heat emitters may have been originally oversized to allow for cold start up, to provide a ‘safety margin’ or simply for aesthetic reasons. And subsequently, as a result of energy saving measures (for example, draught proofing, improved thermal insulation and double glazing) the heating loss in the building may have reduced substantially below the available output of the heating distribution system. The heat loss to potential heat output ratio is termed the oversize factor.

Whatever the reason for the system’s oversizing, it provides an opportunity to increase the operating performance of a heat pump, since larger heat emitter

areas allow lower water flow temperatures to meet the required heat output. The combination of oversize factor and heating system flow water temperature is used to give a predicted SPF for the retrofitted heat pump installation.

For new buildings, the guide provides a matrix to assist in the selection of heating systems that are likely to operate at an appropriate SPF. This uses a combination of room heat loss, heating emitter types and heating flow temperatures to assess the likely SPF for air (and ground) source heat pumps. It identifies the most appropriate solutions, using a ‘traffic light’ colour coding system, in terms of the required ‘oversize factor’ for radiators and convectors (i.e., the multiplier of their catalogue output at an emitter-room temperature difference of 50K), and ‘pipe spacing’ (PS) for underfloor systems, related to various floor finishes.

The matrix is shown in Figure 3 and can be freely downloaded from www.microgenerationcertification.org. The guide may well assist in improving the application of heat pumps, and provides a quick first feasibility check.

Carbon dioxide heat pumps

The commercialisation of small scale heat pumps employing CO₂ as a refrigerant potentially offers some key benefits to the domestic and small commercial marketplace. To act as a refrigerant, CO₂ uses far higher pressures than HFC refrigerant, making more demands in the engineering of the underlying system. However, the major benefit is that the systems can be designed so that they can efficiently produce heat at 65C – a temperature that can satisfy the requirements of hot water systems, without needing top up supplementary heating.

However, due to the way that CO₂ heat pumps work (known as supercritical

Key for GUIDANCE TABLE

- REDUCE FABRIC AND VENTILATION HEAT LOSS** – System cannot perform at the design parameters stated, consider reducing heat loss outside (such as draught design with other emitter types).
- CONSIDER MEASURES TO REDUCE FABRIC AND VENTILATION HEAT LOSS** – System can perform at these design conditions but emitter sizes are likely to be excessive.
- CAUTION** – System can perform at these design conditions with extra consideration on the emitter and heat pump design.
- GO AHEAD** – System can perform at the stated efficiencies with the selected emitter design.
- Underfloor Pipe Spacing** – PSU10 means 100mm gaps should be spaced at 100mm or less to achieve the design condition.
- Oversize Factor** – multiply the design heat loss (in W) by the Oversize Factor to determine the required emitter output with a mean water to air temperature difference of 50°C. Oversize Factor is the same as a Heat Transfer Multiplier.

operation), they require a large temperature drop across the load to achieve consistently good COPs. This means that they are particularly effective when heating up low temperature loads (such as incoming cold water supplying a hot water service) but not so effective when heating the returning water from a heating system. Hence, they are likely to show the greatest benefit where a building has a relatively large domestic hot water load compared with the heating load – a trend that is becoming more likely with increasing building fabric performance.

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For further reading in this area see:

CIBSE Journal, October 2011 pp50-56. The article ‘Hot Prospect’ covers the realities of heat pump application. See: <http://content.yudu.com/A1u3w5/CIBSEoct11/resources/50.htm>

The BSRIA guide *Heat Pumps – A guidance document for designers* (BG 7/2009) provides an excellent overview of heat pump technology and application. HVCA’s *Guide to Good Practice – Heat Pumps* (TR/30) covers the practical aspects of installation.

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Module 36

January 2012

1. What temperature is likely to be most appropriate for underfloor heating when used with an air source heat pump (ASHP)?

- A 10-20C
- B 20-30C
- C 30-45C
- D 45-60C
- E >60C

2. What is the minimum allowable COP for an ASHP when used to provide heating and domestic hot water in England and Wales?

- A 1.8
- B 2.0
- C 2.2
- D 2.5
- E 2.7

3. In the work undertaken by the Energy Savings Trust, what was value of 'system performance' measured in at least 50% of the installations?

- A 1.8
- B 2.0
- C 2.2
- D 2.5
- E 2.7

4. Referring to the MIS 3005 *Heat Emitter Guide for Domestic Heat Pumps*, what seasonal performance factor could be expected if an ASHP is used for space heating with a flow temperature of 45°C?

- A 3.6
- B 3.4
- C 3.0
- D 2.7
- E 2.4

5. Using CO₂-based heat pumps, water can be produced efficiently at what maximum temperature?

- A 35C
- B 45C
- C 55C
- D 65C
- E 75C

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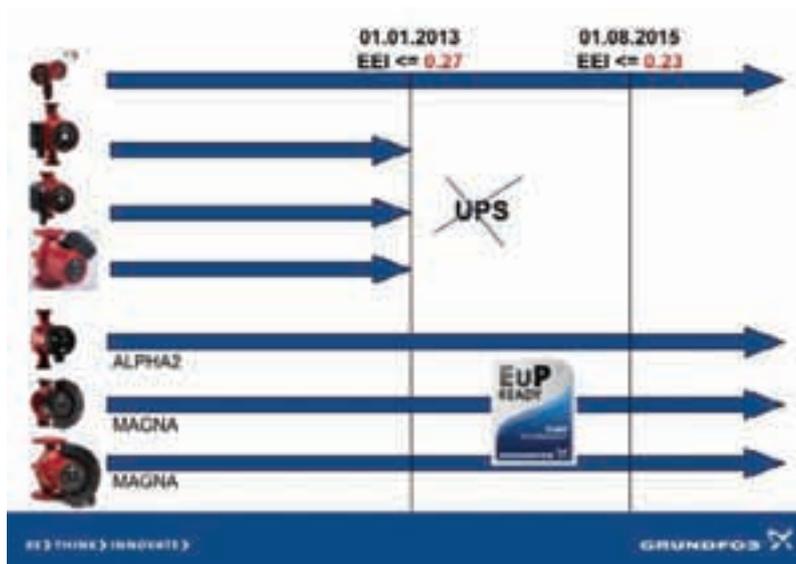


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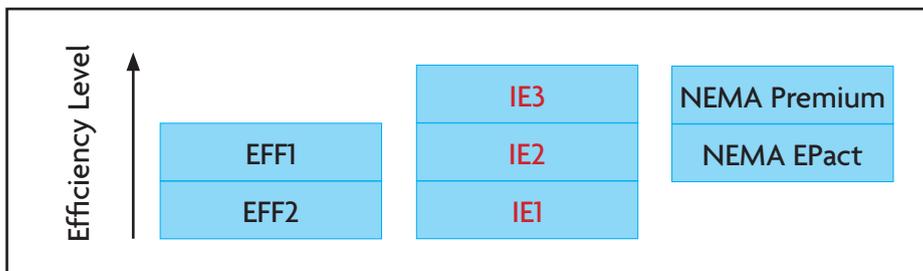
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SAV System launches low carbon technology centre

In November, SAV Systems celebrated the official opening of its low carbon technology centre with an open day, which included interactive workshops and CPD seminars. During the day around 80 delegates from the building services industry were able to find out more about the company's products. As part of the launch ceremony, Ebsen Mortensen, of the Danish Energy Industries Federation, and Bjarne Bogner, of EC Power, explained how many of Denmark's energy-saving initiatives are now being applied to reduce carbon emissions in UK projects.

● For more information visit www.sav-systems.com



Panasonic pro-academy training centre opens for business

Panasonic was delighted to welcome the company's distributors and members of the media to the grand opening of the brand new Panasonic ProAcademy, in Bracknell, last week. Guests were invited to be the first to see the new facilities, as well as hear about the company's plans for the coming months in both the heating and cooling markets. During the two-day event, a number of new product innovations were revealed, as well as giving guests an insight into growth at Panasonic.

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Panasonic extends VRF range with launch of Mini ECOi

Panasonic has added the Mini ECOi series to its VRF range, bringing high efficiency heating and cooling solutions to new and growing markets in the residential and light commercial sector. Exclusively available from Panasonic distributors, the single phase Mini ECOi became available in October 2011, with a three-phase version added in December 2011. Panasonic has incorporated a number of cutting-edge technologies to this product range to deliver an industry-leading coefficient of performance values.

● For more information call 01344 853182 or visit www.panasonic.eu



Free seminars to reduce operating costs and improve energy efficiency

Leading voltage optimisation company EMSc UK is inviting businesses in London, East Anglia and East Midlands to attend free CPD seminars that will inform business professionals on how they can reduce operating costs and improve overall efficiency through voltage optimisation. The London seminar is scheduled for Wednesday 25 January and will be held at the Wellcome Collection Conference Centre. The East Anglia seminar will take place on 21 February at the Norwich City Football Club; and the East Midlands seminar will be held at Nottingham Conferences on 22 February.

● For more information call 01709 836200 or email tracy.eaton@ems-uk.org



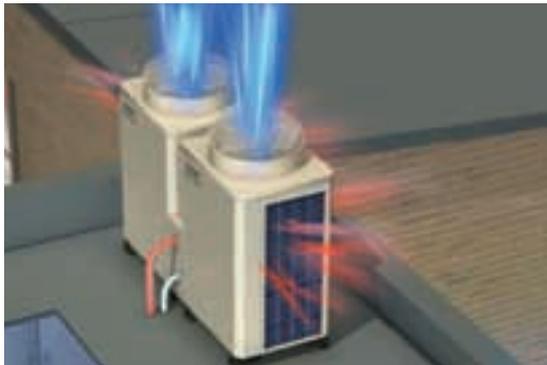
HCP supplies T2 Dublin airport

HCP, a division of SAS International, has supplied a range of perimeter heating and air handling grilles to the new Terminal 2 at Dublin Airport, Ireland. More than 1,400 metres of floor-mounted straight and curved perimeter heaters, with double heating elements, were installed. Encased in brushed stainless steel metal casings, the finish followed a horizontal direction to answer aesthetic requirements. HCP was involved with the design and manufacture of these systems, providing Mercury Engineering, Dublin, with a mock-up of units in advance.

● For more information call 01424 712195 or email info@hcp-sasint.co.uk

Animation highlights ease of achieving renewable commercial heating

Mitsubishi Electric has just launched a short animated film to highlight how easy it can be for both existing and new-build commercial buildings to achieve renewable energy targets with the company's range of heat pump water heating systems. The four minute animation focuses on a modern school building and shows how easily air- and water-source heat pump systems can be incorporated into a building to work alongside, or replace, traditional heating systems.

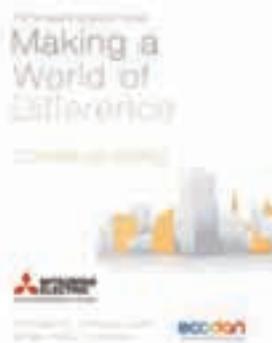


● For more information visit www.commercialheating.mitsubishielectric.co.uk

Brochure focuses on heat pumps for commercial heating

Mitsubishi Electric has launched a new brochure to highlight the ease with which a variety of commercial buildings can now achieve renewable energy targets, by utilising equipment from the company's range of Ecodan® renewable heat pump boilers. The products are a mix of ground- and air-source heat pump systems that can enable both existing and new-build commercial properties to achieve renewable energy targets with more ease and flexibility of design than almost any other system.

● For more information visit www.commercialheating.mitsubishielectric.co.uk



Leeds' Elland Road scores with FP200 Gold

Leeds' famous Elland Road Stadium is undergoing a major redevelopment of its East Stand, including an upgrade and expansion of the existing fire alarm and emergency systems. Both are being installed with Prysmian's 2 and 4 core FP200 Gold. Cost-effective, FP200 Gold complies with fire alarm standard BS 5839, emergency lighting standard BS 5266, and is BASEC and LPCB approved,



while also possessing superb voice and data transmission characteristics. This represents the hard-skin standard fire resistant cable, incorporating unique Insudite insulation.

● For more information call 023 8029 5029 or email cable.marketing.uk@prysmian.com

MHI drives climate control in luxury car showroom

High efficiency climate control in a luxury car showroom in Bedfordshire is being driven by new air conditioning systems from Mitsubishi Heavy Industries (MHI). The installation combines a VRF heat recovery system from MHI, for simultaneous heating and cooling of the open plan showroom, with a standalone Split System to air condition an enclosed office area. The new systems, supplied by AMP Air Conditioning, utilise the latest inverter technology to constantly adjust cooling/heating output to meet requirements. This ensures consistent and comfortable temperature control, and reduces energy consumption by up to 38%.



● For more information call 0207 842 8100 or visit www.mitsubishiaircon.co.uk



Flakt Woods fans installed as main ventilation for Hindhead Tunnel

Flakt Woods has supplied 43 of its 1,120 mm diameter JMTS horizontally-mounted smoke vents to be used within road tunnels, as well as 34 JM type axial fans for the cross passage sections of the twin-bore Hindhead project. The project has completed the dual carriageway link between London and Portsmouth and removed a major source of congestion. The new road is four miles (6.5km) long and includes the 1.2 miles (1.8km) twin-bored tunnels under the Devil's Punch Bowl Site of Special Scientific Interest.

● For more information call 01206 222555 or email info.uk@flaktwoods.com



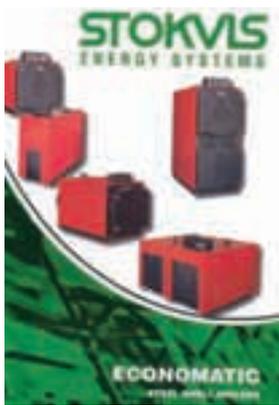
Hitachi offers more with Set Free Mini

Hitachi has extended its range of Set Free Mini outdoor units with the new 4, 5 and 6HP FSVN2E single-phase models, and 4, 5 and 6HP FSNY2E 3-phase models. Offering greater efficiency and improved coefficient of performance, the Set Free Mini is a two-pipe heat pump VRF condensing unit, which connects to all Hitachi's system-free indoor units. The advanced DC Inverter scroll compressor has been optimized to offer better seasonal performance and the unit provides high levels of comfort.

● For more information call 01628 585394 or email aircon.enquiries@hitachi-eu.com

Economonic boilers from Stokvis

The latest range of Economonic steel shell boilers is available from Stokvis Energy Systems. These are three-pass reverse flame boilers, for use on gas and oil, with capacities of 93 kW to 3488 kW in standard units. Features include a front tube plate flanged towards the combustion chamber, which prevents hot spots, reduces thermal stress and extends life expectancy. Thermal energy losses through conduction are kept to a minimum due to the high levels of insulation, both externally and internally on the boiler door.



● For more information call 0208 783 3050 or email info@stokvisboilers.com

Ideal maximises LPG efficiency

Hot on the success of the Evomax natural gas range, Ideal Commercial is taking wall-hung LPG boilers to new levels of performance. The British-based manufacturer has launched the Evomax LPG, a boiler designed specifically for customers who are not connected to mains gas, but who still demand high-efficiency solutions to heating and hot water. Built to the same high specifications as the existing Evomax – with specialist modifications made to the gas management system – the Evomax LPG boasts exceptional performance.



● For more information call 01482 498660 or visit www.idealheating.com



Eliminate grease, smoke and odour from kitchen extract emissions

Air management specialists Sirius Products has developed a modular filtration system designed to eliminate around 98% of perceptible grease, smoke and odour from kitchen extract emissions. This system, consisting of high-performance Electrostatic Precipitators and UV filtration units, can be configured to accommodate any airflow and any cooking process, and is ideal for use in locations where issues of environmental health and sustainability are of particular concern. By improving capture efficiency and eliminating the need for non-recyclable filters, Sirius' ESP and UV filtration sends almost zero waste to landfill and significantly reduces overall energy consumption.

● For more information call 01707 299339 or visit www.siriusproducts.co.uk

Risk free renewable hot water

The HSV Thermal Store from Lochinvar is a groundbreaking approach to producing commercial hot water supplies from renewables, while also eliminating the risk of Legionnaires' disease. It makes it possible to combine up to three separate renewable energy sources with a conventional boiler. The HSV also uses much less space than standard solar water systems. The extensive research and development that went into this new technology opens up opportunities for the wider use of various types of renewable hot water production.



● For more information visit www.lochinvar.ltd.uk

Water pipe sizing and drainage design software

This software incorporates five applications in one product, covering popular topics: Pipe sizing water supply systems (with integrated LU conversion, head loss, and 'industry standard' tabulation), assessment of 'tail end' water design flow (based on probability), sanitary design flow (including mixed occupancy assessment), eaves gutter sizing, and storage capacities for rainwater harvesting. Priced at £95 + VAT, supplied as a binder enclosing CD and user guide, the product will appeal to mechanical design professionals, PH Engineers, and trainees.

● For more information visit www.phoffice.co.uk/design-software.php or call 0845 459 6029



EMS establishes dedicated new build team

The advantage of a new building is that every measure can be taken to ensure optimal energy efficiency: buildings are insulated and double glazed; solar energy is utilised; and efficient lighting is installed. However, one area that is often overlooked is the amount of energy consumed in new buildings. To address this, EMSc (UK) has established a new division to focus specifically on highlighting the contribution voltage optimisation can make to cutting energy costs within new builds.

● For more information call 01709 836200 or visit www.ems-uk.org

Marco builds on product excellence



Marco, a leading uPVC Cable Management Company, and the UK's largest manufacturer of Steel Wire Cable Tray, has improved the specification of a number of its products, further enhancing quality, strength and durability. Two suspension brackets, key accessories within the Steel Wire Cable Tray range, the MCSB68 and MCSB1012, have been adapted to include additional hook-locking mechanisms, providing extra strength and stability when suspending a wire tray. The two brackets offer space for 6 and 8 mm or 10 and 12 mm threaded rod.

● For more information visit www.marcocableman.co.uk

Advanced smoke ventilation from SE Controls protects Nottingham students

A £55 million student accommodation development in Nottingham is using integrated smoke and heat exhaust ventilation systems from SE Controls to provide smoke free escape routes for around 1,000 students living in the new purpose-designed apartments at Chettles Yard. To meet the fire safety and smoke ventilation needs in three of the new buildings at the Chettles Yard development, SE Controls developed specific smoke and heat ventilation solutions for each accommodation block, based around its versatile SHEVTEC® system. As the maximum escape travel distance in two of the apartment buildings was within the 7.5 metre limit covered by Approved Document B of the Building Regulations, the SHEVTEC Natural Corridor Ventilation System was installed. In the event of a fire, the main exit route is through a single protected stairwell, so the SE Controls solution had to provide high integrity smoke and heat ventilation that not only allowed occupants to travel the increased distance to safety, but must also perform at least as well as the code compliant systems installed in the other two accommodation blocks.

● For more information call 01543 443060 or visit www.secontrols.com



Data centre banks on Star for cool solution

Star Refrigeration has installed a bespoke cooling system at a UK data centre operated by a major financial institution for retail and commercial banking. A world leader in cooling and heating system innovation, Star replaced an existing R22 refrigeration plant with a highly energy efficient, low maintenance solution. Star has provided the banking client with a state-of-the-art data centre cooling system designed for low carbon, cost saving operation.

● For more information call 0141 638 7916 or visit www.star-ref.co.uk

Mark wins eco-friendly vehicle competition



Visiting the Renewables Roadshow, powered by the Plumb Center, turned out to be a great decision for installer Mark Ward. He won a Skoda Fabia Greenline, worth more than £13,499 courtesy of headline sponsors' Plumb Center. Mark, managing director of Ward's Gas

Engineers in Milton Keynes, was one of hundreds of visitors that entered the competition nationwide. He visited Wembley Stadium, which was just one of six venues that the Renewables Roadshow visited across the UK.

● For more information visit www.renewables-roadshow.co.uk



Vaillant brings solar power to Woodlands bed and breakfast

In July 2010, a Vaillant auroTHERM exclusive three panel solar collector set, and an ecoTEC 637 condensing boiler was installed at Woodlands bed and breakfast in Glossop, Derbyshire. The installation followed the recommendation of a Vaillant solar panel system by Vaillant approved solar installers, Gas Care UK.

The adjoining tea rooms are now exclusively powered by the Vaillant auroTHERM solar panel system. Brian Mairs and his wife Julie, owners of the bed and breakfast, were very pleased with the benefits that the new system has brought.

● For more information call 01634 292 300 or visit www.vaillant.co.uk



Grundfos answers DIY SOS

The Norris Green Youth Centre in Liverpool was the setting for the biggest challenge ever to be taken on by the BBC programme, *DIY SOS*, in aid of Children in Need. The 60-year-old building – located in one of the poorest areas in Liverpool – was in a very poor state of repair when Nick Knowles and the team arrived, with just nine days to transform the premises into a centre that the local community could take pride in.

● For more information call 01525 850000 or email uk-sales@grundfos.com



Smith's Caspian reaches new heights

Smith's Environmental Products has launched a new, high level version of its Caspian fan convactor for use in commercial applications. The new products are versatile, robust and ideal for meeting the heating requirements of large areas. Fitted unobtrusively above head height, the energy efficient Caspian HL maximises wall space, while providing rapid response heating with the option of room temperature control. Available in seven models, it offers outputs from 3 kW to 12 kW, and connects and runs from an existing central heating system.

● For more information visit www.smiths-env.com

Improved Polypipe ventilation online specification planner

Polypipe's online Ventilation Specification Web Planner, which provides customers with a quick and simple ventilation specification tool, has been upgraded to make it even easier to specify and install domestic ventilation. Now, in just three simple steps, the online planner provides a quick and simple solution to specifying the most appropriate appliance and optimum duct system for properties using centralised energy efficient ventilation systems. Polypipe Ventilation's online planner provides installers and specifiers with the ability to specify the most suitable appliance for a building.



● For more information call 08443 715523 or visit www.polypipe.com/ventilation



ATAG XL commercial boilers combine highest efficiencies with lowest lifetime costs

ATAG Heating's new XL commercial boiler range takes environmentally friendly, sustainable technology to new levels of excellence. Reflecting its Dutch energy-saving heritage and featuring ATAG's tried and tested 316 stainless steel heat exchanger technology currently used throughout their boiler range, the XL gives a class leading efficiency of 109.3% (EN677), achieved through seamless upwards modulation. NOx emissions have been reduced to below 30ppm, which ATAG believe is the lowest in its class.

● For more information call 01243 815770

BESCA presents first MCS certification

The first company has gained microgeneration certification through BESCA's arrangement with NICEIC's Microgeneration Certification Scheme (MCS). BESCA chief executive, Bruce Kirton, presented the certificate to Martin Burton, of Delron Services, a building engineering services company based in Maidstone, Kent. The alliance between BESCA, HVCA's independent national assessment and certification body, and NICEIC, the UK's largest certification body for electrical contractors and renewable installers, provides members and installers of renewable technologies with NICEIC MCS certification.

● For more information call 01768 860427 or email r.davidson@welplan.co.uk



BACnet natural ventilation control from TITAN Products now available

The CCM-204-NV provides energy efficient control in buildings by monitoring the natural ventilation on demand, and improving the environmental conditions through the control of temperature and CO₂ levels. The CCM-204-NV can control two separate zones and, when used in conjunction with TITAN Products' temperature sensors, CO₂ sensors, rain detectors and window controllers, the CCM-204-NV can create an extremely flexible, multi-zone, natural ventilation system. This advanced application-specific controller, with automatic seasonal adjustment, will increase ventilation as CO₂ and temperature levels increase.

● For more information call 0161 406 6480 or visit www.titanproducts.com



Irradiance measure is the ultimate solar site-survey tool

A new high-specification instrument combines irradiance measurement with a host of other features to enable solar PV and solar thermal contractors to carry out site surveys quickly and easily. The versatile Seaward Solar Survey 100 uses a precision PV cell sensor for the highly accurate irradiance measurement, displaying results in either Wm⁻² or BTU/h/ft² and making it ideal for both solar PV and solar thermal site installations. Uniquely, the new multifunction unit also incorporates a digital compass, a digital tilt meter and a dual channel precision thermometer.

● For more information call 0191 586 3511 or visit www.seawardsolar.com



Modular, efficient, secure, green: the Modulys green power UPS from Socomec

Socomec UPS, leader in bespoke solutions for IT and other critical power applications, launches Modulys Green Power: all the benefits of the Green Power range in a fully modular UPS configuration. Socomec's Modulys Green Power



UPS, designed for complete vertical and horizontal modularity and scalability, is ideal for use in IT and other critical power applications. The system guarantees unbeatable energy efficiency – verified at 96% by TÜV SÜD – in true online, three phase, double conversion mode.

● For more information call 01285 863300 or email info.ups.uk@socumec.com

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Classroom ventilation units

Aircraft Air Handling's 260mm-high classroom ventilation units are silenced to nr25. The plate recuperator is 60% efficient, with an air volume of 0-500 litres. Heating: LPHW/ELECTRIC. Cooling: CW/DX. Larger air volumes and bespoke units are available.

● For more information visit www.aircraftairhandling.com



Good looking, light and robust

This natural aluminium dome is 14 m wide x 5.3 m high, and was designed to support Liverpool's City Centre Christmas Tree. The structure underwent strict structural calculations before being pre-built in our warehouse. Our Truss is UK manufactured and is used extensively for exhibition stands, lighting rigs, shop fits, product launches and other applications that require a good looking and robust aluminium structure.

● For more information visit www.aluminium-structures.co.uk or call Jason Reed on 01707 390122



EC Vent controller from Systemair

Systemair's EC-Vent is an intelligent control unit that promotes new levels of comfort and energy efficiency by adapting fan speed to ventilation demand via remote sensor. Its main features include:

- Room unit with built-in humidity and temperature sensors;
- A weekly time schedule; and
- 24V feed sensors and dampers.

EC-Vent provides lower energy consumption than traditional systems and, in combination with EC-driven fans, EC-Vent offers an intelligent yet easy-to-install climate solution for new buildings, as well as renovation projects.

● For more information call 0121 322 0850 or visit www.systemair.co.uk

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 See: Taking Control - CIBSE Journal Dec 2011
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Senior Operational Engineer

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The Trust comprises two of London's oldest and best known teaching hospitals. The hospitals have a long history, dating back almost 900 years, and have been at the forefront of medical progress and innovation since they were founded. Both hospitals have built on these traditions and continue to have a reputation for excellence and innovation.

We are part of King's Health Partners Academic Health Sciences Centre (AHSC), a pioneering collaboration between one of the world's leading research-led universities and three of London's most successful NHS Foundation Trusts. Our AHSC is one of only five in the UK. It consists of King's College London, and Guy's and St Thomas', King's College Hospital and South London and Maudsley NHS Foundation Trusts. King's Health Partners includes seven hospitals and over 150 community based services, is responsible for seeing 2 million patients each year, has 25,000 employees and 19,500 students, and a £2 billion annual turnover. It brings together the best of basic and translational research, clinical excellence and world-class teaching to deliver groundbreaking advances in physical and mental healthcare. **See www.kingshealthpartners.org**

From 1 April 2011, the management of community health services in Lambeth and Southwark transferred from the local Primary Care Trusts to Guy's and St Thomas' NHS Foundation Trust, marking a new era for community services locally.

The integration of community services into GSTT provides an opportunity for staff to help shape services so they better suit patient needs, balance demands across the whole system and create a seamless care pathway for patients.

Responsible for effective maintenance of the Trust's technical infrastructure. Through personal leadership, commitment and practice the post holder will secure the highest professional standards of engineering standards throughout the Trust. The post holder will be expected to work closely with the shift team leader, the engineering teams, Capital development and environment teams. The post holder will be responsible for the effective implementation of the Hospital's Health & Safety policies and protocols.

The ideal candidate will be a Chartered Engineer with substantial experience of identifying and undertaking minor building repairs within set performance targets, managing budgets and resources whilst delivering responsive customer services. The ability to work in a frenetic environment whilst leading a professional and motivated team will be key to your success.

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Our excellent benefits include final salary pension scheme. Please visit our website to find out more.
Equality of opportunity is our Policy.



www.guysandstthomas.nhs.uk

Senior MEP Design Engineers Saudi Arabia, Riyadh, 35k SAR (pcm) + accommodation

Our client, an international multi-disciplinary consultancy, requires a Senior Electrical Design Engineer, and a Senior Mechanical Design Engineer with experience of plumbing and fire protection. The successful candidates will be working on a large exhibition centre in the financial district, as client's representatives, liaising between the design and construction teams. Both positions require a degree qualified candidate with substantial experience working on site based roles in the Middle East.

BAR730/PA

Design Manager London, £50 - £60k + benefits

Our client has been established over 60 years and has a £500+ million turnover with offices throughout the UK. They operate across a variety of sectors including building services. This position exists in the specialist rail group which generally works on network rail and London underground projects including ticket halls, platform lengthening, and station upgrades. The company are currently looking for an electrically biased Design Manager from within building services that has previously worked on rail related projects.

BAR702/JA

Senior Electrical Design Engineer Dubai, Abu Dhabi, 40k AED (pcm)

We have a fantastic opportunity, with a well-known international multi-disciplinary consultancy. Our client requires a degree qualified engineer with 10 years' experience including at least 3 years in the UAE to work on a high profile development. The project is anticipated to run for two years and will require the successful candidate to start at relatively short notice. This is a site based role, co-ordinating the activities of the design office and the team on-site; consequently previous experience as a resident engineer is crucial.

BAR724/PA

Senior Electrical Engineer London, £28 - £32 per hour

Our client have been established for over 60 years, and have offices worldwide. They deliver highly technical projects to clients including data centres, laboratory, healthcare and industrial building sectors. The successful candidate will be degree qualified and have previously led projects with exposure to writing specifications, system selection and development of design criteria. Candidates will have worked on design of electrical services for data centres, UPS or mission critical projects, with infrastructure, LV, MV and KV power distribution experience.

BAR717/JA

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Engineering

**Mechanical Operations
Development Engineer**

Location: Highfield Campus

Salary: £34,745 to £44,016

Full Time Permanent

Interview Date: To be confirmed

Reference: 072711TD

With an ambitious target of reducing carbon emissions by 20% by 2020, the University of Southampton is looking to recruit an engineer to lead its mechanical operations team.

The estate's mechanical services are spread across a number of academic and residential sites served by a wide range of HVAC plant including large scale district heating and CHP and condensing economisers, condensing boilers, absorption and vapour compression chillers, chilled beams, displacement ventilation, VAV, fan coil units and VRV, the vast majority of which are controlled by an extensive Trend BEMS.

The installations are of varying vintages and qualities and there is ample opportunity to develop and improve the energy efficiency of the plant.

This post will require a dynamic and innovative approach to developing the way in which the plant is operated and maintained that will deliver improvements to energy efficiency, health and safety, auditability at the same time as improving the efficiency with which the service is delivered.

The successful applicant will bring extensive practical experience of managing the operation of mechanical services installations as well as a good understanding of the factors affecting energy efficiency in buildings and how these can be introduced to existing operating installations. He/she will have a thorough understanding of BEMS DDC controls systems and how to specify and use them. Excellent interpersonal communication and negotiating skills will be essential in order to obtain the 'buy in' of the team and excellent written and oral communication skills will be essential in reporting progress to senior colleagues.

The closing date for this post is 1st Feb 2012.

Please apply online through www.jobs.soton.ac.uk or alternatively telephone 023 8059 2750 for an application form. Please quote vacancy reference number 072711TD on all correspondence.

www.jobs.soton.ac.uk



www.ies-ltd.co.uk

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Ideally, candidates will be self motivated and customer focussed; with a flair for design and project management in a high-integrity industry sector. Work will be based in Aberdeen, but may involve short secondment to our Great Yarmouth office together with occasional offshore or international visits. Preference will be given to candidates with petrochemical experience, but applications are also invited from professionals with relevant HVAC design experience gained elsewhere.

Successful candidates may be required to undertake offshore survival training (BOSIET & MIST).

In the first instance, please submit CV stating qualifications, relevant experience and salary expectations to: gordon.finnie@ies-ltd.co.uk.

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Happy New Year to our clients and candidates from the team at Blueprint!

Intermediate & Senior Elec Design Eng | London | to £34K-£45K++ | ref: 1757
An international blue-chip consultancy is looking for intermediate and senior Electrical Design Engineers. Candidates will ideally be degree qualified and have worked on large overseas projects. Excellent opportunity!

Senior Mechanical Design Engineer | Hampshire | to £30LTD! | ref: 2833
Our client has recently secured new projects within the education sector and is looking for a senior Mechanical Design Engineer who can lead projects and a small team. Ideal candidates will be confident dealing with clients and have a solid track record of delivering projects. Long term opportunity!

Senior Electrical & Mechanical Design Engineers | London | £NEG! | ref: 9765
Following major project wins on Crossrail a number of our clients are looking to recruit experienced Design Engineers. Candidates will have a solid track record delivering projects within the rail sector and have worked on NR and LUL projects previously. Permanent and contract opportunities available!

Intermediate Electrical Design Engineers | South of Eng | to £35K | ref: 4797
We are looking for intermediate Electrical Design Engineers for a number of consultancies in various locations across the South of England. You will have strong post graduate experience of taking projects from concept through to completion. Progression to Chartered status on offer!

Business Development Manager | London | £NEG! | ref: 1909
An international consultancy, with a recently established London office, is looking for an experienced Business Development Manager. Ideal candidates will have previous sales experience with a consultancy and have dealt with clients in the data centre, airport and pharmaceutical sectors. Competitive package, plus commission!

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We're right at the forefront of technical advances, but with design and operational experience like yours, you can't help but spot better ways of doing things including how to improve the efficiency as well as reduce the environmental impact of our assets. So, as well as monitoring our existing systems, you'll leave your mark by setting standards, delivering new systems, and using your credibility and sway to influence across the organisation. It's just as high-profile as it sounds. After all, you will be our national expert. To find out more, please visit www.natscareers.co.uk

Closing date: 15th January 2012.

NATS is committed to equal opportunities. We aim to reflect the diversity of society throughout our workforce.

www.nats.co.uk

NATS



Leisure, International Venues & Events

Job Title: Head of Facilities Management
Location: Bournemouth
Salary: c£46,800

BH Live is a leisure and cultural trust established in 2010 to promote participation in leisure, culture and events across 6 sites in Bournemouth including the nationally recognised Bournemouth International Centre (BIC), the Grade II listed Pavilion Theatre and the award winning Littledown Centre. Our aim is now to build on our success and firmly establish BH Live as a leading organisation in the sector and secure a national reputation for excellence.

When you join BH Live as the Head of Facilities Management you will have strategic responsibility for asset management across the organisation including capital projects. You will also be responsible for ensuring a high quality building and technical service provision. You will be a forward thinking facilities management professional who is business driven with a "can do" commercial approach and able to take a lead role in effective environmental management including minimising energy usage and delivering a carbon reduction programme.

If you have the experience of facility management of a significant building with strategic skills to prepare, monitor and implement major capital and revenue programmes as well as managing a multi skilled team/contractors, and ideally a member of the Chartered Institute of Building Services Engineers, please apply by sending your CV with a covering letter outlining how you meet the role requirements to recruitment@bhlive.co.uk. For an informal discussion please call Steve Piper, Head of Venues for BH Live on 01202 456506.

For further details please go to www.bhlive.co.uk

Closing date: 23 January 2012

Interviews will be held during the week beginning 6 February 2012



Houses of Parliament

Would you like to play a leading role in the delivery of important estates projects in one of the world's most beautiful and iconic buildings? At the Houses of Parliament modern facilities sit alongside centuries of history. New ideas jostle with grand traditions. If you relish the idea of applying your professional know-how to a Grade 1 listed building, you'll find it a fascinating place to work.

As a member of the Parliamentary Estates Directorate you will be part of a strong team, dealing with a vast range of property and construction activities, helping to ensure that the estate is developed, maintained and managed to the highest of standards.

The Projects Team is split into two distinct areas. The Design Authority establishes technical and construction standards for the Estate and the Delivery Team is responsible for leading and delivering construction projects to meet the needs of the two Houses.

Within the Delivery Team, the Principal Project Leader (PPL) and Project Leaders (PL's) both perform proactive "Intelligent Client" roles for the organisation. The PPL heads up the team and, with a number of PL's, leads external project managers and design teams, liaising with fellow professionals to ensure the delivery of our estate strategy.

For more information and to apply, please visit:

www.houseofcommons-careers.org.uk

Or write to: Campaign Management, Hays Public Services,
23 Lower Belgrave Street, Ebury Gate, London, SW1W 0NT.
Alternatively please Email: HouseOfCommons@hays.com

Interviews are likely to be held in late February/March 2012.
Closing date for both roles: 27 January 2012



We are looking to recruit:

Delivery Team

Principal Project Leader
Construction and M&E (one post)
£56,584 - £74,270
Ref: 311069

Project Leader Construction (one post)
£29,786 - £41,601
Ref: 311070

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Events & Training

NATIONAL EVENTS AND CONFERENCES

Indoor air quality, air distribution and ventilation: striking a balance between quality and efficiency
 25 January 2012, London
 Exploring the conflicts involved in ventilation and giving you the tools you need to provide good indoor air quality in your projects.
www.cibsetraining.co.uk/conferences

CIBSE Building Performance Awards 2012
 08 February 2012, London
 The CIBSE Building Performance Awards recognise, reward and celebrate the best performance, innovation and practice in buildings.
www.cibseawards.org

Lighting the Olympic Games, London
 27 February 2012, London
 Open-to-all panelled discussion, hosted by the Institution of Engineering and Technology with speakers including Olympic Delivery Authority learning legacy ambassador, Michael Grubb, of lighting designer Sutton Vane Associates, which created the lighting strategy for the Olympic Park.
www.theiet.org
www.sva.co.uk

The ARC Show 2012
 29 February - 01 March 2012, London
 Lighting show focusing on global architectural, retail or commercial lighting. Plus new sustainability, and healthcare and education feature areas.
www.thearcshow.com

SOCIETY OF LIGHT AND LIGHTING

SLL Masterclasses - One Building a Minute
 25 January 2012, Bristol
 This series brings together speakers from Philips, Thorn, Tridonic, Trilux and Wila and, along with a guest paper from an IALD

speaker, they make an exciting mix. The theme for the Masterclasses is refurbishment.
www.sll.org/events

Trotter Patterson Lecture
 31 January 2012, London
 Dr Mark Rea, director of the Lighting Research Center at Rensselaer Polytechnic Institute, will discuss the topic, 'Whatever happened to visual performance'. This is a free event, but booking in advance is essential.
www.sll.org/events

CIBSE GROUPS AND REGIONS

Fire Alarm Systems
 09 January 2012, Cardiff
 Details yet to be announced.
www.cibse.org

Whitcroft Lighting: lighting the modern office (implications on energy of the new BSEN 12464-1)
 10 January 2012, London
 Details yet to be announced.
www.cibse.org/sophe

Society of Public Health Engineers - selection and application of cold water booster sets
 10 January 2012, London
 Details to be confirmed.
www.cibse.org/sophe

Annual East Anglia Region empowering debate
 12 January 2012, Ipswich
 Join us for the inaugural debate, covering a topical subject, and have your say on the industry. More information on subjects to follow.
www.cibse.org

Society of Public Health Engineers - the history of booster sets 1970s to the present day
 18 January 2012, Manchester
 Details to be confirmed.
www.cibse.org/sophe

Lighting seminar - the application of LEDs
 18 January 2012, Birmingham
 Details to be confirmed.
www.cibse.org

The Daylight Group and the Society of Façade Engineering presents: Is daylighting still a factor in façade design?
 18 January 2012, Manchester
 Details to be confirmed.
www.cibse.org/sohpe

Flood risk and sustainable drainage
 19 January 2012, Chichester
 Examining the key issues and requirements for assessing flood risk and the need for Sustainable Drainage (SuDS) on development schemes.
www.cibse.org

Sealed systems
 02 February 2012, Norwich
 Details to be announced.
jonathan.page@mlm.uk.com

Carbon Trust
 06 February 2012, Cardiff
 Details to be announced.
jno@neiloliver.plus.com

CPD TRAINING

Visit www.cibsetraining.co.uk, call 020 8772 3660 or email eventbookings@cibse.org

LCEA EPC Training
 10-11 January 2012, London

Earthing and Bonding Systems
 16 January 2012, London

Energy Efficient Façade Design
 17 January 2012, Manchester

Air conditioning inspection for buildings
 17 January 2012, Birmingham

Building electrics basics 1: choosing electricity supplies
 18 January 2012, London

Mechanical Services Explained
 18 January 2012, Manchester

Building electrics basics 2: distribution systems and equipment
 19 January 2012, London

Getting ready for Green Deal 2012

24 January - London; 7 March - Coventry; 24 April - Manchester



Elena Elisseeva/Shutterstock

The Green Deal is the newest government initiative designed to allow private companies and householders the opportunity to make energy efficiency improvements to their properties at no upfront cost. The cost of these improvements will be repaid through the reduction in consumers' energy bills.

In autumn 2011 there was a formal consultation on secondary legislation and it is anticipated that in early 2012 this secondary legislation will be laid before

parliament.

The Green Deal offers opportunities for those qualified as Green Deal 'advisers' and 'installers'.

Now, CIBSE is holding several one-day workshops to give insight into the scheme and allow you to recognise where opportunities created by the Green Deal lie. They will also show how you can prepare your business ahead of this policy shift.

For more information visit www.cibsetraining.co.uk/green-deal

Smoke control: matching the method to the building
 24 January 2012, London

Getting Ready for Green Deal 2012
 24 January 2012, London

Running Projects Effectively
 25 January 2012, London

Energy Surveys
 26 January 2012, London

Low and zero carbon energy technologies: undertaking feasibility studies and understanding design considerations
 31 January 2012, London

Electricity at work regulations explained
 7 February 2012, London

Electrical distribution design
 8 February 2012, London

How to specify a ground source energy system
 9 February 2012, London

Understanding and application of psychometric charts
 14 February 2012, London

2010 Part L Building Regulations
 14 February 2012, Birmingham

Control of door release arrangements (half day)
 15 February 2012, London

Introduction to building services
 15 February 2012, London

Unvented and other types of efficient hot water system
 16 February 2012, London

Send your event details to cbailey@cibsejournal.com

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Product Reference:
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PUHZ-W85VHA2-(BS)
PUHZ-HW140VHA2/YHA2-(BS)

For more information please call: **01707 282880**
or email: **commercialheating@meuk.mee.com**

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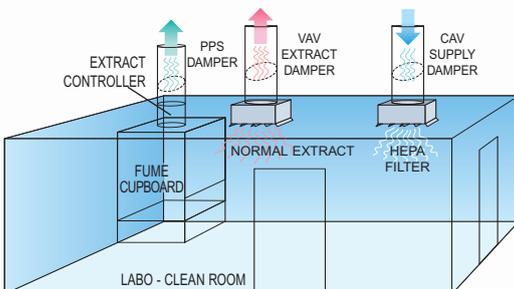


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