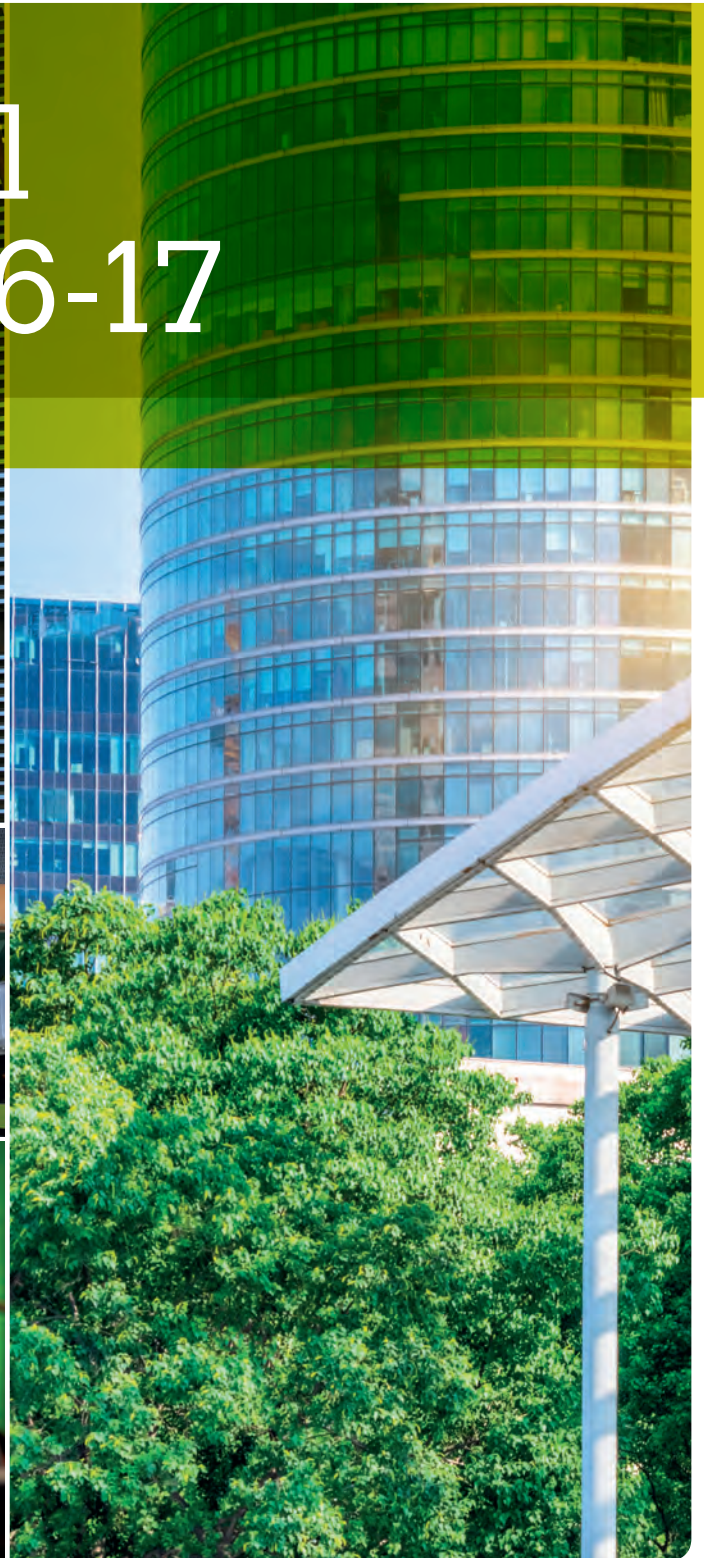


BRE Annual Review 2016-17



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1997-2017 Celebrating 20 great years... ...of the BRE Trust



We are rightly proud of the BRE Trust's achievements over the last 20 years. Created in 1997 to oversee BRE, the Trust uses profits from the BRE Group to fund research and education programmes that help to meet our goal of 'building a better world together'.

A registered charity, the Trust commissions BRE and BRE Global, along with our university and other partners, to conduct research that generates the knowledge,

skills and tools needed to create a better built environment for all.

Over the last 20 years we have funded more than £20m of research, published over 300 new or updated titles and supported more than 300 post-graduate students. We have also been able to attract extensive additional funding from both government and private sector sources, and we have developed a growing network of partners and collaborators whom we work with and support.

The findings of this research have been disseminated in over

3,000 peer-reviewed papers, conference proceedings and books, and more than 2000 students have graduated from BSc and MSc courses supported by the Trust.

While celebrating the Trust's achievements, we remain focussed on the challenges of the future, such as population growth, urbanisation, climate change and resource depletion. We aim to take a leading role in gaining the new knowledge, innovation and skills that will be needed to meet these challenges. And to succeed we must continually respond to the changes going on around us, such as advances in digital technology and rapid international development.

The BRE Trust has already embraced digital dissemination platforms, but we will now more actively use digital approaches in research and education programmes. And while the UK and European markets have been our primary focus, the communities that the Trust supports operate globally, so further extending the outreach and impact of the charity internationally is a key goal.

The challenges and rewards beckon – we look forward to the next 20 years!

James Wates CBE
BRE Trust Chairman





...of the BRE Group



Following over 75 years as a UK government owned building research organisation, BRE was transferred to charitable ownership in 1997. The leadership team at this time recognised how critical it was for the UK to continue to have a multi-disciplinary research based organisation that continued to operate in a way independent of vested interests, with a purpose for public good. Moving from public sector ownership was a major step, and one full of risks and

challenges because the built environment and infrastructure sectors were, and are not significant investors in research based activities compared with other sectors. Well, thanks primarily to an outstanding array of colleagues, whose shared values, purpose and energies have enabled our successes, here we are two decades later – not just surviving but thriving – and with a growing international presence that is driving our positive impact across the built environment.

Our research, in partnership with our University Centres, is at the highest scale and quality it has been at any stage in our long history. And the standards, tools, schemes and qualifications that are based on our science are making ever increasing positive impacts around the world. Keeping people safe and healthy, protecting property, stimulating economic growth, and enabling ways of doing so that are kind to our planet's precious resources and environment remains at the heart of everything we do. The journey hasn't been an easy one – I can testify to that having been part of BRE before and since privatisation. There's no guidebook for turning a public sector organisation into a successful and sustainable charitably owned organisation, but we knew we must find ways to enable us to continue the research so needed by society, business and the environment. But in other respects we've become a very different organisation during the last 20 years. Originally, almost all our work was UK government commissioned, but now we supply expert research services and tools to governments, companies and organisations of all kinds, all around the world. In 1997 for example, a relatively small number of UK buildings were certified to BREEAM, our sustainable building scheme. Today we have more than 560,000 certified buildings and 2.2m registered buildings in 78 countries.

BRE Global's LPCB fire safety and security standards are specified in 65 countries protecting people and property.

Our Watford Innovation Park has inspired a global network of innovation parks from China to Brazil, and our BRE Academy e-learning platform – launched in May 2016 – has already been accessed in more than 160 countries. But there is much more still to do. The world faces a myriad of challenges that need to be met. Progress towards creating truly sustainable practices across the built environment still has a long way to go. In BREEAM and our other sustainability tools we have some of the mechanisms that are increasingly making a difference. But a step change in commitment from governments, investors and the private sector is required.

Increasingly ageing populations around the world are putting pressure on health care systems that are unsustainable, and the priority must now be on how to keep people healthy and happy in their homes and communities.

The levels of care, professionalism and quality given to the design, construction, inspection and maintenance of buildings and infrastructure is poor across our sector and needs urgently to improve.

The need for innovation to improve productivity and performance is significant.

So, there is much to be done. But new technologies, digital deployment, big data, collaboration and learning from other industrial sectors are just some of the ways that solutions to these challenges will be met. There has arguably never been such a critical need for independent and trustworthy research and evidence on which to base policy and investment decisions, nor for tools, schemes and standards that provide common platforms to move forward against and to ensure competency. We will continue to play our part in collaborating with others to make the positive impacts so needed. This year we recognise 20 years under BRE Trust ownership. In 2021 we will celebrate our 100th anniversary.

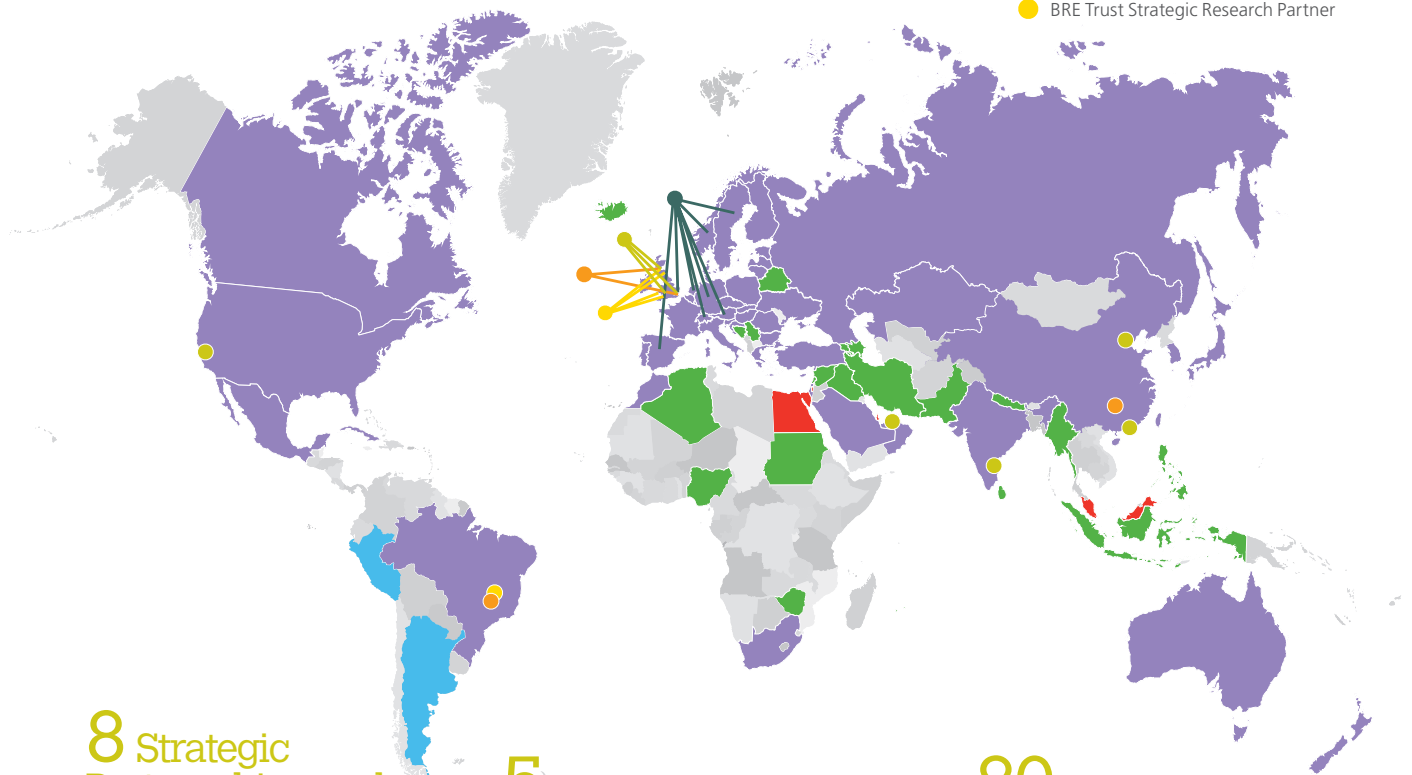
Please join with us to help optimise the positive impacts we can make by Building a better world together.

Peter Bonfield OBE FREng
BRE Group Chief Executive Officer

2016/2017 About BRE Trust and the BRE Group

At a glance

- BRE Office
- BREEAM Presence
- LPCB Presence
- BRE Academy Presence
- BREEAM/LPCB/BRE Academy Presence
- Innovation Park
- BREEAM National Scheme Operator
- BRE Trust Strategic Research Partner



8 Strategic Partnerships and collaboration with over 15 other academic institutes globally

5 BREEAM National Scheme Operators in Europe

working in **80** countries

over **11,500** products and services certified by LPCB

630⁺ people directly employed by BRE

working with **3000⁺** BREEAM and code assessors

26 million data records held on UK housing stock

300⁺ studentships supported by BRE Trust University Centres of Excellence

35,000⁺ people trained by BRE Academy

BRE making a positive difference in the built environment since 1921

Our vision:

To be the world leading research organisation enabling a better performing built environment.

Our mission:

To build a better world together.

Who we are

BRE is an international, multi-disciplinary, building science organisation with a mission to improve buildings and infrastructure through research and knowledge generation and their application. We are owned by a charity called the BRE Trust, which delivers one of the largest programmes of built environment education and research for the public good.

What we do

We use our cutting edge collaborative **research** to develop a range of **digital products, services, standards** and **qualifications** which are adopted around the world to bring about positive **change** in the built environment.

Our values

- Passionate about the **health and wellbeing** of our colleagues, customers, consumers, suppliers and partners.
- **Collaborative** with our customers, colleagues and the many stakeholders and partners we work with.
- **Consumer focused:** safeguarding the interests of consumers and society.
- **Agile:** responding with pace, dexterity and innovation to meet the needs of customers and colleagues.
- **Beyond reproach:** individually and collectively taking responsibility for working to the highest quality and ethical standards.

These values underpin all we do.



2016/2017 BRE Trust A global funder of new research



“The BRE Trust has become a globally significant supporter of the research needed to meet the complex challenges of climate change, urbanisation, environmental damage and resource depletion,” says Deborah Pullen MBE, Group Director of Research.

“Using profits made by the BRE Group, the Trust supports new research and demonstration programmes conducted by BRE scientists, our University Research Partners and the wider built environment community. However, significant amounts of additional funding are won by BRE and its partners from both public and private funding sources.

In 2016, for example, the total research programme was worth over £25m, with £6.5m direct to BRE and £9m to our University partners. On top of this another £10m has been delivered by over 75 other collaborative partners. This makes a significant contribution to the development of knowledge and skills, and the wider knowledge economy, which underpins the products and services of our industry.

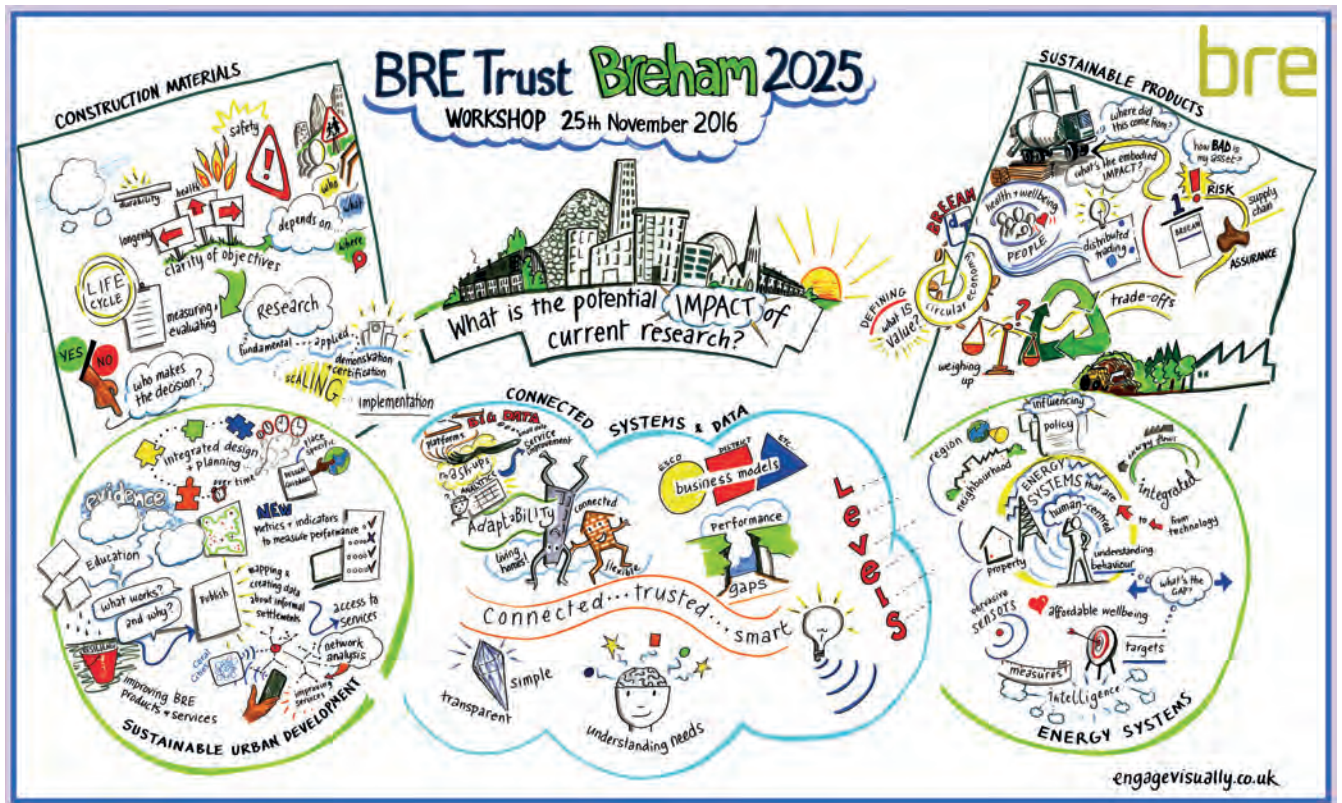
The nature of our research spans the full spectrum, from fundamental understanding through to applied research, validation and demonstration of new technologies, processes and methodologies. A selection of highlights from our research programmes during 2016/17 are outlined here and throughout the report.”

BRE Trust Research Programme

Each year the BRE Trust Research Committee selects research projects based on their potential for improving the built environment and their outcomes in terms of public benefit. Six projects were completed in 2016 :

- Delivering BRE DataLabs – an open platform for data sharing and reuse in the construction sector. The DataLab platform can house live BRE datasets. The approach adopted was based on the model used by the UK and US Governments. On the back of this, the project created a mobile application that uses live BREEAM data to enable a user to locate their nearest BREEAM certified building, BREEAM Assessor or Accredited Professional. This is a critical platform for future data management for the BRE Trust and its collaborative partners.
- Developing a fire resilience index for buildings.
- Delivering sustainable buildings: savings and payback (see also ‘Bringing value’ on page 14).
- Developing data structures to allow buildings and communities to be systemised.
- Developing Fuel Poverty Measures.
- Identifying suitable performance tests for video fire detectors.





Resilient Built Environment

BRE has been warning of the impacts of flooding, wind and overheating for some years, and in 2016 the Trust's thematic programme focused on the Resilient Built Environment was completed. Over £600k of funding was provided across a portfolio of projects that considered aspects of flooding, overheating, wind loading, post-disaster recovery, resilience in Brazil and energy security.

An additional £410k for new funding and £450k of existing project work were aligned with the programme. We engaged with a wide stakeholder group, held workshops before, during and after the programme to ensure the focus of work was validated, and forged additional partnerships for delivery. Over 25 organisations were part of the active delivery of the programme and many will continue to work with BRE in delivering ongoing work.

This programme has underpinned the activities of the Centre for Resilience, covered later in the report (page 21), by delivering new data, information and modelling.

BRE Trust University programme

Over the last 10 years the BRE Trust has provided funding for more than 110 PhDs and provided additional support to over 300 others. The £6m Trust funding has leveraged over £60m of additional funding, bringing more than 100 staff and researchers together in world leading Centres of Excellence. In the last year, four PhD studentships were completed and five more initiated, bringing the total of active studentships to 22 at the year end.

To celebrate 10 years since the initial University Centres of Excellence were launched, the 2016 Research Conference and following workshop focused on the students that are currently being supported by the BRE Trust across its eight strategic partnerships. More than 90 students and staff from BRE and the centres attended the event in Birmingham. The development of this city was used as the backdrop for presentations and discussions covering various aspects of developing a better built environment.

External speakers from Birmingham City Council and Carillion set the scene on the historic development of the city, and also provided insight into current and future development plans to continue meeting the needs of Birmingham's citizens and businesses.

Publications programme

2016/17 also saw continued progress in the delivery of the publications programme, with £260k of income expended on completing 101 individual outputs spanning reports, guidance documents, articles, presentations and training modules.

These were disseminated and promoted to over 1 million individuals by BRE's Bookshop and other digital outreach platforms. The shift towards outputs that support active learning, distributed or delivered using digital technology, continues.

2016/2017 BRE Group A strong year for the BRE Group



The BRE Group showed a strong performance in 2016/17 with unconsolidated net income up 12% on the previous year, thanks to a high level of demand for our products and services in the UK and increasingly from our international clients. BRE products are now deployed in 80 countries around the world. In addition to the UK we now have subsidiary businesses operating in China and the USA. Revenues from international clients now total some 40% of the Group total.

Our partner networks with both industry and universities continued to grow. During the year we acquired a number of membership organisations which have extended our reach and links with key supply chains. We have been pleased to welcome these organisations into the Group.

The commercial success of the businesses enabled us to make important new investments over the past year in

both highly skilled people and facilities which are key to our long term mission. A strong senior management team underpinned by professionally qualified building scientists and engineers ensured our work was delivered to professional and independent standards.

There is a growing awareness amongst governments and commercial organisations that the quality of the built environment, including the underlying infrastructure, is critical to both creating economic wealth and health of citizens at home, in the community and in the workplace. BRE is providing guidance and products and services that improve the way the built environment is designed, built and operated.

Working with the BRE Trust we have an extensive research programme with leading universities which helps inform the development of new products and services. We are pleased and privileged to be playing our part to 'Build a Better World Together'.

Chris Earnshaw OBE FREng
Chairman BRE Group



The Group had a strong financial year, with income of £46.7m delivering a net income of £1.69m, a significant improvement against last year's net expense of £0.3m. Our digital revenues now account for over 25% of our revenues, and over 40% of our revenues come from outside the UK. This is a clear demonstration that our focus on high margin, geographically diversified activities is working. This has

resulted in the strengthening of our balance sheet. Before accounting for the pension deficit, our net assets have increased by £2.9m to £32.47m.

Our focus on profitable growth is most clearly evidenced in our cash balances which have improved by £2.8m to £3.5m. We continue to focus on productisation of services which allows us to access high margin, recurring revenues and securing payment in advance.

This is the first financial year in which our operations in China and the USA have been fully incorporated. Whilst in start up phase, China delivered a profit in its first year and has opened access to new and fast growing markets. The USA has huge market potential and has delivered great brand awareness that lays the foundations for strong growth.

Jat Branch
BRE Group Chief Finance Officer

Highlights of 2016/2017

Income

£46.7m

2015/2016 £47.8m

Net asset value

£32.47m

2015/2016 £29.5m

Net income

£1.69m

2015/2016 £(0.3)m

Average number
of employees

643

2015/2016 630

People and culture



“Our people are the lifeblood of our organisation.” says Kirsten Lord, Group HR Director. “Their health, safety and wellbeing – and that of all those visiting BRE sites – is our top priority.

We fully recognise that it is the combination of our colleagues’ personal and professional strengths that is the key to BRE’s success. We take great care in investing in their training and personal development – often engaging with trusted research and education partners to further extend their capabilities and skills. We have also developed a range of awards to showcase their outstanding achievements.

And, with the Brexit vote a major factor in 2016/17, we are also working to support our talented European colleagues in this time of uncertainty. They have been and remain an essential component of our success – international cooperation between researchers has been fundamental to advancing our industry for decades.”

Health, safety and wellbeing

The health, safety and wellbeing of our employees, visitors, contractors and everyone involved in our work, is our top priority. Our activities are all managed to eliminate or reduce risks to a minimum, based on four principles – that health, safety and wellbeing is everyone’s responsibility, it is integral to everything we do, it is essential to the success of our business, and nothing is worth risking our own or others’ health, safety and wellbeing.

All of our people undertake regular mandatory health and safety training on topics such as behavioural safety, fire safety, manual handling and risk assessment, along with specialised training appropriate to their work.

Diversity

Our people are the key to BRE’s success, and they are recognised solely on the basis of their strengths, capabilities, performance and potential. We believe that the more the people at BRE reflect the diversity of the world around us, the more we will be able to build a better world together. Our colleagues come from across the EU and as far afield as Malaysia, New Zealand, Kenya, the US and Sri Lanka.

As part of our drive for diversity we seek to understand the strengths of all our colleagues. For example, we are leading on an initiative to better enable the talents of dyslexics across our industry. In April we hosted an event by the British Dyslexia Association in partnership with Dyslexia STEM, on how to assist individuals in deploying their strengths in professional environments. Having now defined the purpose of Dyslexia STEM and engaged like-minded organisations, the focus will be on sharing best practice via the Dyslexia STEM website (www.dyslexiastem.com), to help organisations support and enable their dyslexic colleagues and customers.

The BRE Women’s Network, founded in 2013 to support women working in the built environment, is just one example of how BRE champions diversity. In 2016, the Network organised the BEInspired event, which brought together successful women from across the industry to tell their stories and inspire others.



Graduate scheme

BRE's two-year graduate scheme offers motivated science, architecture, sustainability and engineering graduates the chance to progress their careers and make a difference in the built environment.

The scheme is based on four, six-month rotations in areas such as building structures, energy modelling, resource efficiency, sustainability, fire sciences and security. Each graduate has a mentor to guide them through their programme, until they take on a fulltime role. Graduates participate in every aspect of our work, from structural and fire tests to the development of BREEAM schemes.

Apprentice scheme

Launched in 2012 by the then Business Innovation and Skills Minister, Mark Prisk MP, the BRE Apprenticeship Scheme offers people the chance to work at our specialised labs and test facilities, IT and finance departments, and on-site nursery. The scheme has been recognised by the official UK government regulatory body, NAS, and in 2014 the BRE Group was listed in the City & Guilds Top 100 Apprenticeship Employers. Over the last year 13 people have completed their apprenticeships.

BRE Awards

We help colleagues to be excellent in their chosen field and develop new skills by providing development pathways and more flexible ways of working. We also recognise their achievements. In 2016, for example, 57 members of our people have received achievement awards for outstanding technical and non-technical work, and eight received long-service awards – the longest length of service being over 48 years.



Community programme

We also take our role in the wider community very seriously. Our long-standing schools programme, for example, aims to inspire children and young people of all ages to take an interest, and develop their careers, in the built environment. Using the specialist buildings and laboratories located on our Watford site, we host half day educational visits that support the delivery of the National Curriculum and the Construction and Built Environment Diploma. More than 500 schools and almost 17,000 pupils visited free-of-charge between 2008 and 2016.

BRE also holds free open days for the public, such as the 2016 Heritage Open Day. This gave visitors insights into our history and achievements, and included visits to the Mohne Dam model (used in the early stages of developing the Dambusters' famous Bouncing Bomb), our larger test labs, and 'Bucknalls' the 19th century mansion house at the centre of the Watford site.

S Plan

The S Plan is BRE's sustainability strategy. It was launched in 2008 with 17 sustainability targets to reduce BRE's environmental impacts. Early accomplishments included achieving the zero non-hazardous waste to landfill target and reducing electricity consumption by 14% compared with 2008 levels. In 2014 energy use was reduced to below the Carbon Reduction Commitment threshold for UK businesses, leading to a £60,000 tax saving per annum, as well as reducing energy costs.

The S Plan continues to deliver results, for example by installing seven new EV car chargers at BRE Garston and setting up a Group-wide car sharing scheme. BRE has also recruited its first Sustainability Manager, demonstrating our commitment to sustainability.

In 2016 we achieved a slight reduction in electricity and gas use at the Watford site, compared to our baseline energy use in 2010, and a 47% reduction in water use. Carbon dioxide emissions from all BRE people commuting to work was 48% less in 2016 than in 2010. We achieved a 4% overall reduction in waste materials in 2016 over the previous year, with 50.8% of waste segregated on site, 1.79% recycled off site, 47.39% sent to energy from waste plant, and just 0.01% sent to landfill.



High performing buildings, infrastructure and communities



“We want buildings that not only perform better, but also have less impact on the environment, use resources more efficiently, and are safer, healthier and more productive places, which as a result provide better financial returns,” says Gavin Dunn, BRE’s Director of Building Performance.

“Our job is to provide the tools needed to make this happen – such as BREEAM, CEEQUAL, YellowJacket and SmartWaste – along with the research and knowledge dissemination that underpins better buildings, infrastructure and communities. A few highlights from an exciting year are outlined in this review.”



BREEAM

This year’s vibrant BREEAM Awards event hosted by Michael Portillo at the London Marriot Hotel, reflected the continued success and expansion of BREEAM, both in terms of international reach and impact on sustainability.

With BREEAM now present in 78 countries, awards attendees came from as far afield as Russia and China, as well as throughout Europe. Notable international advances this year have included significant progress by BREEAM In-Use into the US market.

An important trend this year has been the expansion of BREEAM in assessing existing buildings during the in-use phase and for refurbishment and fit-outs. Investors are increasingly recognising this as a good way of managing risk and return in their real estate portfolio investments.

Forging new partnerships

Our international presence has recently been characterised by collaborations with other standards. Last year, for example, we joined forces with the WELL Building Institute to map and define mutual recognition between the BREEAM and WELL standards. This was in response to feedback from developers wanting to certify their buildings for both sustainability and health and wellbeing. We will continue to work together to build even greater alignment. We have also conducted a mapping exercise for BREEAM and China’s Three Star Standard. This enables investors or developers looking to attract international tenants, to benefit from certifying with the local standard while gaining international recognition and comparability from BREEAM.

In addition, BREEAM and GRESB (Global Real Estate Sustainability Benchmark) are partnering to recognise high performance in responsible and sustainable real estate investment. Part of this initiative included adding a new dimension in this year’s BREEAM Awards, with two new award categories: Leadership in Responsible Real Estate Investment and Corporate Investment in Responsible Real Estate.

2,265,586 Registered Buildings

562,099 Certificates

78 Countries

Bringing value

An exciting new trend is for the market to be less driven by lowest capital cost alone, and more influenced by higher building asset value from increased rents, lower running costs, and tenant satisfaction and retention.

There is a growing body of research highlighting the asset value that BREEAM brings. Among the most compelling yet is a report published in March 2017, *Delivering Sustainable Buildings: Value of BREEAM to Retail in the UK*, which shows how retailers and developers can use BREEAM to help attract customers, increase operational effectiveness and manage costs and income.

Rapid growth for In-Use and Refurbishment and Fit-Out BREEAM schemes

While BREEAM's primary focus has in the past been on new construction, our In-Use schemes have made great strides in recent years and are now making a real difference to the sustainability of existing buildings. This year an important milestone was reached when revenues of over £1 million were achieved, exceeding what had once seemed to be an ambitious target with a business growth of 70%.

Of this, around £250k was generated by the Refurbishment and Fit-Out (RFO) schemes, which are increasingly attracting important projects, including refurbishments to a number of landmark buildings in London. Of the more than £750k earned by BREEAM In-Use, a third came from assessments conducted entirely online. This reflects the effectiveness and success of our new digital platform, the use of which seems certain to grow.

Along with such technical progress there have also been strategic developments, such as a refocusing of promotional efforts on the schemes' potential end users – including the top 200 decision makers in the real estate property market. Meeting these people and showcasing the schemes to them directly, while explaining the value that BREEAM certification can add to a building asset – and the whole portfolio – has proved an effective strategy.

This has been backed up with business development initiatives, such as pilot projects demonstrating the portfolio-level adoption of BREEAM In-Use. These are designed to show real estate clients how we can make it more cost effective and efficient for them to roll out the scheme across a whole suite of assets.

One of the most outstanding aspects of BREEAM In-Use's success has been its international uptake, particularly in Europe. Our BREEAM In-Use 2017 Fact File reports that, as of February 2017, 10,917,564m² of building assets were certificated under BREEAM In-Use International in more than 30 countries worldwide.

A recent development has been the availability of BREEAM In-Use in the USA, with current BREEAM In-Use International licensed assessors now able to apply for BREEAM USA In-Use licences.

Review and improve

BREEAM owes much of its success to the regular reviews, updates and improvements made to its standard and processes. We are currently implementing, for example, the BREEAM UK's Strategic Ecology Framework (launched in 2016) into UK BREEAM schemes – including the Home Quality Mark – which are due to be launched during 2018.

Working with CIEEM and the Landscape Institute, we have formed an advisory group of ecologists and landscape architects to guide the Ecology criteria. This follows similar reviews, such as that of the responsible sourcing schemes recognised by BREEAM.

We have recently commenced a review and mapping of the UK and International Refurbishment and Fit-out (RFO) scheme technical manuals.

“BREEAM has guided us to provide a better quality for our tenants and consumers, at a lower environmental impact, against lower costs.” CBRE



Infrastructure

CEEQUAL

The 2016 CEEQUAL Outstanding Achievement Awards was a fantastic celebration, not only of the superb shortlisted and award winning projects, but also of CEEQUAL's success in operating at BRE since November 2015.

The event at the Institution of Civil Engineers was a clear expression of how much BRE values CEEQUAL and how well it has integrated into BRE – and is thriving here. Twenty-two projects were shortlisted and an expert panel of independent judges made awards in 12 categories, honouring some of the top sustainability accomplishments by civil engineering project teams.

There have been 49 major new infrastructure projects registered with the scheme in CEEQUAL's first full year since acquisition, with a construction value of over £5.5bn – 20% more than the previous year. We have engaged extensively with the CEEQUAL community in UK and in Sweden, Norway, Hong Kong and the Middle East, and have been inspired by the enthusiasm for the scheme.

The CEEQUAL team has an ambitious year ahead, continuing to promote and grow CEEQUAL, operating the BREEAM infrastructure pilot with currently six challenging projects, and developing the next version which will bring the best of both together into a single outstanding scheme from 2018.

Supporting the engineers of the future

In collaboration with academia and industry, the BRE Trust awards scholarships and bursaries to PhD and MSc students studying built environment topics. These include the funding of four students at the EPSRC Future Infrastructure and Built Environment Centre for Doctoral Training (CDT) at the University of Cambridge.

The FIBE Centre focuses on integrating Cambridge's internationally recognised strength in structures, geotechnics, materials, construction, sustainable development, building physics, and water and waste, within the wider context of related engineering disciplines, architecture, the sciences, land economy, manufacturing, business, economics, policy and social science.

The aim of the CDT is to develop world-class, technically excellent, multi-disciplinary engineers equipped to face current and future infrastructure and built environment challenges. BRE is one of the Industrial Partners, which represent major consultancies, contractors and asset providers who are engaged in the training and research activities of the CDT.

“Using CEEQUAL has been instrumental in driving performance forward” Crossrail



Homes

Home Quality Mark

In March 2015, BRE introduced a beta version of its new voluntary, national Home Quality Mark (HQM) for new housing. HQM is designed to put consumers and quality at the heart of house building. An early target of gaining 10,000 registrations to the scheme by Christmas 2016 was surpassed, with 11,000 homes on 80 sites in England having been registered in early December.

In achieving this HQM has already helped to change the housing debate, broadening this from a focus on the quantity of homes to also include their quality and long-term sustainability. A wide range of developments – a number of which are now close to completing their HQM certification – have been registered throughout England by developers who fall mainly into four categories:

- Those with sustainability / high quality in their DNA. They could be high end developers or those who are likely to have longer-term relationships with the buildings.
- Small to medium sized developers demonstrating that they are offering something different (both high end and social housing).
- Developers of sites that are having some sort of planning difficulty – there are some sites where developers have said that registration to HQM is helping the planning process.
- Major housebuilders who are trialling HQM.

For our work on HQM, BRE was presented with the Green World Ambassador 2016 award at the Annual International Green Apple Awards for environmental best practice, in November at the Houses of Parliament. This work continues, with feedback from the housing sector being constantly sought and used in the further development of HQM – the latest version of which is expected to be released in early 2018.



50 years of national housing surveys

In 1967 it was questioned whether the then rapid housing development was scientifically based. Families were re-located from street communities to inappropriate high rise flats and homelessness was a problem. The UK government undertook a national house condition survey to benchmark the existing housing stock and set priorities and targets for future housing investment.

BRE has been involved in the English House Condition Survey (and the Welsh House Condition Survey) since its inception 50 years ago. This continuous national survey, now commissioned by the Department for Communities and Local Government, collects information about people's housing circumstances and the housing stock. It covers all housing tenures and provides valuable information and evidence to inform the development and monitoring of the UK government's housing policies.

The year 2017 marks not only the 50th anniversary of the English House Condition Survey, but also the first time for many years that all four UK surveys – England, Wales, Scotland and Northern Ireland – are in the field at the same time. BRE is involved in the delivery of all four.

In 2016 we extended our national housing survey work to the European Union and Brazil, and lead the world in this specialist field.

Each Home Counts report published

In 2015 an independent review of how consumers can be properly protected and advised when they install energy efficiency and renewable energy measures in their homes was conducted. With workstreams led by industry representatives from across the sector, the review considered issues relating to consumer advice, protection, standards and enforcement in relation to home energy efficiency and renewable energy measures in the UK.

Published in December 2016, the report sets out the findings of the review, at the heart of which is a recommendation to establish a quality mark for the domestic retrofit sector. To obtain the quality mark, installers, designers and assessors will need to show that they have been certified by an approved certification body, and meet the requirements of three key elements – a Code of Conduct, defined Codes of Practice and standards and a Consumer Charter.

BRE is fully committed to playing its part alongside its industry peers and is actively involved in a number of the Each Home Counts workstreams.



Investigating overheating in modern urban homes

In partnership with Loughborough University, BRE experts have been investigating the complex issue of overheating in modern, low-energy urban buildings*.

While there have been many studies of overheating in the built environment, most have focused on external factors such as heatwaves and climate change. This study examined the issue of chronic, year-round overheating in temperate climates. A review of the effects of planning and legislative constraints on urban residential design, was followed by a case study in a block of poorly performing London flats to investigate these issues in practice.

Detailed field monitoring was undertaken and survey data gathered for several newly built flats in a multi-residential block. As with many new developments, the block has a high thermal specification and low carbon building services – such as communal heating systems and mechanical ventilation with heat recovery. Zonal measurements of a range of environmental and building services parameters were carried out to identify the key factors behind the overheating in these modern low-energy flats.

The results suggest multiple causes of the chronic overheating in the flats, but they typically share common factors stemming from poorly integrated architectural and MEP design decisions. Conflicts between regional planning policies, UK building regulations and health and safety legislation appear to be compounding the problem.

This case study is part of a larger research project investigating the causes of overheating in high density urban dwellings across Greater London.

* R.S. McLeod and M. Swainson. Chronic overheating in low carbon urban developments in a temperate climate. *Renewable and Sustainable Energy Reviews* 74 (2017) 201–220.

Energy Efficiency mortgages

The final LENDERS project report was launched by the Minister for Industry & Climate Change at Westminster Central Hall in July 2017. Part-funded by Innovate UK, the project set out to improve the accuracy of predictions used to estimate household energy costs when calculating mortgage affordability.

Households with lower fuel bills have more uncommitted household income, so better forecasting of fuel costs could allow home buyers to access bigger mortgages for low energy properties without paying more overall. To enable this, the project developed a more accurate method of estimating energy bills that can be readily incorporated into the mortgage process at the appropriate stage.

If adopted, this approach could transform the housing and energy efficiency markets by making energy performance a fundamental part of mortgage lending. Over time, it could lead to a much closer relationship between properties' energy efficiency and their value, encouraging buyers towards homes with lower energy bills, and increasing their willingness to invest in improving energy efficiency. The project has been praised by BEIS, who are now looking at how this and related energy efficiency drivers can be adopted by the UK mortgage sector.

BRE's Wales office conceived the original idea, collated the project consortium, won Innovate funding and then project managed the successful delivery by the team, who comprised: Arup, BRE, Constructing Excellence Wales, the Energy Saving Trust, Nationwide Building Society, Principality Building Society, UCL Energy Institute and the UK Green Building Council.



Buildings

The Biophilic Office

In 2017 BRE launched the UK's first research workspace to measure the real-world health and wellbeing benefits of incorporating nature into building design.

Nature is known to have a positive impact on human physiology and psychology yet we isolate ourselves in buildings for 90% of our lives. The fully operational Biophilic Office is being monitored by BRE's lighting, indoor air quality, acoustic and thermal comfort experts. It will incorporate design to maximise natural light and use plants, diversity in design, circadian rhythm artificial lighting, colour, natural airflow and views of nature.

Biophilia acknowledges that we are genetically connected to nature. Biophilic design brings nature into spaces and recognises that a human-centred approach can improve many of the spaces that we live and work in, with numerous benefits to our health, wellbeing and productivity.

The Biophilic Office is the focus of a two-and-a-half year research and demonstration project by BRE and Oliver Heath Design, supported by several industry partners. The office will be refurbished using biophilic design principles during the project, and the effects of the space on staff before and after the refurbishment will be recorded.

Developing standards for environmental quality monitoring systems

BRE is part of a consortium that is developing a global set of standards and guidance for indoor and outdoor environmental quality monitoring systems and sensors.

The impacts of indoor and outdoor environments on health and wellbeing are increasingly well understood, but the proliferation of new and untested monitoring sensors and sensor-based systems is already causing confusion and uncertainty in the marketplace.

Building owners and facilities managers have little guidance on what they should be monitoring, how to interpret their data, and what equipment provides the best solutions. Meanwhile, sensor manufacturers have few specific data quality standards to adhere to, leaving them with no verifiable way in which to distinguish their products' performances.

The consortium of IWBI™, BRE, RESET™ and the Green Building Council of Australia, is developing standards and guidance designed to ensure that environmental assessment data is accurately produced, interpreted and communicated. The standards will be designed to harmonise and work seamlessly with the leading building assessment systems including, BREEAM, WELL, RESET and GreenStar.

BRE Centre of Excellence in Energy Utilisation

The BRE Centre of Excellence in Energy Utilisation is located at the University of Strathclyde, and focuses on energy use, sustainable energy supply and better local and national energy control. In 2016 the centre formed a new partnership with the Korea Institute for Energy Technology Evaluation and Planning to develop a stock model for Korea's non-domestic buildings.

Other highlights included Graeme Flett completing his PhD, focused on 'Modelling and Analysis of energy demand variation and uncertainty in small-scale domestic energy systems'. This considered whether domestic energy demand is significantly influenced by occupancy patterns, socio-economic characteristics and individual household behaviours. The output model has highlighted the need to predict demand probabilistically, to ensure robust performance of largely grid-independent systems under all potential operating scenarios.



Communities

Healthy Cities

Some estimates credit urban planning and policies with shaping up to 80% of a community's health. The World Health Organisation (WHO) attributes 12.6 million global deaths to unhealthy environments annually through factors such as air pollution (3.7 million deaths) and physical inactivity (3.2 million deaths). Urban environments can also play a positive role in health and wellbeing, for example through high quality design providing access to nature and opportunities to be active.

A healthy built environment also has environmental, economic and social benefits, such as increasing productivity, reducing healthcare costs and tackling climate change. There are many opportunities to design and retrofit our cities to tackle these complex challenges.

Using methodology developed during our Future Cities programme, we have developed a Healthy Cities index by identifying key connections between the physical built environment and health. It measures performance against a set of urban health indicators across ten environmental categories, and highlights the interconnectedness and complexity of urban health challenges.

The tool is aimed at city leaders and built environment professionals with a role in designing, building and managing healthy places. The index is comprised of 10 categories: Air quality, Food access, Green infrastructure, Housing and buildings, Leisure and recreation, Noise pollution, Resilience, Safety and security, Transport, and Utilities and services.

The Index has initially been used to evaluate 10 UK cities, and over the last year funding from the Dubai Land Department has helped us develop it to a beta stage to test its use and value with city stakeholders in Dubai. Further opportunities are now being sought to evaluate the Index.

BREEAM Communities

During 2016/17 we have been working to revise the BREEAM scheme for communities to make it easier to use for clients with non-UK based projects. The technical manual for the internationalised issue of the BREEAM Communities 2012 scheme (v1.2) has now been made live and the scheme is open for registration for non-UK projects, as well as UK ones.

The launch of the revised scheme removes the need to go through a bespoke BREEAM Communities criteria development process for most clients with non-UK based projects. This will help to pave the way for further uptake and growth of communities-level assessment.



Publications

BRE wrote, published and contributed to a wide range of research and guidance publications in 2016/17. Designed to help building professionals to enhance our built environment, they included:

Health + Mobility

This report by Arup, BRE, University College London and AREA Research, shows that taking a new approach to designing city streets and other transport infrastructure could help to improve public physical and mental health. It provides civic leaders, city planners and architects with a guidance protocol that can be applied in any urban setting. It helps cities identify the health issues that can be influenced by taking a more holistic approach to transport design.



BRE expert guidance compilations

We are publishing a series of compilations of BRE background documents and current guidance on the built environment, each offering a valuable reference library of BRE Digests, Information Papers and other guidance. Those published this year include:

- Sustainability: the issues and impacts of sustainability on the built environment, and
- Sustainable design and assets: delivering a sustainable built environment.



Assessing the environmental impacts of construction

The context for environmental assessment in the construction sector is changing. This is largely due to the publication of the suite of standards from CEN TC 350, which interlink with those from International Standards Organisation (ISO) relating to life cycle assessment (LCA) and Type III environmental labelling. This paper is an aid to understanding the implications of CEN TC 350's emerging standards for assessing the environmental performance of construction products (materials) and buildings.



Green Guide to fit out

This Briefing Paper discusses how to reduce the environmental impacts of refurbishment, with a focus on the embodied impacts of construction materials. It describes the tools and other forms of support available, particularly from BRE, that can be used for assessing the environmental impact of refurbishment projects and products, and provides some examples in the form of case studies.



Green Guide ratings for foundations

The challenges of site-specific ground conditions have made reliably measuring the environmental performance of foundations and substructures very difficult. As a result, foundations and substructures have tended not to feature in whole-building, environmental impact assessments such as BREEAM.

The new IMPACT methodology has changed this situation and presents the building designer with a building specific solution for assessing the embodied impacts of different foundation and substructure options. The Home Quality Mark (HQM) includes a whole building LCA approach and this is being mirrored in the current work on updating BREEAM UK schemes. So foundations will form a part of the assessment for the first time when these are launched. This Briefing Paper highlights environmental performance issues in foundations and substructures for designers, specifiers and other stakeholders.



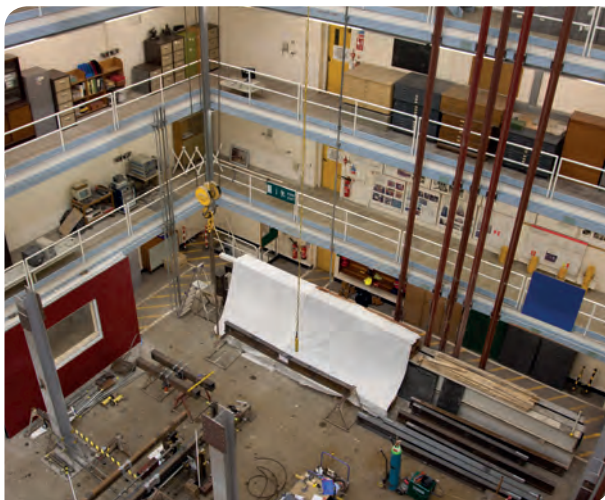
Innovation and engineering



“The UK has some of the most innovative engineers in the world, creating ingenious structures from the Olympic Stadium and the Shard to the Channel Tunnel and Crossrail. An important element in the success of many of these construction projects – and that of a growing number of international projects – is the ability to have innovations independently tested by BRE, giving clients confidence that they will perform safely, efficiently and effectively.”

We use established and bespoke performance tests to investigate building materials to construction systems and entire buildings – and also the quality of air, lighting, acoustics and other indoor conditions.”

Julie Bregulla, Director of Fire & Building Technology



World-class facilities

Equipped with extraordinary facilities, we pride ourselves on being able to support clients in almost every area of the built environment, for example:

Whole buildings – large scale structural test facilities capable of accommodating a four-storey building.

Materials and components – performance testing facilities for steel, concrete, stone and other traditional and innovative construction materials and components.

Indoor environments – environmental test chambers for full scale mock up testing of internal environments and HVAC systems, and sound transmission suites.

Wind conditions – two atmospheric boundary layer wind tunnels that simulate natural winds for a range of environments.

Renewable energy systems – unique facilities for renewable energy performance testing.

Fire – the largest Burn Hall in Europe and comprehensive fire testing facilities, including fire detection and suppression research and testing.

We use these resources to support innovation in every facet of the built environment – as illustrated below by examples of projects on building components, materials and indoor environments – and help to develop the engineers of the future.

Building components – Crossrail platform screen system

Crossrail is the new high frequency, high capacity railway for London and the South East of England. Full height platform screen doors are being installed at each of the eight new underground stations on the Elizabeth line, roughly four kilometres of platform edge screens in total.

The doors protect passengers on the platform from the train and track, keep the platform cleaner and quieter and facilitate economical air conditioning. They are installed as modules comprising entire door sections, which – to ensure their effective operation and safety – must meet performance requirements with regards to crowd and air pressure loading. BRE was commissioned to conduct a programme of tests to assess the performance of the door modules under crowd loading, air pressure loading and combined crowd and air pressure loading.

The prototype test specimen was supplied to BRE by Knorr-Bremse Rail Systems UK who, under their Westinghouse Platform Screen Doors brand, design and manufacture the system. This prototype was a fully functional model of a standard door module comprising a pair of sliding doors flanked by a fixed panel and an emergency exit door. The photograph shows the test specimen in the BRE structures laboratory.

A series of five tests was carried out to assess the module’s ability to meet specified deflection and performance criteria, and the test specimen was found to fully meet, or exceed, the criteria.

Low carbon cements

In 2016 we introduced a new test programme and guidance for low carbon cements, related to the performance standard PAS 8820, which has been developed for manufacturers, specifiers and designers of concrete containing alkali-activated cementitious material (AACM).

AACMs have low carbon and improved fire resistance properties, and are resistant to chemicals and other aggressive agents. The standard, developed to encourage their use in the construction industry, specifies a range of performance and durability requirements that manufacturers of the material need to meet.

Currently 5% of global CO₂ arises from traditional cement production. The use of low carbon cements is key for our industry as it moves towards greener and leaner means of construction in line with the Government's 2025: Industrial strategy for construction

To help those wanting to adopt AACMs and use them commercially as binders in concrete products, we also published a new Information Paper detailing the range of different standards and certification that can be applied to AACM.

Air quality and lighting

One of the areas that we believe requires increased understanding and standardisation is the quality of internal environments. As part of our services to innovators, we support the development and use of products from initial prototype research to testing. Knowledge gained from commercial projects – where BRE is asked to investigate poor indoor environments – is fed into applied research, and into the development of test protocols for appropriate technologies.

For example, the International WELL Building Institute (IWBI) recently commissioned BRE to conduct practical research into the next generation of handheld monitors and modelling and calculation techniques for assessing and monitoring indoor air quality and lighting conditions.

Much of this research has been carried out in a bespoke environmental chamber at BRE Watford, a test facility which was built by BRE three years ago as part of the collaborative EC research project ECO-SEE (www.eco-see.eu). In this 30 m³ enclosure we are able to control temperature, humidity and ventilation rates while introducing known amounts of different volatile organic compounds (VOCs) or other gaseous indoor air pollutants. We then compare measurements made with new monitors and sensors with those made using existing methodologies – using 'test atmospheres' generated within the chamber.

The chamber work was followed up by evaluation of light measurement methods in a test office; and a comparison of standard and new methodologies/instrumentation used to check for VOCs and particulate matter in the air – this being undertaken in one of BRE's occupied open-plan offices.

Inspiring the next generation of engineers

For the last three years BRE has participated in the Institute of Engineering and Technology's Open House Day. Designed to encourage children to consider engineering as a profession, more 150 children and their parents have taken part in these events hosted at our Watford headquarters site.

Flexible Robotic Assembly Modules for the Built Environment – FRAMBE

Skanska is pioneering 'Flying Factories' – temporary factories located close to or on construction sites, enabling flexible, efficient component manufacture/assembly whilst reducing fixed costs and optimising transport logistics.

However, to fully exploit this manufacturing flexibility advanced automation/robotics and supporting software systems common in other sectors are needed, along with business models and cultural changes for mainstream use. Partners in the 'FRAMBE' project – Skanska, BRE, Reading University, ABB, Tekla (UK), and Exelin – are developing a scalable, modularised flying factory that can be used for the flexible manufacture of a wide range of construction components.

BRE Centre for Innovative Construction Materials

The BRE University Centre of Excellence at the University of Bath works to reduce the environmental impacts of construction and infrastructure, developing radical, low-carbon building materials and reinforcement technologies. The BRE Trust has funded over 20 PhD studentships here in the last 10 years and works on a number of large collaborative research programmes with staff and students from the centre.

The recently launched project, Resilient Materials 4 Life (RM4L) is the second phase of the project called Materials 4 Life (M4L), which introduced and carried out research and advancement into the adaptable, self-diagnosing and self-healing capabilities of materials.

The RM4L project (costing £6 million) has received fresh funding of £4.7 million from the Engineering and Physical Sciences Research Council (EPSRC) and contributions from other partners. It aims to help companies incorporate self-healing technologies into systems that can automatically repair concrete – looking to nature to inspire these technologies – and build the overall resilience of construction materials. The Centre's Deputy Director, Kevin Paine, is the Lead Investigator on the project for Bath, which will be led by Cardiff University, the University of Cambridge, the University of Bath and the University of Bradford.

Tagging and tracking of building components

This two-year, £1m Skanska-led project – which was completed in June 2017 – implemented the real-time 'tagging and tracking' of building components from the factory floor to the finished building.

The latest digital techniques were used to 'mark' project components with radio frequency identification (RFID) tags/barcodes. This allowed the monitoring of the manufacturing process, delivery to site, storage and installation. The tagged components remained in place for the life-cycle of the project, providing accurate information as required.

This technique enables the progress of components to be followed, identifying whether they are at the correct stage of production or delivery – as dictated by a scheme's schedule – so that any potential delays can be flagged early in the process.

Tracking all the components in the system can allow great savings to be made, reducing delays and defects by giving contractors more control over the management of quality control. The programme was designed to be integrated with Building Information Modelling (BIM).

Resilience



“Resilience of the built environment is increasingly the focus of governments and industry around the world,” says Stephen Garvin, Director of the BRE Centre for Resilience. “Climate change, urbanisation and an increasing population combine to give substantial challenges to how we develop the built environment. Almost every day destructive floods, storms and heatwaves claim the lives of people around the world, as well as causing widespread building damage.

“Research, supported by the BRE Trust, has addressed the risks from flooding, windstorms and overheating to buildings in which we live and work, as well as addressing disaster reduction. This research is informing practice and policy through the development of new networks.”

Property Flood Resilience Action Plan

Flooding events have severely impacted thousands of households across the UK in recent years.

Making properties more flood resilient can be effective in reducing the impacts of floods. But people are often unaware of the flood resilience products available, and aren't routinely given incentives from their insurance premiums to make their properties more resilient. There is also a shortage of building and surveying skills, and the sector lacks appropriate standards and certification schemes.

To address these issues, Defra published a Property Flood Action Plan in September 2016.

In the document's Ministerial Forward Thérèse Coffey said, “The enthusiastic can-do attitude of the group has resulted in this Action Plan which sets a path for addressing the major barriers to people being able to better prepare their homes and businesses for future floods. It also offers some immediate, concrete progress. Ultimately, it will empower people to address the impact that flooding has on their lives and livelihoods.”

The Action Plan's recommendations include a call for rigorous independent standards with proper certification processes that enjoy support across the industry, so that consumers have confidence in both the flood products they buy and their installation. This included the creation of a certification scheme for flood surveyors linked to continuing professional development training for relevant specialists – see page 22.



Property flood resilience surveyors

In response to the recommendation in Defra's *Property Resilience Action Plan*, BRE Global this year launched a certification scheme for independent property flood resilience surveyors who can provide property owners with impartial information about the measures needed to make their homes and businesses more resilient to flooding.

Supported by training from the BRE Academy and industry partners including RICS, certificated property flood resilience surveyors can collect and upload data to a Property Flood Resilience Database recently developed by BRE, AXA and LexisNexis under an Innovate UK funded programme. This will create a highly valuable, UK wide industry data source for 'flood resilient' properties – supporting insurance applications for 'at risk' homes and businesses.

Stephen Garvin, Director of BRE's Centre for Resilience said, "Defra's *Property Resilience Action Plan* identified the need for skills, standards and certification to reassure property owners that flood resilient repair and property protection measures will be effective. This new scheme and supporting training programme is key to achieving this goal. By creating a robust, independent and specialist group of property flood resilience surveyors, we can support people, the business community and our industry better. This is the first of a number of new products BRE is developing in line with the recommendations of the Action Plan."

Making homes flood resilient

In February 2017 we launched a flood resilient prototype home on the BRE Innovation Park to demonstrate ways of protecting against flood damage and limiting disruption. It shows how practical measures can prevent flood water entering a property, disperse water quickly if it does get in, and facilitate rapid drying. These simple solutions include:

- flood resistant doors and windows.
- water resilient walls and insulation.
- a resilient kitchen with moveable kitchen units.
- floor and wall membranes to channel water towards floor drains.
- an automatic sump pump that stops water rising through the floor and disperses water quickly should it get in.
- one way valves fitted to the toilets and sinks to prevent flooding via sewers.

It is not yet normal practice for properties in areas at high flood risk to be made more resilient following a flood. The aim of this project is to show contractors and householders in a tangible way that resilient repair isn't as challenging or difficult as they may think it is.

Floods Minister Thérèse Coffey said, "We are investing a record £2.5 billion to better protect 300,000 properties from floods by 2021. But, if the worst happens, property resilience measures play a crucial role in limiting flood damage, so home and business owners can get back on their feet as quickly as possible."

The Flood Resilient House was put to a stern and very public test on BBC's *Countryfile*, and performed extremely well – see page 31.



Life safety, property protection and security



“As homes, buildings and communities are built, the safety and security of people in and around buildings is paramount,” says Debbie Smith OBE, who was appointed Managing Director of BRE Global in April 2016. “And when buildings are occupied, the need to keep people safe and secure continues. We help our clients and partners to protect people and their property and businesses by providing research, assessment and testing services.

“The tragic fire in Grenfell Tower has brought home just how important our work is in providing independent and robust research to support a better built environment. It has also demonstrated the great value of the work we have funded through our owners, the BRE Trust, to develop world leading fire science and engineering at the University of Edinburgh.

“Brief details of our work related to the Grenfell Tower fire are presented here, along with a few examples of our activities to improve fire safety and security in the built environment during 2016/17.”

The Grenfell Tower fire

Following the Grenfell Tower tragedy, BRE was commissioned by the Department for Communities and Local Government (DCLG) to carry out two different test programmes. The first involved screening tests to help building owners identify which of three different types of Aluminium Composite Material (ACM) panels they had on their tower blocks. We tested the filler – the core of the panel – to check whether it was of limited combustibility. The tests were based on the international standard for reaction to fire, BS EN ISO 1716.

In the following test programme, BRE conducted seven large-scale cladding system tests to British Standard BS 8414 Part 1. These tests evaluate the complete cladding system in a ‘real fire’ situation. We were commissioned to test the three different categories of ACM with three different types of insulation. The data generated from these tests have been published and used by DCLG to inform tower block owners and managers of the actions they should take on their buildings, following Grenfell, in the interests of public safety.





A busy year for LPCB

The Loss Prevention Certification Board – LPCB – has been working with industry and the UK government for more than 100 years to set the standards needed to ensure that fire and security products and services are effective. Now part of BRE Global, LPCB is the leading force in fire and security approvals and the publisher of the Red Book, which has more than 11,500 listings to help customers source products and service providers.

This long history of industry service does not mean that LPCB is slowing down. We have continued to enhance an already extensive range of research and test facilities, expand LPCB's influence internationally, engage in training to improve fire safety, and develop new standards designed to keep people, property and businesses safe and secure. For example:

Facilities – among the highlights in 2016 was the installation of a new rig to test fire protection systems used on steel frame beams, which play a critical role in maintaining the load bearing capacity of multi-storey buildings in the event of a fire.

International influence – LPCB fire and security standards are specified in more than 65 countries. As part of a continuing programme of international expansion, the BRE Global Middle East Regional Office was opened for business in June 2016. Located in Dubai, the office is promoting BRE Global services in fire and security – particularly LPCB certification.

Training – LPCB has been involved in the development of BRE Academy Fire Safety Awareness courses aimed at building owners and facilities managers around the world. Practical training courses in areas such as fire door inspection and maintenance have also been delivered through BRE Academy this year.

Standards – a recent highlight in the development of new standards has been the launch of the SABRE building security standard and certification scheme (see below).

New SABRE building security standard



December 2016 saw an important milestone for LPCB's new SABRE certification scheme, when the St. Regis Astana in the Republic of Kazakhstan became the first hotel development in the world to adopt the scheme. SABRE is a standard that building owners and occupiers can use not only to measure and evaluate how well they manage security risks, but also to communicate their security credentials to the market.

The independently-operated scheme recognises and rewards a risk-based approach to building security, design, construction and management, with organisations measured against nine categories. Achieving effective security can be particularly difficult in mixed-use and multi-tenanted buildings, where occupants and the landlord may have different, even competing security objectives. SABRE certification demonstrates an appropriate security risk management approach, ensuring that all responsible persons are identified and understand the scope and extent of their security responsibilities.

Fire Research Conference becomes a major annual event

Since the first BRE Fire Research Conference in 2015, the event has quickly become an important annual fixture. At the second conference in June 2016, research shaping the future of fire safety design and management was outlined to a packed auditorium. Experts discussed newly published and current BRE research related to both passive and active fire protection, ranging from roof void compartmentation and fire safety in open plan flats, to sprinkler systems in housing and the problem of false fire alarms.

More than 150 delegates from across the UK and overseas, including the Middle-East, attended the conference at BRE's Watford campus. Reflecting BRE's standing in the field of fire research and fire performance testing, the diverse programme of ten speakers attracted a wide range of attendees, including architects, engineers, building control officers, local authorities, housing associations, manufacturers, fire safety consultants, and representatives from the NHS, fire services, academia and insurance industry.

The third annual Fire Research Conference has proved equally successful and the event looks set to remain a prominent feature of the fire research calendar for many years to come.

Cyber security

This year has seen many high profile cyber attacks on key organisations around the world, including the UK's National Health Service. We take the security of our IT systems and digital products very seriously. BRE is certified to the UK government's Cyber Essentials standard, an independently verified self-assessment – organisations assess themselves against five basic security controls and a qualified assessor verifies the information provided.

We also chair the AIRTO Cybersecurity Interest Group, which was formed in September 2016. AIRTO is the membership body for organisations operating in the UK's innovation, research and technology sector and the Interest Group allows members to collaborate and share best practice. Among its activities is the development of meaningful key performance indicators for cyber security and awareness raising for staff.

New Award for achievement

The inaugural 2016 BRE Chairman's Big Award, which recognises the achievements of BRE employees, went to Raman Chagger, Principal Consultant in Fire Safety for his research into the causes of false fire alarms. The enormous numbers of false fire alarms that occur are estimated to cost £1 billion a year in the UK (due largely to businesses being disrupted) and divert the fire services away from more serious incidents.

Raman has researched extensively on this issue – this award was for his work with the Scottish Fire and Rescue Service, Glasgow City Council, CBRE and others, on a project to help fire alarm investigators record the details of false alarms.

BRE Centre for Fire Safety Engineering

The BRE Centre for Fire Safety Engineering at the University of Edinburgh is the only centre of its kind in the UK. Its experts were conscripted to advise Government in the aftermath of the Grenfell fire.

Highlights in 2016/17 include the appointment of a new Chair, professor Grunde Jomass who has joined the Centre from the Technical University of Denmark. Another Trust-supported appointment was Dr Angus Law, as a new lecturer in Fire Safety Engineering who will lead the development of new teaching courses and also enhance research capabilities. Also, Dr Rory Hadden received Arup/ EPSRC Impact Acceleration funding to support large-scale timber compartment testing at BRE.

Publications

An extensive range of fire and security publications produced in 2016/17 include the following:

Understanding the factors affecting flashover of a fire in modern buildings

By Richard Chitty

Aimed at fire risk assessors, fire safety managers, safety managers and building managers, this Information Paper gives an outline of the process of flashover and the factors that influence its occurrence and development.

The role of codes, standards and approvals in delivering fire safety

By Sarah Colwell

This Information Paper identifies the key processes used to test and approve fire suppression products. It discusses the risks of assuming compatibility between different codes and standards, which may ultimately impact on the safety of both people and property in fire.

Security glazing: is it all it's cracked up to be?

By Craig Devine and Richard Flint

Standards are critical to the selection of an appropriate product. However, in the case of glazing a number of different standards have been developed based upon specific test requirements. This publication outlines the different types of glazing, guides the reader through the maze of applicable standards and offers advice on selecting glazing systems appropriate to their intended use.

Assessing the performance of Phase Change Materials in buildings

By Corinne Williams

Phase Change Materials (PCMs) are an emerging technology in the UK. They offer improved thermal performance and comfort of low thermal mass buildings, both in current construction and when renovating existing building stock. This guide (FB 84) explains what PCMs are, how they work, their benefits, current technical developments and available products.



Knowledge and skills



“Educating, enabling and empowering the people in our industry is the thread that runs through everything BRE does,” says BRE Academy Director Pauline Traetto. “Through the Academy, we help people to understand the scientific insights that drive our standards, and guide them through the training and qualifications they need to apply these standards in the built environments they manage.

“Over 35,000 professionals have benefited from the courses we provide, while the BRE Bookshop offers 1,300 titles on all aspects of the built environment. BRE also organises conferences that bring together thought leaders from across industry to help delegates understand some of the key challenges for the built environment and demonstrate BRE’s credentials in key areas.”

Launch of e-learning service– BRE.AC

With the global e-learning market expected to exceed \$240bn by 2023, the BRE Academy launched its own e-learning platform – BRE.AC – in May 2016, to take advantage of this opportunity and to offer customers more flexible access to courses. The platform was introduced with 25 digitally-delivered courses ranging from BIM Essentials and BREEAM Associate to general topics such as construction management and regulation. In its first 14 months BRE.AC was accessed in 167 countries, more than 3200 courses were purchased and 4670 students signed up.

Fast rising Academy membership

The BRE Academy has a membership programme to encourage lifelong learning and keep individuals up-to-date with developments and innovation in the construction industry and the wider built environment. In the past year membership has grown 45% compared to the previous year, including expansion into India, China, Argentina, Brazil and the USA.

Training partnerships

To ensure the relevance of its courses among professionals working across the built environment, the BRE Academy has strengthened its relationships with other membership institutions, and is an approved training provider for CIAT, IEMA and RIBA. Working with these organisations enables the Academy to cross promote activities and give members access to services and courses at a preferential rate.

CIBSE award winner

In February 2017, the BRE Academy received the CIBSE Building Performance Training Programme of the year award for the BREEAM Associate course. Developed in partnership with HOK, Ferrovia, BT, BAM, SEGRO, Grontmij, Arcadis, Assa Abloy, WSP/Parsons Brinkerhof and ISG, the course is designed to enhance the way the international sustainability standard, BREEAM, is applied to developments around the world.

Launch of higher education programmes

The Academy's BIM Approved Graduate (AG) is a new higher education programme being launched in September 2017. It is designed to fill a recognised gap in the BIM training currently offered in higher education. Universities will be able to licence the course and integrate it into their existing modules. The programme will train students to become BIM professionals and fast-track them to certification.

Also in September 2017, the Academy will deliver a joint BEng and MEng in Civil Engineering, in collaboration with the University of Hertfordshire.

BRE Bookshop

Sales of publications through the BRE Bookshop totalled 5,289, and downloads via the Construction Information Service reached just over 71,000, in the last year.

The active dissemination and promotion of new titles continues, using a number of digital platforms. The total circulation for these exceeds 1 million individuals, and visits and downloads continue to grow. Designing Buildings Wiki now has 128 BRE articles, which have received more than 50,000 viewings in the last year – up 300% on the previous year. This is becoming a very important portal for dissemination of free information to the wider built environment community.

Conferences tackling today's issues

BRE organised and promoted numerous leadership conferences in 2016/17, which tackled some of the major issues facing sectors across the built environment, including:

BIM Prospects. This two-day conference was held just days after the launch of the UK government's BIM Level 2 mandate and assessed the readiness of industry, including the skills issues.

Build4Quality. Quality is a major issue for the construction industry and this conference sought to define quality beyond 'zero-defects construction', and its relation to sustainability.

Connected Cities. Local authorities are critical to the commissioning and delivery of digital technologies, but despite significant success stories there remains a widespread lack of knowledge, leadership and funding.

City Infrastructure. This conference assessed the key challenges facing urban infrastructure and explored how collaboration can better deliver projects.

Healthy Buildings. The health and wellbeing agenda is gathering pace but there are still gaps in knowledge. This conference examined the practical solutions to improving the healthiness of existing, in-use commercial properties.

Healthy Places for People. There is a pressing need to enable people to stay in their home, independent and well for longer. The solution requires the joining up of local level services around housing, social care and health.

Offsite Outlooks. Conference investigated the build-to-rent sector, the challenges affecting the delivery of quality new homes, and the role of offsite construction in delivering build-to-rent homes.

Resilience16. This conference explored the latest development in flood resilience, including the recommendations contained in the 'Property Flood Resilience Action Plan'.

Retrofit4Change. Following the ending of the UK government's Green Deal incentive, this conference examined alternative funding and how to improve efficiency through better supply chain management and the use of innovation.

SolarPVSummit. This conference reviewed the current policy landscape, post-FITS subsidy funding, certification and the investment case for PV in commercial buildings.



Construction process and supply chain



“From driving the BIM agenda and championing modern methods of construction, to helping companies reduce waste and source materials more responsibly, BRE is committed to improving productivity and efficiency in construction,” says Miles Watkins, BRE Group Business Development Director. “And by investing in digital technologies, we are building on a rich heritage of helping industry to deliver construction better. A selection of some key activities in this area during 2016/17 are briefly outlined below.”

Digital tools and services

BRE has been applying digital technologies in a wide range of dissemination, research and education programmes, and in a suite of tools designed to make the construction process more efficient, safer and more sustainable, including:

SiteSmart – safety, quality and sustainability in one place

BRESiteSmart.com, launched at the Digital Construction Week trade show in October 2016, is the home of BRE’s SmartWaste, YellowJacket and ProcessHub (see below). The SiteSmart platform provides a single place where companies can measure, collate and report critical construction site information, to make them safer, healthier, more environmentally friendly, more efficient and ultimately more productive.

SmartWaste – driving exemplary environmental performance

SmartWaste is a powerful online tool for environmental data in construction. Used by over 170 organisations across all sectors, SmartWaste has been used on over 14,000 projects to make environmental compliance, saving time and identifying cost savings in environmental data simple. To date our members have saved £12,000 per project on average.

SmartWaste enables users to capture data onsite about waste, energy, transport, water, materials, pre-demolition audits, biodiversity and more, and produce reports that provide insights about project and company performance against environmental targets. The latest release of the tool in July 2017 saw the addition of new features for monitoring staff hours and numbers, toolbox talks and environmental incidents, complaints and visits.

YellowJacket – better health, safety and quality

The YellowJacket online tool is designed to capture and manage health, safety and quality of performance across projects. Project information can be readily gathered using a computer or mobile app, allowing companies to more easily spot where improvements can be made. YellowJacket allows everyone to become a project’s eyes and ears for health, safety and quality. For example, in August 2016, two years after the launch of the YellowJacket mobile app, there was a 124% increase in near-miss reporting among users.

ProcessHub – ‘lean construction’

Process improvement, or ‘lean construction’, is about identifying what your customers really value, and understanding the processes that deliver this value. Improvements of up to 50% on quality, cost and delivery have been recorded for construction companies and projects that have worked with BRE’s lean construction specialists. Now, ProcessHub enables users to collect data – via the YellowJacket mobile app – about the work package, process issue type, number of people involved, and amount of time lost on site for every process issue.

BIM – using certification to showcase capabilities

April 2016 saw the UK’s Building Information Modelling (BIM) Level 2 requirements come into force for all central government projects. With considerable expertise in BIM, BRE has been helping companies to meet those requirements through events and training courses, and to demonstrate their BIM capabilities to government clients.

BRE Global’s BIM Level 2 Business Systems Certification scheme, for example, assesses and demonstrates a company’s ability to use advanced 3D modelling tools, and shows it has the standards, methods, procedures, skilled staff and infrastructure in place for compliance with the UK government’s BIM Level 2 mandate. Certification is also available for individuals who have passed examinations in BIM courses run by the BRE Academy.

Among the companies that have received BIM certification are designers – BDP Architects, main contractors – Interserve and Wilmott Dixon, modular construction specialists – McAvoy, and mechanical, engineering and plumbing specialists – SES Engineering Services.

The BRE Trust Centre for Sustainable Engineering

The Centre for Sustainable Engineering at Cardiff University aims to pave the way for a new generation of digital buildings that have lifelong resilience and adaptability to their environment, use and occupancy. In recent years the Centre has established itself as a leading centre for BIM research and informatics at city scale.

In 2016 Shaun Howell completed his PhD which focused on 'Ontological representations for integrated smart cities modelling and data analysis'. The study served as a proof of concept, formalised substantial learnings for practitioners, provided a reference implementation that could serve as a benchmark extension of the state of the art, and offered valuable domain ontologies.

In March 2017 Cardiff University announced that it secured almost £1m of EU funds to reduce energy use and tackle fuel poverty by enhancing urban energy efficiency. This research is being led by Professor Yacine Rezgui in the BRE Centre of Excellence. Outcomes from the research will be applied across Europe in a bid to deliver more efficient energy use in the built environment.

Environmental Product Declarations (EPD)

BRE is at the forefront of the development and uptake of EPD, which provide companies with a standardised way of quantifying the environmental impact and life-cycle of construction products under the EN 15804 standard. As clients and specifiers increasingly see the value of sustainability and demand more transparency, so EPD will become a business-critical tool for suppliers.

In June 2016 we launched LINA, our online life cycle assessment tool that allows companies and trade associations to self-assess their products in line with EN 15804. Data from the LINA assessment is submitted online for a BRE Global EPD stamp of approval, which demonstrates that the underlying data and data handling on the product's sustainability are consistently reliable.

Ethical, efficient, sustainable

Despite the emphasis on digital technologies, BRE has continued to be very active in improving other aspects of the construction process during 2016/17. This includes projects to develop new standards, demonstrate modern methods of construction and producing guidance material:

The Ethical Labour Sourcing Standard – Demonstrating Continuous Improvement

The introduction of the Modern Slavery Act 2015 has brought the issue of modern slavery and human trafficking to the attention of British businesses and the general public. BRE has responded by developing the Ethical Labour Sourcing Standard, which is about demonstrating continuous improvement and human rights due diligence in a business and its supply chains.

This year, BRE and BSI – together with Constructing Excellence, the Royal Institution of Chartered Surveyors, the Royal Institute of British Architects, the Chartered Institute of Procurement & Supply, the Chartered Institute of Building, Build UK, the Supply Chain Sustainability School (and others), created a construction industry coalition with the Gangmasters and Labour Abuse Authority to build a sector-level approach to the challenge of modern slavery.

Demonstrating the latest MMC

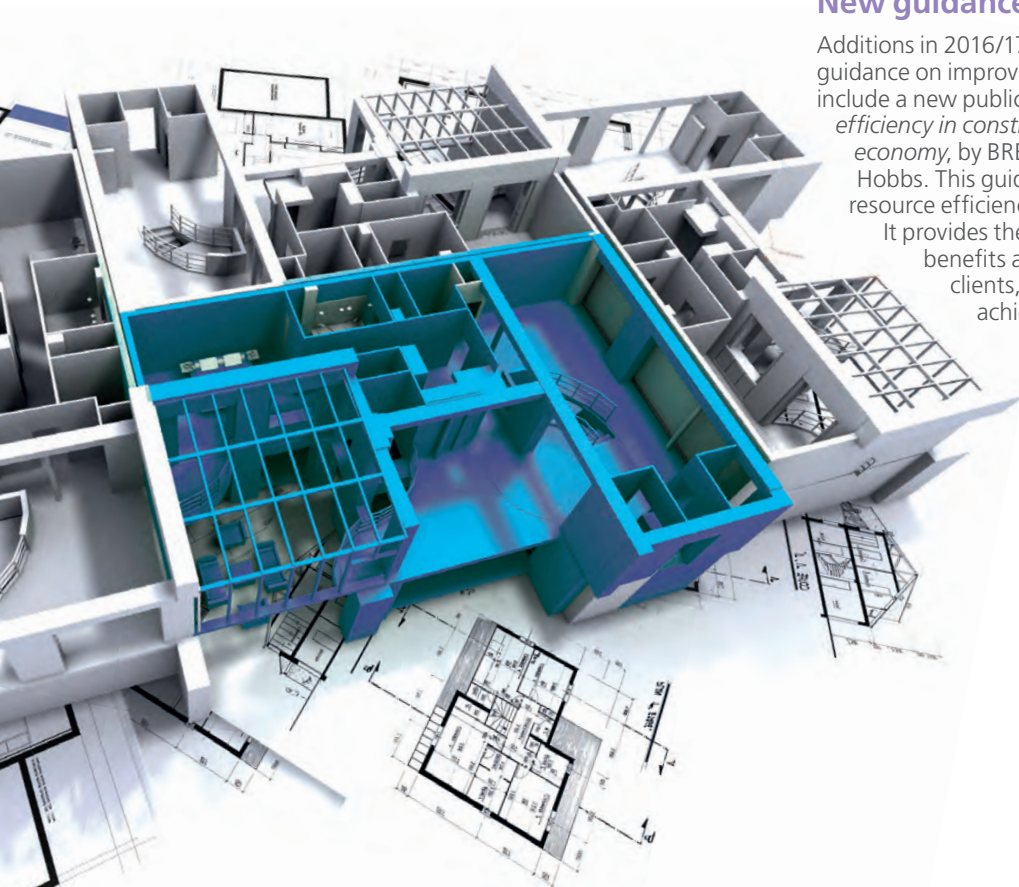
Modern Methods of Construction (MMC), encompassing offsite and modular construction, is regarded as a key solution to meeting the current housing shortage, while improving the quality and delivery of construction at a time when there is also a shortage of skills.

The BRE Innovation Parks at Watford and at Ravenscraig in Scotland (see page 28) are providing spaces for companies to demonstrate the latest MMC concepts. Examples added to the Watford Innovation Park this year include ZEDpod, a low cost micro-home that can sit on an elevated platform above existing outdoor car parks, and Koda, an energy efficient and movable concrete house, designed for small brownfield developments.

New guidance

Additions in 2016/17 to our extensive published guidance on improving construction efficiency include a new publication on *Material resource efficiency in construction: Supporting a circular economy*, by BRE's Katherine Adams and Gilli Hobbs. This guide describes the material resource efficiency requirements in BREEAM.

It provides the background, drivers, benefits and practical advice to help clients, designers and contractors achieve higher levels of material resource efficiency.



Smart homes and buildings



“Smart technologies offer huge opportunities for enhancing people’s lives, and for tackling many of today’s most pressing issues – from caring for our aging population to mitigating climate change,” says Martin Ganley, Director of the BRE Centre for Smart Homes and Buildings.

“With the fast pace at which smart technology is moving, it is vital that people across the supply chain work together to maximise its benefits. We all have a role to play in meeting the challenges ahead – such as fully understanding the changing ways we use our homes and buildings, ensuring that new technologies actually meet our needs, and installing the right infrastructure to make them work effectively.”

“At the BRE Centre for Smart Homes and Buildings we have created a collaborative hub of expertise at which partners from industry, academia and government can work together to maximise the benefits of smart technology.”

The benefits

Among the more obvious potential benefits, smart technologies can help to reduce energy use, cut carbon emissions and support more intelligent and flexible management of energy supply and demand.

Health and wellbeing can be improved through better management of internal environments, safety and security. Responsive and intelligent assisted living services can provide support for the elderly and those with chronic illnesses, helping them live better and for longer at home.

Costs can be reduced and productivity increased through reduced utility bills, but also through smarter facilities management and predictive maintenance. Smart technologies also offer greater convenience for all, allowing control through voice and mobile apps as well as using automation and artificial intelligence to support and predict our changing needs.

A focal point

Launched in 2017, the BRE Centre for Smart Homes and Buildings (CSHB) provides a focal point for those wanting to ensure that smart technologies meet defined needs. It helps all in the supply chain to gain accurate information on the performance of devices and systems, and address any emerging risks.

CSHB is given direction and governance by a Strategic Advisory Board and Expert Groups from industry, academia and government. It is operated by BRE in collaboration with CSHB members and partners. CSHB members have access to reports, events, workshops and other benefits, as well as opportunities to work with CSHB on a range of projects. Members include gas and electricity supplier EDF Energy, telecommunications provider Telefonica, building materials producer Wienerberger, smart home platform nCube, and purchasing body LHC.

Smart Home Lab

The speed and scope of the changes present both opportunities and challenges in the areas of energy and comfort, health and wellbeing, safety and security, connectivity and interoperability, data security and privacy, design, construction and installation.

BRE has developed the Smart Home Lab at its Watford site, to equip CSHB with a collaborative demonstrator and test bed for smart home technologies. The Smart Home Lab is a full-scale, fully-functioning house in which technologies and systems can be rigorously tested and monitored in ‘real-life’ circumstances.

A number of smart technologies are already being put through their paces at the home:

Home management technologies – Smart home platform nCube, for example, has joined CSHB and has installed the nCube system in the Smart Home Lab. nCube Home manages many aspects of the home, such as heating, energy, security, safety and entertainment. Operating with the nCube app and hub, this integrates several different communication protocols such as Z-Wave, Bluetooth, WiFi and Zigbee.

Cyber security – CSHB is also collaborating with Internet of Things research hub, PETRAS, on cyber security projects for smart homes and buildings, with the BRE Smart Home Lab providing the test bed environment.

In addition to those at the Smart Home Lab, BRE will be deploying smart technologies across the BRE Innovation Park at Watford. For more information and to get involved with the Centre for Smart Homes and Buildings please visit www.cshb.com

“nCube are pleased to be part of the BRE Centre for Smart Homes and Buildings and look forward to demonstrating the full benefits at the Smart Home Lab,” says nCube CEO Phil Steele.



Membership networks



“BRE has always valued the role that membership networks can play in helping to improve the built environment,” says Don Ward, Director, Constructing Excellence. “The Building Research Housing Group, for example, has disseminated building science best practice to social housing providers for more than 20 years. More recently, BRE has merged with two other significant membership networks – Constructing Excellence and APRES – as briefly described below.”

Constructing Excellence

Constructing Excellence merged with BRE in August 2016, bringing over 20 years' experience of bringing together leading clients, contractors, consultants and suppliers in the sector to drive change through collaborative working. Under the merger, Constructing Excellence has retained its distinctive brands, while growing the network, adding critical capacity to the development of digital tools, delivering training and events, and extending its international reach.

Highlights over the past year include the annual conference, which explored the synergies of our sector with sport, and reports and theme groups on a variety of subjects, from innovation in the repair of Hammersmith Flyover, to productivity in the nuclear construction sector, to offsite and driving forward the 'Farmer Review' – *Modernise or Die*.

Action Programme on Responsible and Ethical Sourcing – APRES

APRES is a network of industry and academic partners, membership of which is open to people from all relevant organisations. It acts as a centre for sharing knowledge and disseminating responsible and ethical sourcing practices, forging new research ideas and relationships, and providing advice directly to industry.

Since merging with BRE in 2015 the APRES network, which was founded in 2011 by the University of Loughborough, has continued to advocate and embed the responsible and ethical sourcing of materials, products and services in the construction industry.

The evolution of APRES to include ethical sourcing has provided further opportunities to widen the network and raise the profile of our work in this area, particularly with professional bodies like CIOB and IEMA. Indeed, the role of professional institutions in driving the responsible and ethical sourcing agenda was a major theme of the 6th APRES annual conference in November 2016.

The following annual conference in November 2017 focusses on a strategic overview of responsible and ethical resourcing, details of the latest tools and guidelines, and insights into the latest research.



Innovation Park Network



“Hundreds of the very latest building technologies and products are being tested researched and showcased in a network of BRE Innovation Parks extending around the globe,” says David Kelly, Group Director, BRE Innovation Park Network, “from the UK to China, Brazil and Canada – with plans for new Parks in South America and across China.”

“The Parks include full-scale demonstration buildings developed by industry partners, which incorporate innovative designs, products, materials and technologies. They enable architects, designers, developers, manufacturers and suppliers to test pioneering ideas in life-like conditions before using them in real communities.”

“We have recently established a more consistent dialogue between the Parks to identify and share current and future challenges, and explore and demonstrate solutions. This also provides important opportunities for collaboration between Park partners when common themes and challenges are identified.”



BRE Watford Innovation Park

Opened by John Prescott in 2005, the Innovation Park at BRE's headquarters site near Watford now comprises 15 full-scale buildings from leading developers, attracting 20,000 visitors a year.

The model on which the other Parks in the network are based, the Watford Park remains a dynamic, real-life industry testbed. Its 2016/17 highlights include the addition of a flood resilient home, a home that needs no land, and one that has no energy bills – see below.

The Flood Resilient House

The Flood Resilient House is resistant to flooding from water up to 600mm (2 feet) deep, and resilient to the effects of being flooded beyond that – it dries out quickly and the occupants return home a very short time after it has been flooded. This was convincingly demonstrated in a report on BBC 1's *Countryfile* in May 2017. Water that was poured into the home by the local fire brigade was quickly dispersed, and the home soon dry and warm.

ZEDpod

At a time when many people can't afford to get on the property ladder, the revolutionary ZEDpod aims to shake the homes market by providing ready-made quality homes on stilts, which stand over the bays of ground-level parking.

This solution to the shortage of affordable city homes is a low-cost (£65k), prefabricated, super energy-efficient micro-home. As the Innovation Park's demonstration ZEDpod shows it requires no land, sitting on an elevated platform above one of BRE's outdoor car parks.

Zero Bills Home

The Zero Bills Home – designed to have no net annual energy bills – is the brainchild of zero carbon pioneer Bill Dunster, and the first show home for a new 96-home zero bills development in Essex. Representing 10 years of innovation and supply chain development, this timber and steel hybrid home comes as a kit of parts with its component parts laser pre-cut. It far exceeds requirements under the new building regulations and will be tested against the Home Quality Mark.

Living with Dementia project

Further projects for demonstration houses are now being planned. The 'Living with Dementia' project in partnership with the University of Loughborough, for example, will see the refurbishment of two units of the Watford Park's Victorian Terrace to incorporate features designed to make life easier and safer for those with dementia. This follows the Dementia Refurbishment Building project at BRE Innovation Park @ Ravenscraig in Scotland (see below).

BRE Innovation Park @ Ravenscraig, Scotland

Opened in 2012 by Alex Neil MSP, the BRE Innovation Park @ Ravenscraig has been developed on part of the former Ravenscraig steel works in Lanarkshire, a 1125-acre site being regenerated into a new town.

The Park demonstrates development that considers the position and orientation of buildings, surface water management, biodiversity, ecology and placemaking. It combines science and technology with innovation and entrepreneurship to find solutions for existing and future building issues, not only in Scotland but also in the UK, Europe and around the world.

In 2016/17 the demonstration buildings on the site have continued to support BRE research projects such as 'Wall-in-One' and the EPSRC funded LCD-FITS project (thermal storage), while people from across the UK, France, Belgium, China and Russia have visited the Park.

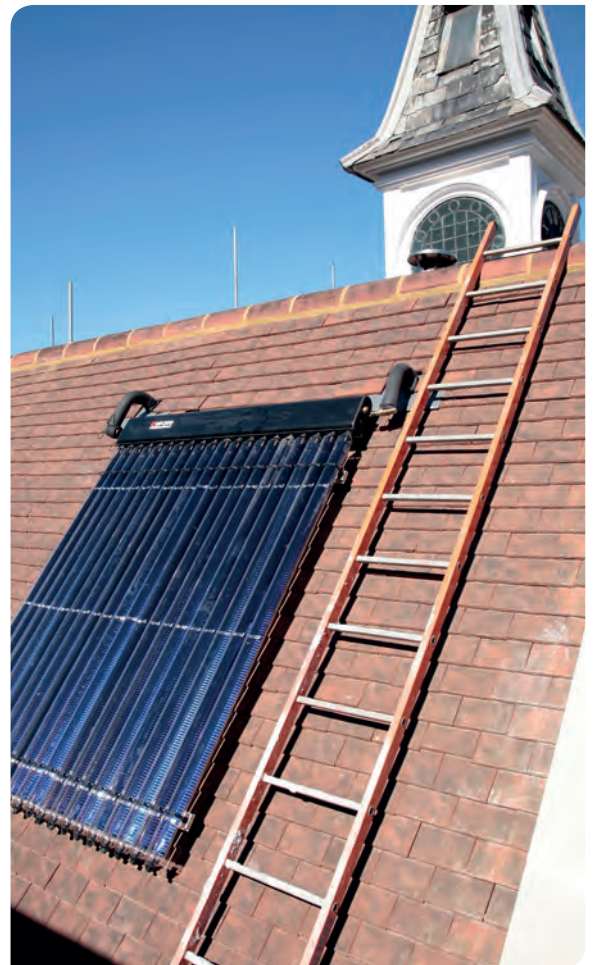
The development of the Curriculum House – a low carbon demonstration home designed and built by students from New College Lanarkshire – has progressed well, and the Park has delivered our first Dementia Refurbishment demonstration building. This was developed in conjunction with Alzheimer Scotland to show how adjustments to traditional properties can make living at home easier and safer.



Liverpool Innovation Park

Our Liverpool Innovation Park at John Moores University was opened in September 2016. The Park includes three refurbishment demonstration buildings and a soon-to-be-completed offsite volumetric dwelling.

The Innovation Park team is also working in the Liverpool area to develop and deliver projects across the business, for example with our energy advisory services, targeted at domestic refurbishment, and the BRE Academy.



BRE Innovation Park @ The Living City Campus, Canada

The BRE Innovation Park @ The Living City Campus in Toronto addresses design and construction issues relevant to the Canadian market, demonstrating a variety of innovative products, systems and design approaches to provide sustainable, resilient and affordable communities.

The Park's key themes include affordable sustainability, First Nations housing ('First Nations' refers to the primary aboriginal people of Canada South of the Arctic Circle), assisted living and health, off-grid applications, designing for deconstruction, interactive buildings and indoor environmental quality.

Recent activity has focussed on developing three new demonstration facilities, an innovative, offsite dwelling, a rehabilitation centre for First Nations, and a smart-grid demonstration operating within the Innovation Park.

The Park also has a pipeline of future demonstration buildings including the EllisDon Centre for Sustainable Construction, a net zero energy dwelling by Ryerson University and partners, and an off-grid learning centre for refurbishment.

Gui'an Innovation Park, China

In 2011, Chinese Premier Li Keqiang (then Vice Premier) visited the BRE Watford Innovation Park and put forward the idea of building an Innovation Park in China. That Innovation Park was officially launched in China's Gui'an, Guizhou Province in June 2015, thanks to the collaborative efforts of BRE, Tsinghua Holding Human Settlement Construction Group (THHSCG – part of Tsinghua University in Beijing) and Gui'an New District Area's local government. Its aim is to support the Chinese Government's drive for sustainable community development and air quality improvement.

The Park's modular and BIM designed Visitor Centre is providing a valuable platform for green building research and education delivery, and is an international exhibition centre for low carbon technologies. It was the first building to gain certification to both BREEAM and Three Star – China's national sustainability standard for buildings.

The building's design to Three-Star and BREEAM standards supported a project to map Three-Star clauses against BREEAM criteria, and in 2017 we published a guidance document setting out the alignments between the two standards in collaboration with Tsinghua University. This helps building projects to more efficiently and cost effectively gain certification against both standards, and benefit from certifying with the local Three-Star standard while gaining international recognition from BREEAM.

A natural progression from establishing the Innovation Park, BRE China was launched in the city of Shenzhen in May 2016 to support the country's goals for developing more sustainable towns and cities, and reducing carbon emissions (see page 38).

Plans are now well underway for the construction of other buildings on the Gui'an Innovation Park – including an Education Building – and for the wider development of a network of innovation parks across China, to meet the wide ranging built environment needs of a country so vast as to have five different climate zones within its borders.



PISAC, Brazil

Construction of the Innovation Park in Brazil – known by the acronym 'PISAC', which translates as 'Park for innovation and sustainability in the built environment' – is now underway. The design of the Park has been completed and the building phase has begun.

Based in the capital, Brasilia, PISAC is a partnership with BRE, the University of Brasilia, the Brazilian Chamber of the Construction Industry and the Ministry of Science Technology and Innovation. There are 15 embassies involved in the project along with around 300 other organisations and professionals.

PISAC has been designed to be a living laboratory where new technologies and designs will be developed and evaluated in use, and will act as a catalyst for the modernisation of Brazil's construction sector.



International expansion



“Our strategic objective to drive BRE’s international growth has progressed rapidly over the last year,” says Niall Trafford, BRE Group Chief Operating Officer “with overseas income rising to reach 40% of the total this year.”

“BREEAM is now present in nearly 80 countries, with projects shortlisted at the BREEAM Awards including those from Europe, Russia and China. BRE Global certification schemes increasingly attract international clients, with LPCB fire and security schemes, for example, being very actively promoted – through events, visits and local representatives – in key markets such as India, China and the Middle East. This has included opening a new Middle East office in Dubai and appointing a Regional Manager.”

“Among the countries where there have been particularly exciting developments over the last year are China and the USA, but important progress is also being made in South America and Africa – and our work extends as far afield as Antarctica!”

China

The BRE China team has been doing great work on our behalf, with the support of BRE colleagues from the UK.

In March 2017, for example, a group of colleagues flew out to China to help with our BRE China Annual Event at the Shangri-La Hotel in Beijing. It included VIP speakers from the British Embassy and Chinese industry including China Construction Group, Jinmao Group. There were presentations on the future direction of green buildings in China, the handing over of BREEAM certificates and awards, and recognition of some of China’s most pioneering clients, partners and professionals. To date there are over 80 development projects across China being assessed to the BREEAM and China Three Star green building standards. This is generating more data on China’s local conditions and further supports the adaptation of BREEAM to meet China’s requirements, and better alignment of the two standards.

In October 2016, one year on from signing our agreement at the UK/China Summit in London with Tsinghua University and partners to conduct research into sustainable development, Peter Bonfield (BRE Group CEO) was appointed as an international expert advisor to the new Institute for China Sustainable Urbanisation. This new Institute recognises the importance to clean the air and water in China, of embracing environmental sustainability in developing cities across the country.

BRE has also formed strategic partnerships with Shenzhen University and Nottingham University to set up a local laboratory to support the environmental monitoring and green building standards for the City of Shenzhen. Both Peter Bonfield and Jaya Skandamoorthy (President of BRE China) were appointed as Visiting Professors to the Shenzhen University, to further deepen collaborations between the Organisations.

With Jay Skandamoorthy leading the team in China, and Chairman of BRE China Niall Trafford ensuring strong support from the UK, BRE China has delivered a profit in its first year. It has opened access to new and fast growing markets, for example, launching a training business in partnership with NSD and the BRE Academy, and introducing BRE products through SiteSmart.



BREEAM ‘very good’ design rating Jin Mao Palace housing development in heart of Shanghai

BRE America

In January 2017 Niall Trafford, in his capacity as President of BRE America, Gavin Dunn (Vice President) and Jat Brainch (Chief Financial officer) visited BRE America in California. They found the team there to be on track to building a successful business that will deliver positive impacts across the built environment and spearhead BRE products and services into the North American market.



The launch of BRE America the previous year had been an important milestone in our international strategy, which has targeted the USA as a key territory. This was achieved by merging with BuildingWise, a highly regarded sustainability business operating out of Monterey Bay California. The initial focus has been on continuing the Bulidwise business and developing BREEAM In-Use for the US market which was launched in October last year. The aim is to help US based real estate owners to better manage their buildings – not only to be ‘greener’ but also more valuable, less costly to run and bringing reputational benefits. We are making great progress – the first BREEAM USA In-Use certificate was issued for The Oaks Mall in Thousand Oaks, California in late 2016, with dozens more large projects in the pipeline.

South America and Africa

One of the five BRE University Centres of Excellence is at the University of Brasilia in Brazil’s capital city – the BRE University Centre for Integrated and Sustainable Communities is the first to be located outside of the UK.

The Centre’s work is focussed on sustainable urbanisation, including resource efficiency, life cycle analysis and resilience, and has been involved with the development of the Innovation Park on the University of Brasilia Campus (see page 30). Other highlights include a new partnership with the Federal University of Mato Grosso (UFMT) and the Laboratory of Technology and Environmental Comfort (LATECA), where collaborative research on energy and environmental sustainability applied to photovoltaic and hydroelectric generation, is taking place.

In addition to the Centre of Excellence and several other established partnerships in Brazil, we are developing projects in other parts of South America. For instance, BRE is working in partnership with Univerisidad de Chile and the Laboratory for R&D, Innovation of Structures and Materials (IDIEM), to create an Innovation and Technological Centre in Santiago, Chile.

In Argentina BRE is implementing a post-graduate course on sustainable built environment, in collaboration with the University of San Martin in Buenos Aires.

We have also been increasingly active in Africa, working for example with partners on developments in Pretoria in South Africa. These include a residential area of 80 BREEAM ‘Very Good’ rated homes and a BRE Innovation Park. This Park will join the expanding Network of Parks being developed as far afield as China and Canada (see page 37).



Supporting the conservation of Horseshoe Island base ‘Y’ in Antarctica

A team from BRE has been providing construction product and materials expertise for a conservation project in Antarctica led by the UK Antarctic Heritage Trust (UKAHT).

Horseshoe Island base was established by the British Antarctic Survey as scientific base ‘Y’ in March 1955 and closed in August 1960. The conservation programme aims to conserve the base’s huts, keep them weathertight and the artefacts conserved for the long term.

BRE experts were called on to help the conservation team gain information about the materials that make up the base huts. This included their original life expectancy, their condition now, how they are affected by local factors such as wind and UV exposure, their expected longevity if nothing is done, and their expected longevity if conserved.

The BRE team reviewed drawings, images and evidence of building condition and advised on methods for sub-sampling materials, suitable equipment, sample sizes for investigating condition, and ‘making good’ after sub-sampling.

The sub-sampling conducted by the conservation team included:

- Concrete foundations
- Timber and plywood sheathing and roof
- Roof felt and membrane
- Metal cables
- Fibreglass loft insulation
- Window glass fragments and window hinges.

The next step for the BRE team has been to advise on the testing required on the materials obtained – supported by the UKAHT and the BRE Trust. The collective value around a common cause of conservation of historic explorers’ and scientists’ huts, supports the UKAHT’s education programme about the Antarctic region and the history of exploration – inspiring future generations in the UK and internationally.

Site redevelopment



“BRE’s Watford campus is undergoing a major redevelopment programme,” says Michael Grant, BRE Group Operations Director.

“We have invested over £3m on a programme of improvements to our facilities and infrastructure. We are consolidating our operations into a smaller area of land to reduce operational costs and environmental impact, while improving current facilities to ensure that BRE remains a world-class organisation. We have grown our properties business by 24%, or an additional £225,000 in 2016/2017 from tenants compared with the previous financial year. All of the additional income has been reinvested into refurbishment of our office and testing facilities.”

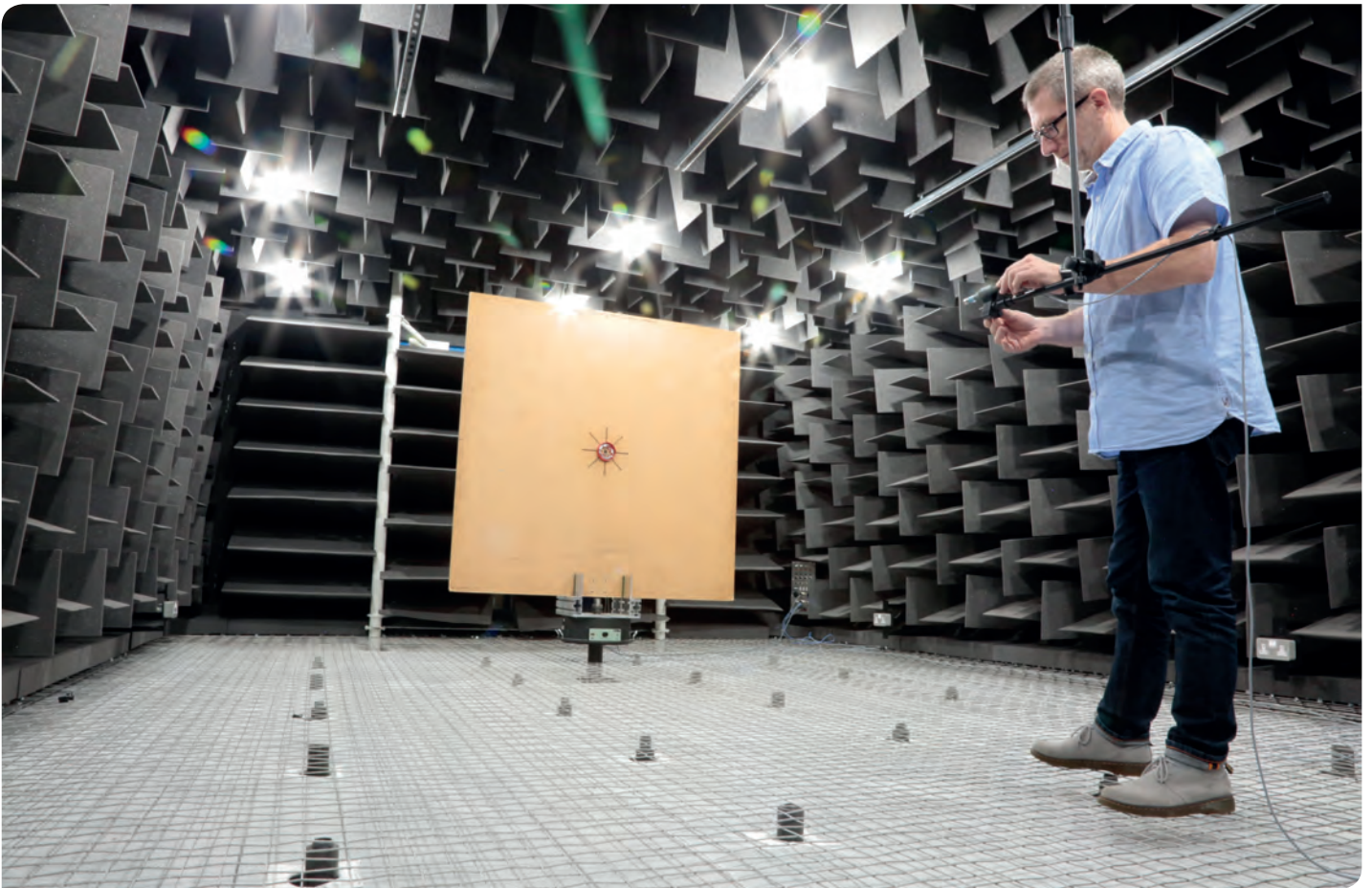
Development of the North Site

In 2012 BRE submitted an outline planning application to St Albans City and District Council for the construction of up to 100 homes on the northern part of the Watford site. Last year, following planning approval, Crest Nicholson was chosen to build the homes. The company has a 50-year track record of delivering vibrant and sustainable communities, and in 2016 was named by the UK Green Building Council, Homes and Communities Agency and JLL as the number one housebuilder for sustainability. Crest Nicholson will work to the Home Quality Mark and BREEAM Communities in order to deliver a great place that local residents and BRE staff will be proud of. The first homes are scheduled for completion in early 2018.

New nursery

As part of our commitment to employee welfare, BRE has a subsidised nursery on the Watford site. The ‘House that Jack Built’ caters for children aged from six months to five years, with flexible times for dropping and picking them up. The nursery was originally located in the north end of the site, but has been relocated to the original stable block adjacent to the Mansion at the heart of the site. The nursery reopened its doors in April 2017, following conversion of part of the building and an Ofsted review.





New laboratory facilities

To remain the UK's leading building science centre we must invest in our facilities. Work was completed early in 2017 on new, flexible indoor-environment test chamber spaces, alongside an existing facility for heat pump testing. The new facility gives BRE the ability to test air-to-water and water-to-water heat pumps, as well as domestic hot water heat pumps, and extends our existing heat pump certification under the microgeneration certification scheme (MCS).

BRE has for many years been a leading authority on building acoustics. To better fit the needs of our customers we are replacing the existing anechoic chamber and building associated sound transmission testing capabilities.



Office refurbishments

BRE employees and tenants work in buildings spanning more than 100 years of British architecture, from the Victorian mock-Tudor Mansion built in the 1880s, to office blocks built in the 1960s-1990s. To improve the working environment for occupants, BRE has been undergoing an extensive refurbishment programme. In 2015, the Mansion was upgraded to attract new external tenants and bring in new revenue. This was followed in 2016-17 by new offices for the BRE Academy, the Building Performance Group, Housing & Energy and the Finance department, and for new paying tenants. Planned works, include a new reception area for the Innovation Park Visitor Centre plus a new gym and welfare units.

BS OHSAS 18001

BRE is certified to BS OHSAS 18001, the standard that helps organisations to fully integrate health and safety into their policies and working practices. This in turn helps us to identify risks, engage staff and continuously improve their processes and systems, while signalling to architects, clients, insurers and specifiers that we take health and safety responsibilities seriously.

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BRE Trust

The BRE Trust uses profits made by BRE Group to fund new research and education programmes, that will help it meet its goal of 'Building a better world together'.

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