WHITE PAPERS
07/SUSTAINABILITY

A Building PRODUCT

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2/EXECUTIVE SUMMARY

The need to deliver a more sustainable built environment is one of the biggest challenges facing the construction industry. It is a challenge that impacts on the entire supply chain from funder to end user and will become progressively tougher over the next seven years. This white paper examines the drivers behind this agenda, the regulations and incentives being used to realise it and how the industry is responding. The ability of firms to understand and respond to these challenges by delivering better performing buildings cost effectively is a key requisite for survival in today's tough market.

The government has set the target of reducing carbon emissions 80% by 2050 compared with a 1990 baseline and says emissions from all buildings will have to be reduced to practically zero. As part of this trajectory the government has set a goal of requiring all new buildings to be zero carbon by 2019. These demanding targets are being realised by increasingly onerous regulation, planning requirements and for public sector projects funding conditions. Each iteration of Building Regulations ushers in bigger carbon reduction targets that are matched in turn by corresponding changes to these other requirements.

Some large organisations have aligned with this agenda. Sustainability is perceived as a key element in corporate social responsibility reporting and is often expressed in terms of minimum environmental performance targets applicable to buildings. Many large developers are responding to occupier CSR policy by ensuring new developments perform significantly above current Building Regulations. There is no premium associated with low energy buildings but evidence shows the lettable value of less efficient buildings is declining. Many large developers exceed current energy standards to protect the long-term value of building portfolios.

Organisations that procure and occupy their own buildings often exceed the environmental standards required by regulation. The big supermarkets have embraced high standards because strong environmental credentials are perceived to offer competitive advantage and reduce costs. Marks & Spencer says its sustainability strategy, known as Plan A saved it £70m in 2011. Relatively small increases in capital costs can yield big energy performance improvements. Spending an additional 0.26% on a 900 pupil secondary school or 1.6% on a city centre air conditioned office can reduce carbon emissions by 44% compared with 2006 Part L, yielding a positive payback over 25 years.

Although it makes financial sense to build to higher environmental standards only a minority of organisations do so. In a survey for this white paper 75% of occupiers said they don't set minimum environmental standards for the buildings they occupy. In the past the public sector has been responsible for procuring buildings with the highest BREEAM ratings but budget cuts are making this difficult. Very few new homes exceed the regulatory minimum: of all homes built to the Code for Sustainable Homes since 2007, 37,913 of completed homes had a code level 3 rating which is a requirement for social housing funding. Just 34 were built to level 6 with only nine completed by the private sector. Unless homebuyers start paying a premium for more energy efficient homes standards will continue to be almost entirely driven by regulation.

These issues have been recognised by the Department for Communities and Local Government (DCLG) in the 2013 Part L consultation. It proposes a 20% reduction in emissions compared with 2010 Part L for non domestic buildings. According to data prepared for this white paper by Aecom the new standards will add between 0.43% and 3.85% in costs depending on building type, a figure that can be recouped through lower energy bills. The consultation proposes an 8% cut in emissions for homes in recognition of the financial difficulties facing housebuilders.

Meeting the next iteration of Part L in 2016 will be much more demanding as

● Complying with the proposed carbon reduction targets in 2013 Part L will add 1.39% to the cost of a deep plan air-conditioned office, 3.85% to a retail warehouse, 0.92% to a secondary school and 0.43% to a five-star hotel. The most cost effective way of meeting the target for the secondary school was PV.

● The additional costs of meeting the upper levels of the code for sustainable homes explains why 37,913 homes have been built to code level 3 but only 34 to code level 6. It costs 5.2% extra to build a three bedroom semi to code level 3 compared with 2006 Part L but 45% extra to code level 6.

● When occupiers were asked in a survey for this white paper how satisfied they were with the energy performance of their new buildings 18% described their buildings as inefficient and 35% as good. Buildings with an environmental assessment rating fared slightly better with 12% of respondents describing their buildings as inefficient and 42% as good.

● Eighteen percent of developers in the survey have a budget of over a fifth of their annual turnover on their building portfolios to mitigate against energy and carbon price rises and the risks of changing legislation. But 59% are spending less than 5% of annual turnover on portfolio improvements. Developers expect to increase their budgets over the next five years.

● When asked if building elements should be assessed for embodied energy content as part of the specification process 80% of specifiers said yes but 31% currently do so. Forty-nine percent said they did not carry out embodied energy assessment because clients weren't interested with 43% saying there wasn't a simple and reliable method of assessing this. Three quarters expect to carry out embodied carbon assessments of building elements in the next five years.

existing policy states all new homes must be zero carbon after this date. It will cost housebuilders an extra 14% to build homes to 2016 Part L compared with the proposed standards in the 2013 version. If homebuyers will not pay a premium for zero carbon homes the additional costs will either come out of housebuilders profits or will depress residual land values – rendering many developments unviable.

The impact of 2016 Part L on non domestic buildings will depend on the 2016 carbon reduction targets. But it gets progressively more expensive the nearer to zero carbon the targets get. It would cost an additional 12% to reduce regulated carbon emissions from a school to zero and an additional 7.4% to reduce emissions from an air-conditioned office compared with 2006 Part L. This could mean developers are less likely to exceed Building Regulations particularly on tight sites where there is limited space for PV panels.

This is already happening in budget constrained sectors. Some Building Schools for the Future (BSF) teams were offering to build schools to BREEAM 'Excellent' for the same cost as a minimum 'Very Good' to win work. BREEAM has been updated to bring it into line with 2010 Part L, which means buildings need to use 25% less energy than the previous version of BREEAM to achieve an 'Excellent' rating. Achieving BREEAM 'Excellent' ratings without a corresponding budget increase is extremely challenging and means new schools are much less likely to exceed the regulatory minimum.

The government could put back the zero carbon targets if it perceives these as placing an excessive burden on the industry. It has already watered these down by changing the definition of zero carbon and removing the obligation on housebuilders to provide zero carbon energy for domestic appliances. And the carbon reduction targets in the 2013 Part L consultation are lower than previously published. If the economy does not pick up by 2016 the government could delay the implementation of zero carbon housing until 2019.

Reducing emissions from existing buildings is an important part of the government's strategy. The Green Deal is a financing mechanism which funds the costs of energy improvements to existing buildings and is paid off by savings on energy bills. A big barrier to Green Deal take up is property owners do not benefit immediately from the improvements. They have to suffer the disruption of having the work done and then wait for up to 25 years to start enjoying direct savings on bills. Some local authorities are interested in using the Green Deal as it enables them to improve their housing stock without affecting their budgets but regulation is being formulated to drive adoption in the private sector.

A big barrier to Green Deal take up is property owners do not benefit immediately from the improvement

The consultation on 2013 Part L proposes compelling homeowners to upgrade the energy efficiency of the existing element of their home when building an extension. If landlords don't take advantage of the Green Deal tenants may be able to force them to make improvements using the Green Deal after April 2015. It will be unlawful to let buildings with an Energy Performance Certificate (EPC) rating worse than E after 2018.

The government is determined to leverage the Green Deal as reducing emissions from existing buildings is more critical than low carbon new build because about 75% of homes and 60% of non domestic buildings constructed before 2010 will still be standing in 2050. Incentives are likely in the short term and if these do not work regulation is likely to be used to drive these objectives.

2.1 INTRODUCTION

This white paper provides a comprehensive guide to the complex sustainability landscape that supply chains need to negotiate when designing and constructing the built environment. It provides an overview of government targets and how these are being transposed into regulations. This includes an examination of the proposed changes to Part L of the Building Regulations and the cost implications for four building types. There is also a guide to commonly used environmental rating systems and how these are used as a condition of funding for public sector projects or as planning requirements.

The white paper examines how these regulatory pressures are impacting on clients and their corporate social responsibility strategies, and the corresponding impact on the developer community. This includes surveys of occupiers and developers to establish their sustainability priorities and of building designers to see how these priorities impact on the specification process. The white paper also includes a survey of occupiers to see how they think the industry is doing and there are details of the incentives used to drive improvements in existing buildings.

3/POLICY

3.1 POLICY BACKGROUND

The Climate Change Act came into force in November 2008 and committed the UK to a legally binding 80% reduction in carbon dioxide emissions by 2050 compared with a 1990 baseline. The target will be achieved by setting carbon budgets, which stipulate the maximum carbon dioxide emissions the UK can emit for every five-year period between 2008 and 2050. The level of emissions progressively drops so by 2020 the UK should have cut carbon dioxide emission by 34% relative to 1990.

The Carbon Plan, which was published in December 2011 sets out how the first four carbon budgets will be met. The forth carbon budget ends in 2027 by which time the UK should have cut its carbon dioxide emission by 50% compared with 1990. The Carbon Plan sets out the strategies for reducing emissions from the key carbon dioxide producing sectors which are transport, industry, agriculture, power generation and the built environment. The built environment is a key action area for the government as according to the Carbon Plan the built environment produces 38% of the UK's emission which is more than any other sector.

The 2006 Stern Review on the economics of climate change prompted the previous Labour government to launch ambitious targets for reducing carbon emissions from new housing to zero within a decade. The mechanism for realising this ambition was the Code for Sustainable Homes. It set out six levels increasingly demanding levels with a level 6 home being zero carbon and generating all its power with minimal water consumption. The Code also includes minimum standards for surface water management, site waste management, household waste management and use of materials. It sets out a roadmap for future building energy regulation Part L, which would be revised every three years. The 2010 version of Part L would require a 25% cut in carbon dioxide emissions over the 2006 version, the 2013 version 44% lower with all new homes zero carbon by 2016. In 2008 the government recognised generating all the power used in a home was extremely expensive and technically difficult. It engaged industry body the Zero Carbon Hub to redefine what was meant by zero carbon, a process that is ongoing.

The government announced in the 2008 budget that all other buildings would be zero carbon by 2019 with schools from 2016 and all other public sector buildings from 2018. Work on how this policy will be practically implemented has been carried out in three stages with the latest phase completed in July 2011. There are some similarities to the approach used for homes including a fabric first approach followed by additional onsite carbon reduction measures and remaining carbon emissions mitigated offsite.

Policy work on tackling emissions from existing buildings began in 2009 with the publication of the UK Low Carbon Transition Plan. This has been superseded by the 2011 Carbon Plan, which includes emission reduction targets for the transport, industry, agriculture, power generation and built environment sectors. Measures to improve existing buildings include cavity and solid wall insulation, smart meters, better heating and lighting systems and district heating networks. The 2011 Energy Act established the Green Deal, a mechanism that funds the upfront cost of energy saving improvements to existing buildings and is paid back through savings on energy bills.

3.2 CURRENT POLICY ON THE BUILT ENVIRONMENT

Most built environment carbon dioxide emissions reduction policy was put in place by the previous Labour administration. When the Conservatives and Liberal Democrats formed the coalition government in 2010 the prime minister David Cameron pledged his would be the greenest government ever. The coalition also confirmed its commitment to making all new homes zero carbon by 2016

The government made several policy changes last year, which has led many to question Cameron's commitment to be the greenest government ever

and all other buildings by 2019. It has also continued funding the Zero Carbon Hub's work on the zero carbon definition. But the government made several policy changes last year, which has led many to question Cameron's commitment to be the greenest government ever. Critics range from pressure groups including Friends of the Earth to the Confederation of British Industry which questioned chancellor George Osborne's contention that green policies were a burden on business.

Osborne changed the definition of zero carbon in the March 2011 budget to reduce the costs imposed on housebuilders by energy legislation from 2016. The old definition made housebuilders responsible for supplying all the energy used by appliances in the home but after Osborne's announcement the definition only includes the energy needed for space and water heating, fans and lighting. According to the impact assessment published by the DCLG in May 2011 changing the definition of zero carbon will bring down the cost of a home built in 2016 from £8,000-£12,000 more than 2010 Part L per home to £3,000-£8,000 per home.

The recently published consultation on the 2013 version Part L of the Building Regulations sets out less onerous carbon reduction targets than previous policy. This stated that the 2013 revision of Part L would require a 44% cut in carbon dioxide emission compared with the 2006 version, which equates to a 25% reduction over the current 2010 regulations. The DCLG favours an 8% reduction in emissions for homes, and a 20% cut for all other buildings. The DCLG says the reason for the significantly reduced target for homes is the government has committed to reducing the burden on housebuilders

during the course of this parliament. Changes to the definition of zero carbon and 2013 Part L also mean the Code will need updating to realign it with the change to the definition to zero carbon and 2013 Part L. The DCLG says an updated version of the Code will be published in 2013 with Part L.

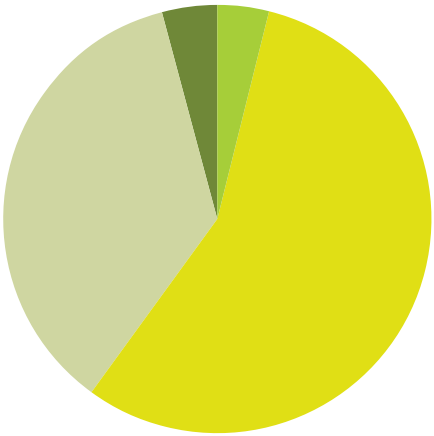
The Part L consultation also includes a proposal to extend consequential improvements to all buildings. This is a requirement to upgrade the energy efficiency of an existing building when building a new extension. This was previously limited to buildings over 1000 m^2 but will now affect homes. This was proposed in the 2006 Part L consultation but was dropped from the approved document and removed from the 2010 consultation just before this was published. Compelling householders to upgrade the energy efficiency of their existing home was seen as politically risky but is more likely to make it into 2013 Part L as the Green Deal means householders don't need to find the upfront cost of the energy efficiency improvements as this is funded by savings on energy bills.

3.3 THE IMPACT OF CHANGING POLICY ON CLIENTS AND DEVELOPERS

As part of this white paper occupiers and developers were asked what sort of risk the legislatively uncertain climate on environmental policy had on their business. Four percent of all occupiers said the legislatively uncertain climate was very high risk and could have a very negative impact on their business, 56% described it as a medium risk which could have some negative impacts, 36% said this didn't affect their business and 4% said some of the changes could have a positive impact (Fig 1).

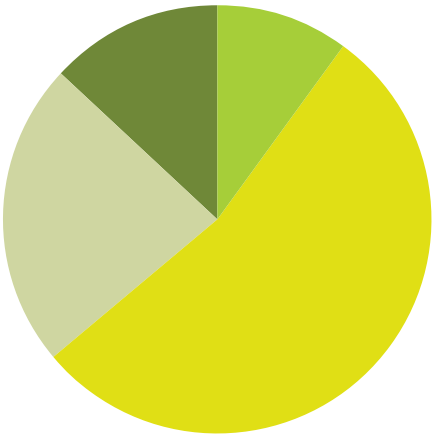
Developers were similarly split with 10% saying the legislatively uncertain climate was very high risk and could have a very negative impact on their business, 54% described it as a medium risk, 23% said they weren't affected and 13% said the changes may have a positive impact (Fig 2).

Fig 1. Over the past 18 months there has been considerable change to some of the energy and carbon related legislation such as the CRC. What sort of risk to your business does this legislation uncertain climate create? (Occupier response):



- High risk, this has/could have a very negative impact 4%
- Medium risk, this has/could have some negative impacts 56%
- This doesn't affect our organisation 36%
- Some of the changes have had/may have a positive impact 4%

Fig 2. Over the past 18 months there has been considerable change to some of the energy and carbon related legislation such as the CRC. What sort of risk to your business does this legislation uncertain climate create? (Developer response):



- High risk, this has/could have a very negative impact 10%
- Medium risk, this has/could have some negative impacts 54%
- This doesn't affect our organisation 23%
- Some of the changes have had/may have a positive impact 13%

3.4 HOW WILL CURRENT POLICIES IMPACT ON CARBON REDUCTION TARGETS FOR 2016 AND 2019?

3.4.1 NEW HOMES

The 2013 Part L consultation proposes limiting the overall carbon reduction target for new homes to 8% better than 2010 Part L. For the first time the target varies according to housing type, for example a detached house needs to improve by 15% over 2010 Part L whereas there is no change for a four storey apartment block. As the next 2016 iteration of Part L will stipulate all homes must be zero carbon this means a significant jump from 2013 to 2016 levels, about 45% reduction in emissions for a detached home, 44% for an apartment block and 28% for semi detached and terraced homes.

The DCLG is proposing homes built from 2013 must comply with minimum fabric performance standards (FEES) as proposed by the Zero Carbon Hub. This means housebuilders will need to start building homes with fabric performance aligned with 2016 zero carbon targets from 2013. This gives housebuilders plenty of time to develop feasible, cost effective fabric solutions.

The downside is all the carbon emission reductions required from 2016 will need to be met either by fabric performance over and above the fabric energy efficiency standard FEES, very efficient servicing solutions such as centralised CHP and heat pumps, renewable technologies or a combination of

some or all of these. Reducing the originally proposed 25% carbon reduction target to 8% does mean housebuilders face a bigger jump in 2016. However this is relatively small compared with the costs of achieving zero carbon in 2016.

The DCLG suggests it would cost an extra £755 (over the 2010 baseline) to meet its preferred 7% carbon reduction target for an end of terrace home. According to the DCLG (published in its review Cost of Building to the Code August 2011) it would cost an extra £3,273 or about 3.9% to meet a 25% carbon reduction target for a three bedroom semi-detached home (the same building form). The DCLG says it will cost an additional £12,553 or 15% to meet the zero carbon target for 2016 compared with a 2010 baseline. This means it will cost £11,798 (about 14% extra) to jump from its proposed 2013 carbon reduction target to zero carbon rather than £9,280 (about 11% extra) if the 2013 carbon reduction target was 25%.

Reducing the originally proposed 25% carbon reduction target to 8% does mean housebuilders face a bigger jump in 2016. However this is relatively small compared with the costs of achieving zero carbon in 2016

3.4.2 NON DOMESTIC

The 2013 Part L consultation proposes limiting the overall carbon reduction target for new non residential buildings to 20% better than 2010 Part L. This falls short of the suggested targets in the DCLG Zero Carbon Non Domestic Buildings report published in July 2011. This posits three scenarios with increasingly tough onsite carbon reduction measures. The middle scenario suggests a 33% reduction in aggregate carbon emissions for 2013 over 2010, 41% reduction in 2016 and 49% in 2019. Although the 20% cut in 2013 is smaller than suggested in the July 2011 document there is an additional three years to get to the final carbon reduction target compared with homes.

4/THE CASE OF INVESTING IN MORE SUSTAINABLE BUILDINGS

Building Regulations are the biggest single driver of reducing carbon emissions from new buildings as Part L sets minimum standards of energy efficiency. The industry has been compelled to deliver greener buildings over the last decade simply because of increasingly higher standards in Part L. An air-conditioned office built to 2010 regulations will emit 46% less carbon dioxide than one built to 2002 regulations. Despite increasingly demanding sustainability focused regulations, there are some organisations and individuals who have always sought to deliver projects that go beyond these for a variety of reasons.

4.1 PIONEERING NEW FORMS OF CONSTRUCTION

Some organisations and individuals passionately believe in creating a more sustainable future and want to prove it can be done. Architect Bill Dunster and entrepreneurial charity BioRegional are both committed to more sustainable lifestyles and worked with social housing provider the Peabody Trust on the UK's first zero carbon housing scheme, BedZED which was completed in 2001, five years before zero carbon became government policy. Engineer Buro Happold and architect Cottrell & Vermeulen wanted to reduce the environmental impact of construction materials and designed the UK's first permanent cardboard building, a school in Westcliff on Sea which was completed in 2001.

Successful innovations often have a big impact on the wider construction industry. Dunster developed the BedZED concept into a range of standardised systems which have been used for several housing schemes. Bioregional formed a joint venture with developer Quintain to build a 172 unit zero carbon development in Brighton. Architect Ralph Carpenter pioneered the use of a lime hemp mixture as a walling material in the UK because of its very low environmental impact and excellent thermal properties. He started by building the walls of his home extension from the material and persuading his neighbours to do the same. The product has been refined and developed by product manufacturer Lime Technologies. Called Tradical Hemcrete, it has recently been used for the cladding of Marks & Spencer's flagship environmental learning store, a 195,000 ft^2 superstore at Cheshire Oaks opening in summer 2012.

4.2 SAVINGS ON ENERGY BILLS

Procuring more energy efficient buildings can make sense for client organisations where small increases in capital costs result in overall savings through reduced energy bills. Consultants Aecom and Cyril Sweett modelled a range of different building types for Tata Steel's Target Zero programme which examines the relationship between capital expenditure and operational energy costs.

Alternative carbon reduction targets were modelled for the different building types. These ranged from 25% to 100% better than 2006 Part L. The study found relatively modest increases in capital costs could easily achieve buildings that had carbon emissions 44% less than 2006 Part L, a figure that is slightly higher than the targets proposed for 2013 Part L. It found spending an additional 0.26% on a 900 pupil secondary school and 1.6% on a city centre air conditioned office would reduce carbon emission by 44% and comfortably yield a negative net present value (a positive payback) over 25 years for both building types. This demonstrates a modest increase in construction budgets is worthwhile for reduced energy bills and makes sense for end users procuring their own buildings. Spending greater sums for bigger carbon reductions doesn't result in positive payback. It would cost an additional 12% to reduce regulated carbon emissions from the school to zero with no negative net present value over 25 years (no positive payback). The office would cost an additional 7.4% for reducing emissions by 79%, the maximum that could be achieved using onsite solutions. Like the school there was no positive payback over 25 years.

4.3 REDUCING CRC ENERGY EFFICIENCY SCHEME LIABILITY

The Carbon Reduction Commitment (CRC) is effectively a carbon tax affecting organisations using more than 6,000 mWh of electricity a year and took effect in April 2010. This affects medium-sized organisations including larger developers, central and local government, healthcare trusts and big retailers (for full details see section 8.8). Carbon is currently priced at £12 a tonne, which on its own is not a sufficiently powerful driver to make companies reduce their emissions. However according to Jones Lang Lasalle's Offices 2020 research programme making organisations measure their energy use makes them more fully aware of how much energy is being used to run buildings. This awareness can stimulate programmes to reduce energy use. The carbon price will also increase in future budgets putting greater pressure on organisations to upgrade the energy performance of their property portfolios.

4.4 FUTURE PROOFING BUILDING PORTFOLIOS

4.4.1 NEW BUILDINGS

Many developers and investors want to ensure property portfolios retain value against a background of increasingly tough sustainability legislation. Many corporate occupiers set progressively higher sustainability targets each year which means they don't want to lease buildings

falling short of energy regulations in force when leases are signed. This has prompted developers who lease buildings to large organisations to ensure their new projects anticipate future sustainability legislation. They will also build to high BREEAM standards as these often form part of occupiers CSR policy. Developers also want LEED certification for those buildings aimed at multi international occupiers.

Building Regulations are approaching the point where it is becoming increasingly difficult to design buildings that perform significantly better than these without resorting to offsite sources of low or zero carbon energy. Once this point is reached, probably with the 2013 revisions to Part L, developers will only build to higher standards on sites where it is possible to do so. Future reductions will be driven by "allowable solutions", the mechanism which allows developers to source a percentage of low or zero carbon energy from offsite sources and still meet Building Regulation requirements. This means many developers are likely to stop demanding buildings that exceed the requirements of 2013 Part L once this takes effect.

4.4.2 EXISTING BUILDINGS

The Energy Act 2011 proposes to make it unlawful to lease residential or commercial buildings with an EPC rating of F or G from April 2018. According to the Department for Energy and Climate Change (DECC) this will affect 18% of non residential buildings although research published by property services company DTZ puts the figure at 40%. It is not clear at this stage whether this will only apply when a lease comes up for renewal or all buildings need to be upgraded by this date. Developers are currently assessing what properties will be affected by the proposal and putting together action plans to protect the value of property portfolios. The secondary legislation enabling the application of this policy will appear later this year. There could be a significant amount of work upgrading existing buildings to an EPC of E or better once the legislation is in place until 2018 as

The Energy Act 2011 proposes to make it unlawful to lease residential or commercial buildings with an EPC rating of F or G from April 2018

leases come up for renewal. This work will be funded either by developers or via Green Deal financing depending on whether a mechanism to pass the all costs of paying back the Green Deal loan to occupiers is put in place by the legislation.

4.5 PREMIUMS ON LEASES

To date there is very little evidence to prove that buildings with low energy credentials command a premium on leases. This means many developers have been reluctant to invest over and above Building Regulation requirements as they do not benefit from the savings on energy bills. Jones Lang Lasalle's Offices 2020 research programme is beginning to see signs the opposite is true; occupiers are beginning to expect to pay less for inefficient buildings. Their research indicates that energy use is still the primary value in determining value rather than broader measures of sustainability. According to Jones Lang Lasalle within five years energy performance will become the key factor in determining portfolio value.

5/WHAT MATTERS TO CLIENTS AND DEVELOPERS

The factors discussed above affect building occupiers and in turn are impacting on the developer community which provides those buildings. A survey of office and retail occupiers and developers was carried out, in association with client body Corenet and developer body the British Property Federation, for this white paper to discover their attitudes to the risks presented by rising energy and carbon prices. The survey also asked what action occupiers and developers are taking to mitigate those risks. The survey includes large corporate organisations including London based developers with portfolios over 20 million ft², local authorities and smaller companies including developers with portfolios under 5 million ft².

5.1 THE COMMERCIAL SECTOR AND SUSTAINABILITY

Developers targeting the corporate occupier market will focus on delivering buildings that exceed Building Regulations requirements due to occupier CSR policy stipulating greener buildings. Recent examples of this trend include British Land's Ropemaker development, which has a BREEAM 'Excellent' rating, and was the first in the City of London to receive a pre-certification LEED Platinum rating. It is now fully let which vindicates British Land's sustainability policy. The Leadenhall building, also British Land has also received a BREEAM 'Excellent' for the design stage. The Shard will also feature a BREEAM 'Excellent' rating; excess heat from the offices will be used to heat the hotel and apartments above. The Heron Tower in the city also features a BREEAM 'Excellent' and surplus heat will be used to warm an adjacent hotel when this is built. There are good examples of low energy refurbishment too, AirWI, a joint Crown Estates and Stanhope development adjacent to Piccadilly includes a hydrogen fuel cell with excess heat from the offices being used to warm a hotel and health club. Developers operating outside this top end market are more likely to build to the regulatory minimum.

Owner occupiers build to even higher standards as they benefit directly from lower energy bills. The Co-op is building a new HQ in Manchester and is targeting a BREEAM 'Outstanding' rating and hopes to save 40%-60% on energy bills when it completes later this year. Our table of the top 10 BREEAM rated offices for 2011 is dominated by local authority and other owner occupiers (section 14).

5.1.1 THE RETAIL SECTOR AND SUSTAINABILITY

The big food retailers are leading the sector with their ambitious sustainability policies. Marks & Spencer launched its Plan A strategy in 2007 with a 100 point plan to improve the sustainability of its business because "there is no plan B". The plan was extended in 2010 to cover 180 issues, which include everything from sustainable food sourcing, carrier bags and buildings. These are called sustainable learning stores with the idea lessons are taken onto the next store. The retailer takes a holistic view of sustainability so its Ecclesall Road store in Sheffield was built from reclaimed bricks and FSC certified timber, includes rainwater harvesting, a green roof and bird boxes to increase biodiversity and has a basket of energy saving measures. It is currently building a 195,000 ft² store in Cheshire that features a glulam frame and lime hemp walls and has demanding targets that include zero waste to landfill during construction. These sustainability policies give the food retailers competitive edge and save money too. M&S says Plan A saved it £70m in 2011. The other food giants have followed suit, Tesco wants the carbon footprint of its stores to be half the 2006 level by 2020 and is rolling out a series of zero carbon stores across the UK. Sainsbury's followed suit last October with a £1bn investment to make cut its carbon emissions 30% over 2005 levels by 2020 and the other food retailers are also reducing their carbon footprint, Waitrose dominates the top 10 BREEAM Retail ratings (section 14). Other big retailers have sustainability policies but are generally behind the big supermarkets. As a rule retailers will try and reduce the carbon footprint of their product lines first if these are carbon intensive. The carbon footprint of petrol filling stations is very minor compared with the energy required to process and transport the fuel.

5.2 SURVEY RESPONSES

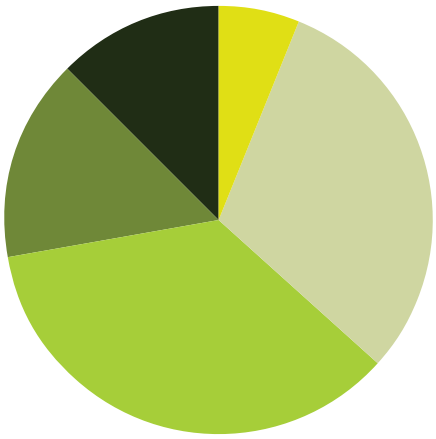
5.2.1 CORPORATE, ENERGY AND LEGISLATIVE RISKS TO OFFICE AND RETAIL OCCUPIERS

When it comes to organisations, image is vital and that is beginning to extend to the buildings those organisations occupy. The survey reveals that the minority of occupiers regard the environmental performance of the building they occupy as low or very low risk to their corporate reputation (Fig 3). The impact of rising carbon and energy prices over the next five years was also cited as a high or very high risk by half of occupiers. Only a fifth of respondents said this was low or very low risk (Fig 4). The fast moving legislative climate is also unsettling for a clear majority of occupiers, again only a fifth of respondents cite this as a low or very low risk (Fig 5).

5.2.2 OCCUPIER BUDGETS FOR SUSTAINABILITY IMPROVEMENTS

The risks presented by loss of corporate image, rising energy and carbon prices and changing legislation are stimulating action as encouragingly 58% of occupiers were prepared to spend a premium on a new lease or on a fitout costs in return for lower energy bills. The amount occupiers were prepared to spend varied, up to 20% extra while others said it depended on payback calculations.

Fig 3. What level of risk does the environmental performance of the building(s) you occupy present to your corporate reputation?

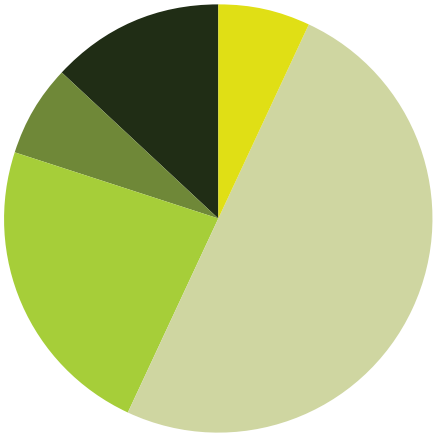


Very high risk	6%
High risk	30%
Neutral risk	35%
Low risk	15%
Very low risk	12%

Fig 4. The impact of rising energy and carbon prices on the buildings you occupy over the next five years

Very high risk	7%
High risk	43%
Neutral risk	30%
Low risk	10%
Very low risk	10%

Fig 5. The impact of new or changing environmental legislation on the buildings you occupy over the next five years



Very high risk	7%
High risk	50%
Neutral risk	23%
Low risk	7%
Very low risk	13%

Budgets vary with the majority spending only 0.25% of turnover on the energy performance of the buildings they occupy

Some occupiers have ring fenced budgets for either leasing more energy efficient building or improving the ones they already occupy. Budgets vary with the majority spending only 0.25% of turnover on the energy performance of the buildings they occupy (Fig 6). Although these figures show some occupiers are prepared to invest in better performing buildings 60% say they don't spend this budget each year.

5.2.3 WHAT SUSTAINABILITY MEASURES ARE IMPORTANT TO OCCUPIERS?

Some occupiers have formulated environmental policies for their building portfolios. Thirty eight percent of occupiers have a policy dictating that any new building they occupy or fitout must have a minimum BREEAM or Ska rating. If an organisation goes to the trouble of putting building environmental performance policies in place it sets high standards with a majority demanding a minimum of a BREEAM Excellent rating (Fig 7).

5.2.4 DEVELOPER RESPONSES TO THE ENERGY AND LEGISLATIVE RISKS FACED BY OFFICE AND RETAIL OCCUPIERS

As the majority of occupiers regard the energy performance of the buildings they occupy, rising energy and carbon prices and changing legislation as neutral or high risk unsurprisingly developers are responding with low energy buildings to protect the long-term value of their portfolios. The survey reveals developers are ahead of occupiers as a bigger majority of developers regard rising energy and carbon prices as a high or very high risk to their portfolios over the next five years (Fig 8). Only 11%

of developers described this as low or very low risk compared with a fifth of occupiers. Attitudes towards the risks presented by new or changing building related legislation were very similar with just 6% describing this as low or very low risk (Fig 9).

5.2.5 DEVELOPER SPENDING ON PORTFOLIO IMPROVEMENT

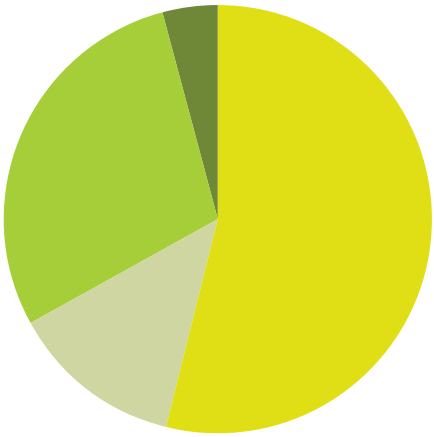
Some developers are investing considerable sums to keep their portfolios attractive to more demanding occupiers. Eighteen percent of respondents have a budget of over a fifth of their annual turnover on improving their building portfolios to mitigate against energy and carbon price increases and the risks of changing legislation. But a significant majority have relatively small budgets as the survey reveals 59% are spending less than 5% of annual turnover on portfolio improvements (Fig 10). The actual amount spent on improvements is even less as 62% of respondents don't spend this budget each year. Developers expect to increase their budgets over the next five years but not by much as just over half expect to spend moderately more while 6% said they expected to spend less (Fig 11).

5.2.6 DEVELOPER NEW BUILDINGS POLICY

Most developers are aware of occupier priorities as 75% have a corporate policy stipulating they will build to a recognised environmental assessment standard such as BREEAM or LEED. BREEAM is the most used environmental assessment method but standards are middling with half of respondents plumping for the relatively undemanding Very Good rating (Fig 12). The pattern is similar for those developers who use LEED (Fig 13).

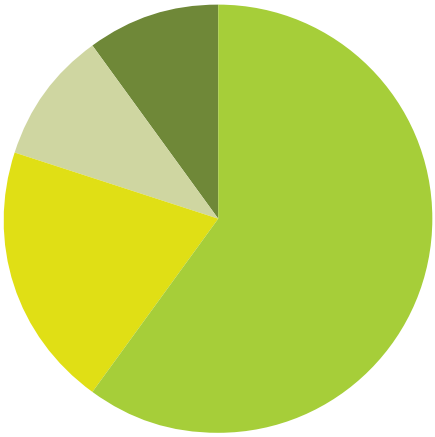
Sixty percent of developers set a target of bettering the current version of Part L with the remainder choosing to stick to the regulatory minimum. Standards are fairly high with over three quarters opting to better Part L by 25% (Fig 14).

Fig 6. In terms of risk mitigation what is your ring fenced budget for leasing more energy efficient and/or improving the ones you already occupy?



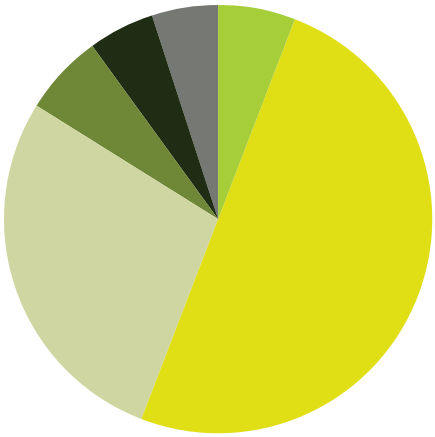
0.25% of turnover	54%
0.5% of turnover	13%
1% of turnover	29%
More than 2% of turnover	4%

Fig 7. If your corporate policy dictates any new building you occupy or fitout has a minimum BREAAM rating, what is it?



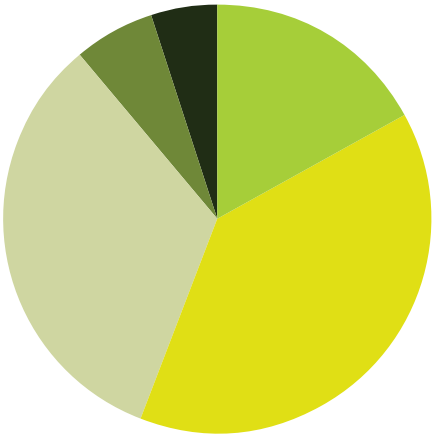
Excellent	60%
Very good	20%
Good	10%
Not applicable	10%

Fig 8. How would you rate the risk presented by the impact of rising energy and carbon prices on your portfolio over the next five years?



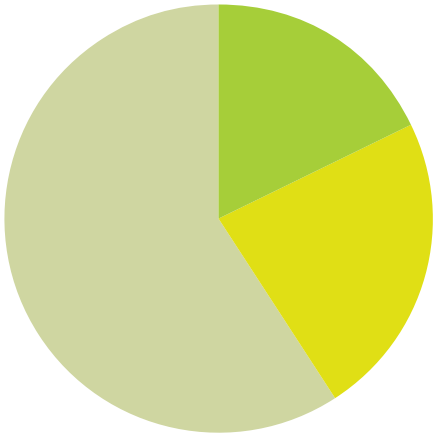
Very high risk	6%
High risk	50%
Neutral risk	28%
Low risk	6%
Very low	5%
Not sure	5%

Fig 9. How would you rate the risk presented by the impact of new environmental legislation on your portfolio over the next five years?



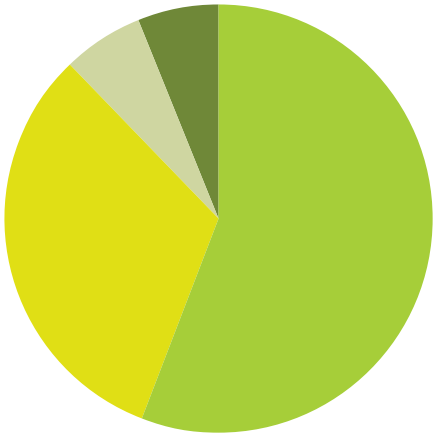
Very high risk	17%
High risk	39%
Neutral risk	33%
Low risk	6%
Not sure	5%

Fig 10. What is your annual budget for improving your portfolio to mitigate the energy price carbon tax and legislative risks?



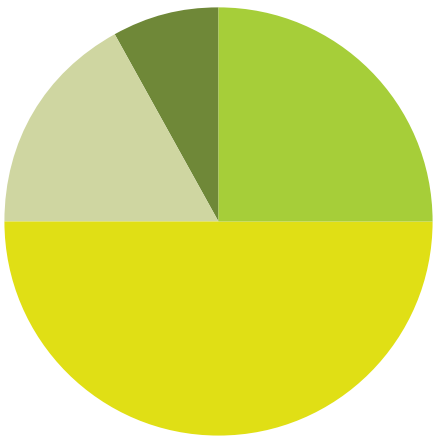
Over 2% of turnover	18%
Over 10% of turnover	23%
Less than 5% of turnover	59%

Fig 11. How do you envisage your annual budgets for mitigating the energy price, carbon tax and legislative risks changing over the next five years?



Moderately more	56%
No change	32%
Less	6%
Not sure	6%

Fig 12. If you use BREEAM what is the minimum rating?



Excellent	25%
Very good	50%
Good	17%
Pass	8%

Fewer developers, 44%, choose to exceed current regulations when refurbishing buildings compared with new build

5.2.7 DEVELOPER EXISTING BUILDINGS POLICY

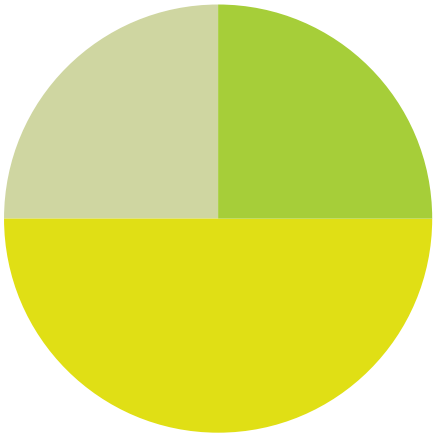
The Energy Act proposes to make it illegal to rent out buildings with an EPC rating worse than E from 2018. The survey for this white paper reveals portfolios are mixed with most developers having some F and G rated buildings in their portfolios (Fig 15). Developers have a range of strategies in place to deal with these buildings, a minority will redevelop and 38% will refurbish these buildings to current standards. Half the developers are not bringing these buildings up to current standards, either bringing these up to the minimum EPC rating of or not taking any action at the moment. The standards set for refurbishment reflect that of new build with a majority plumping for a BREEAM 'Very Good' rating (Fig 16). Of the few that used Ska a third set a target of 'Silver' and two thirds 'Bronze'. Fewer developers, 44%, choose to exceed current regulations when refurbishing buildings compared with new build. But the developers who choose to exceed Building Regulations have similarly high standards as new build schemes with over three quarters opting to better Part L by 25% (Fig 17).

Developers are cautious about taking advantage of Green Deal financing to improve existing buildings, no respondents will "definitely take advantage" but 87% say they will explore the possibility and 13% say they won't be taking advantage of the Green Deal.

5.2.8 WHAT DEVELOPERS WANT FROM THEIR SUPPLY CHAIN.

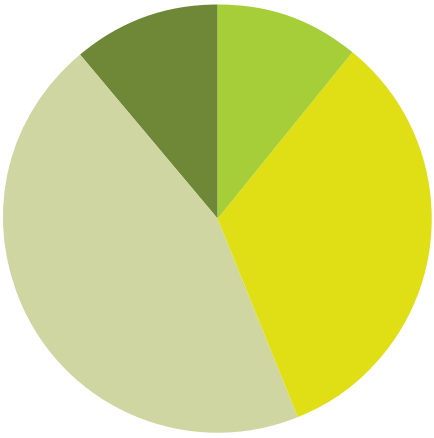
Encouragingly for the industry developers place greater value on relationships and experience than lowest cost when selecting their supply chain. Thirty eight percent select their consultant team on the basis of a good track record delivering low energy projects. Three quarters of developers select their team on the basis of good, previous relationships while only a quarter say they select on the basis of fees. A minority select their contractor on the basis of a good track record of delivering low energy buildings and minimising the environmental impact of the construction process. Again previous good relationships are key to contractor selection with nearly three quarters of respondents saying they selected on this basis. Again a minority said they selected on the basis of lowest priced tenders (Fig 18).

Fig 13. If you use LEED what is the minimum rating?



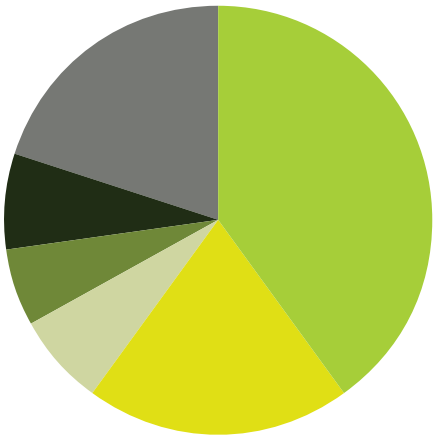
Gold	25%
Silver	50%
Certified	25%

Fig 14. If your corporate policy dictates a minimum energy performance level above Building Regulations what is it? If yes, please state which of the following best applies



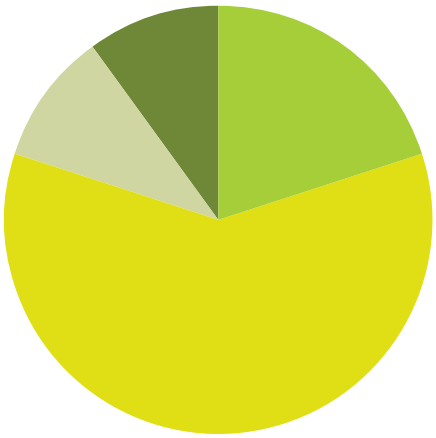
50% better than Part L	11%
35% better than Part L	33%
25% better than Part L	45%
10% better than Part L	11%

Fig 15. What percentage of your portfolio are buildings with EPC rating of F or G?



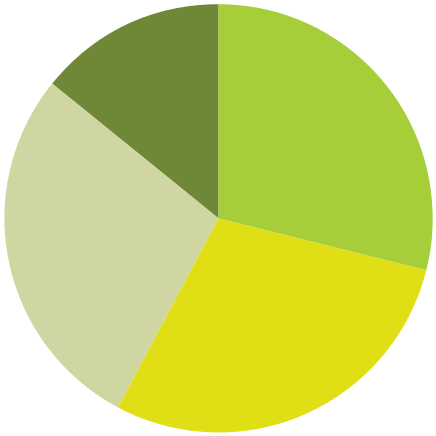
9% or less	40%
10-19%	20%
35-49%	7%
50-74%	6%
90% or more	7%
don't know	20%

Fig 16. If your coporate policy dictates any fitouts you undertake must meet a minimum BREEAM rating what is it?



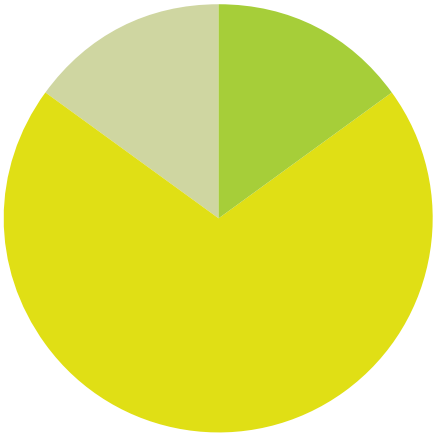
Excellent	20%
Very good	60%
Good	10%
Pass	10%

Fig 17. If your corporate policy dictates a minimum evergy performance level for refurbishment and fitout above that set out in current Building Regulations what is it?



- 50% better than part L 29%
- 35% better than part L 29%
- 25% better than part L 28%
- 10% better than part L 14%

Fig 18. What do you look for when selecting your contractor?



- Contractors with a good record for delivering low energy buildings and reducing the environmental impact of the construction process 15%
- Contractor selected on the basis of previous working relationships 70%
- We always go for the lower priced tenders 15%

5.2.9 THE BUSINESS CASE FOR SUSTAINABILITY – THE DEVELOPER VIEW

"British Land sets challenging annual and medium targets" *Sarah Cary*

EXPERT COMMENT, SARAH CARY, SUSTAINABLE DEVELOPMENTS EXECUTIVE, BRITISH LAND

Why sustainability is business critical for British Land

"British Land recognises that our business activities have environmental, social and economic impacts which can affect the lives of a significant number of people. We also increasingly find that resource efficiency, social investment and sustainable design are important to our occupiers, investors, and the communities we operate in. Focusing on sustainability helps us manage our physical, fiscal and regulatory risks, enhances our reputation with stakeholders, and protects and creates asset value.

"We believe that sustainable buildings meeting business needs have a competitive advantage, giving occupiers tangible cost savings and support their corporate responsibility policies. In our experience, this means they let more quickly and hold long-term value better."

"With a diverse and changing supply chain, one of my key challenges is to ensure all projects achieve high standards of environmental design, community enhancement, and responsible sourcing. Another challenge is to future-proof our buildings against impending environmental regulation so they maintain their quality and value. We also believe that investing in the needs of local communities is also a critical part of the development process, fostering economic regeneration and empowering local people.

"British Land sets challenging annual and medium targets across five focus areas. Our medium-term goals for resource use in new buildings include Zero Waste to Landfill by 2012 (currently achieving over 95% on our developments) and obtaining planning permission for a zero carbon commercial building by 2015. Our Sustainability Brief for Developments outlines a process that all our projects must follow and lays down 13 core targets, which are applied to major developments. We have been using the Brief since 2004 and most recently published version three in July 2011.

"We work hard across our £1.6bn development portfolio to create positive outcomes on each and every project, through sustainable design and responsible construction.

"On community issues, British Land's Community Charter sets out our approach to key local issues and we require our major projects to support training and apprenticeships, use local procurement frameworks where possible, and invest in improving local community facilities. One example is how we are targeting construction employment in the construction of The Leadenhall Building. Through Laing O'Rourke, the site has been granted status as a National Skills Academy for Construction project. This means it will take a bespoke site-based approach, giving local participants the opportunity to receive construction training at all levels directly on-site, rather than being delivered off-site in a pre-established training course. Employment on the site of this building will be provided to a minimum of five local graduates, 40 apprentices and provide 65 NVQ places."

What we look for when selecting our supply chain

"British Land evaluates suppliers through the tender process against their commitment to sustainability and their response to our Sustainability Brief for Developments. A key aspect of the Brief is that we require our project teams to integrate sustainable design right from the start at concept and design stage as lessons learnt from previous projects show that this is more cost-effective and time-efficient. Resource efficiency in particular should be integrated into design as a matter of course.

"I expect our consultants and contractors to bring new ideas and products to us. We are currently particularly interested in reducing energy use, waste generation and carbon emissions associated with the extraction, manufacture and installation of building materials. Our design teams and contractors should understand the origin of materials specified, actively seeking to avoid polluting materials and ensuring all materials are manufactured to robust health and safety and ethical labour standards.

"To demonstrate the integrity of our approach and standards, we are subject to independent auditing which certifies our supply chain's approach to a cross-section of requirements including health and safety, environmental management and sustainability."

BRITISH LAND CORE TARGETS FOR ALL MAJOR PROJECTS INCLUDE:

- **BREEAM 'Excellent' for all major office developments and refurbishments, and a minimum of 'Very Good' for all major retail schemes.**
- **Contractors to operate a local procurement strategy, which takes into account any local authority framework.**
- **100% of temporary and permanent timber to be sourced from FSC or PEFC Certified sources.**
- **Divert a minimum of 98% of demolition and strip-out waste from landfill and 96% of construction and fit-out waste from landfill.**

5.2.10 WHY SUSTAINABILITY MATTERS TO JOHN LEWIS PARTNERSHIP

John Lewis Partnership dominates the top ranked BREEAM Retail tables for its projects. Of the top 10 projects in 2011 7 are either John Lewis or Waitrose stores with six in the top 10 projects of 2010.

TONY JACOB, HEAD OF CONSTRUCTION, ENVIRONMENT & ENGINEERING, JOHN LEWIS PARTNERSHIP

"At the John Lewis Partnership we firmly believe that our future is best served by respecting the interests of all our stakeholders: partners, customers, suppliers and the wider community. This approach, which we feel is the essence of responsible retailing, means actively looking for opportunities to improve the environment and to contribute to the wellbeing of the communities in which we trade.

"Responsible development of our estate is an essential aspect of the way we do business, and it is the right thing to do. It means providing buildings that are comfortable, safe and productive environments for their users. It also means sourcing responsibly, reducing waste and using recycled materials where possible. We need to design buildings with carbon reduction at the forefront of our thinking; to be energy efficient, using energy efficient equipment, re-using materials and reducing water usage. Achieving these goals not only lowers our long-term operating costs but also enables us to improve the shopping experience for our customers and the working environment for our partners. In fact, it is with the energy and expertise of our partners and suppliers that we have been able to make real progress over recent years with our environmental objectives.

Responsible development has always been an integral part of the way we design, procure, build and operate our estate which we first articulated in a Sustainable Construction Framework in 2007. In 2009 we started work on our carbon reduction plan and at the same time formed a group of partners and suppliers to challenge all aspects of our existing framework. The result was a new target-driven Responsible Development Framework, setting out measurable targets for our development projects. Since this framework was launched more stakeholders are aware of our environmental objectives, the targets we have set ourselves and our achievements so far.

"Targets, monitoring and reporting are now embedded in our delivery and review processes – some examples of our targets include:

- Minimum BREEAM rating – we have achieved our first 'Outstanding' rating on the Waitrose estate which is the first post construction accreditation in the world within the retail sector, with more in the pipeline.

We have also delivered our first 'Excellent' rated John Lewis refurbishment:

- Diverting at least 99% of our construction waste from landfill
- Specifying all timbers from sustainable sources
- Improving the carbon impact and energy efficiency of our shops, setting and auditing carbon reduction targets for refurbishments while defining new build specific benchmarks for future improvement.

"In many areas we are leading research projects to deliver commercially sustainable and energy efficient buildings and systems. We are also pioneering on site energy generation solutions that clearly demonstrate our commitment to invest in this area. As an increasingly fundamental part of the way we do business we have set ourselves the ambitious target of an absolute reduction in our carbon output: by 2020/21 we aim to have reduced our absolute emissions by 15% when compared with 2010 while growing both John Lewis and Waitrose businesses in that time.

"Being clear about our environmental aspirations is essential from 'day one' of a project's inception. Without this early understanding of what we want our buildings to achieve we would not be able to maximise the potential of our teams to deliver our objectives. We provide guidance through a number of channels helping our teams to better understand how they can achieve or go beyond our targets. Continual improvement is a critical part of our strategy which we achieve by listening to our Partners, supply chain and other external specialists through project teams, targeted workshops and our relationship management programme which encourages regular two way feedback.

"As the pressure to deliver more commercially sustainable results increases we need to ensure that we continue using the best external partners to help us deliver our goals. We continue to work with our known and trusted supply chain to help us develop and improve – an example of this is our increasing and successful use of BIM across our development projects. We also encourage new suppliers to help us investigate and understand new ideas and to demonstrate their credentials in this area. We require new suppliers to really understand our long-term objectives, to discuss how they feel they can support us in achieving those objectives.

"Our approach to responsible development is particularly distinctive, effective and more likely to succeed because of the energy and passion of our partners and supply chain. Our partners drive us to operate an evermore sustainable and responsible business. Our policy needs to be applied in practice, every day, guiding and improving the way we work. Our partners make sure that this happens and their dedication is enabling us to build a business that successfully balances short-term success with a long-term future."

5.3 PUBLIC SECTOR AND SUSTAINABILITY

5.3.1 NEW BUILDINGS

The public sector makes up nearly 40% of the construction industry workload so is a key source of work. Most of the sustainability requirements of this sector are driven by public sector targets. For example central government projects must achieve a BREEAM 'Excellent' and major refurbishments must achieve a 'Very Good' rating, the same standards apply to healthcare projects. Schools must achieve a 'Very Good' rating and social housing must meet level 3 of the Code for Sustainable Homes. Most public sector projects will be built to meet these minimum standards but some organisations exceed these. The top BREEAM-rated projects prepared for this white paper reveal the public sector has the top three rated office buildings in 2011 and the 2010 top 10 offices is also dominated by the public sector with a Department for Environment, Food and Rural Affairs (DEFRA) project topping the list.

Public sector cutbacks mean less public sector work coming through. It also means there is less money available to exceed the minimum environmental targets which could mean fewer public sector projects in the top 10 BREEAM lists in the future. There is also a question mark over the future of the minimum standards. The Department for Education (DfE) wants to scrap minimum BREEAM standards for schools on the grounds this is expensive and bureaucratic. With the pressure on public sector spending there is a risk if minimum standards for schools are cut other government departments will be tempted to do the same.

District heating schemes are a good way of reducing carbon emissions from existing buildings but are complicated to set up

5.3.2 EXISTING BUILDINGS

The bulk of carbon emissions from public sector buildings come from the existing stock which in many instances is very old and inefficient. Upgrading these building has become particularly challenging due to public sector spending cuts. Matthew Turner principal consultant of Aecom's sustainability group says a big problem is organisations such as local authorities have dedicated budgets for building maintenance but this isn't sufficient to upgrade buildings.

"There is a known budget to maintain existing buildings but the capital investment needed to do wholesale refurbishment is more of a conceptual leap than for a private sector organisation," he says. "The challenge is to persuade them to take a big hit in one year to save money down the line." Some local authorities have managed to break out of this cycle, see case study on Bristol City council (section 5.3.5). Dedicated programmes can make a difference, the Decent Homes programme sought to improve social housing including thermal performance and is still ongoing.

5.3.3 DISTRICT HEATING

District heating networks were identified in the 2011 Carbon Plan as a key tool to improve the energy efficiency of existing buildings. Local combined heat and power energy centres generate electricity with the heat circulated around adjacent buildings. Typically these schemes cut carbon emissions by 20% compared with conventional power and heating solutions. Local authorities, NHS trusts and other public sector organisations have embraced district heating networks because they can partner with a private sector organisation which provides the capital and then recoups this by selling the energy. Building Services and Research Association (BSRIA) predicts this market will be worth £4.5bn in 2020, up from £320m in 2009. Services specialist Mitie recently completed an energy centre and district heating system for London's Royal Free hospital. This will enable the hospital to meet its target of reducing carbon emissions by 10% by 2015 and also save it 20% on its utility bills. Mitie, has set up a special division to target the healthcare market. Funding of £100m from the NHS Carbon Energy Fund has been matched by an equivalent amount from the European Investment Bank and is being used to fund 23 schemes. Cofely is another energy services specialist which is focusing on local authorities. It recently completed a scheme in Leicester where set up a 25-year partnership with the council to supply 15 council buildings, the University of Leicester's campus and 3,000 homes. There are also Cofely run schemes in Birmingham and Southampton. District heating schemes are a good way of reducing carbon emissions from existing buildings but are complicated to set up.

5.3.4 SCHOOLS AND BREEAM

Schools must achieve a BREEAM 'Very Good' rating as condition of DfE funding. According to Gary Chesher, who leads the bid teams on BSF and academies for Aecom, many bidders have offered BREEAM 'Excellent' ratings at no extra cost to give them competitive advantage. Last year BREEAM was updated to bring it into line with the latest version of Part L. This means a school designed to meet BREEAM 2011 'Excellent' must have carbon emissions 25% lower than one designed to BREEAM 2008. As a consequence fewer schools will have BREEAM 'Excellent' ratings. "Increasingly the reality is you can't offer this anymore," says Chesher. "There is a limit to what you can achieve when contractors have an affordability limit which is 30% down on what it was before." A second challenge is BREEAM needs to be designed in from the start to keep the cost down which is difficult when teams only have six weeks to work up a design. The combination of changes to BREEAM, reduced budgets and the possibility of minimum BREEAM standards for schools being scrapped make it inevitable there will be far fewer BREEAM 'Excellent' schools in the future.

5.3.5 CASE STUDY – HOW BRISTOL CITY COUNCIL IS CUTTING CARBON EMISSIONS FROM ITS BUILDINGS

Bristol City Council has bucked the trend of local authorities not reducing carbon emissions from their buildings because of budget cuts. Geoffrey Robinson, the head of building at Bristol City Council, says the only way to improve existing buildings is to create a separate budget otherwise maintenance would swallow all the money. This needs agreement from councillors.

"We needed to prove to the council that we needed to spend money to save money which wasn't easy," he says, adding that showing councillors whole life costs for energy was the key. He says it is easier to get money now as councillors can see the savings from earlier initiatives. These include putting more sophisticated controls in schools to save energy and training caretakers how to use these. Another initiative involved putting movement detectors in gymnasiums as lights were being switched on at 6am and left on until 10pm. Both policies haven't been without their problems, caretakers move on and because their replacements haven't been trained energy use leaps up. Gymnasiums are used for exams where people sit still for prolonged periods which meant the lights would go out, manual overrides have now been fitted.

Robinson says Bristol has more installed biomass boilers than any other local authority. Ashton Court is a large wooded park in the city and the council were paying to have the timber removed. It invested in a chipping plant and now burns the timber in its biomass boilers. Robinson says it was essential to involve the caretakers who initially used the gas back up boilers because they perceived biomass as involving more work. "Its all about changing perceptions and involving the caretakers to show it can work," he says. "These things can't be imposed on people."

FIG 19. LOW ENERGY HOMES (APRIL 2009-SEPT 2011)

Code level 1	**406** to design stage	**0.46%** of design stage total
Code level 1	**171** built to post-completion stage	**0.4%** of design stage total
Code level 2	**997** to design stage	**1%** of design stage total
Code level 2	**354** built to post-completion stage	**1%** of design stage total
Code level 3	**68,944** to design stage	**80%** of design stage total
Code level 3	**37,913** built to post-completion stage	**88%** of post-completion total
Code level 4	**14,915** to design stage	**17%** of design stage total
Code level 4	**4,102** built to post-completion stage	**10%** of post-completion total
Code level 5	**453** to design stage	**1%** of design stage total
Code level 5	**160** built to post-completion stage	**0.37%** of post-completion total
Code level 6	**329** to design stage	**0.38%** of design stage total
Code level 6	**34** built to post-completion stage	**0.08%** of post-completion total

5.4 RESIDENTIAL

Government policy requiring homes to be zero carbon by 2016 is the principal driver of housebuilder sustainability strategy. When the policy was introduced in 2006 housebuilders started building prototype homes to find out the best way to build a zero carbon home. Policy at the time stipulated all power needed by the home and appliances within had to be generated using onsite renewables. This resulted in some unconventional looking homes with wrap around roofs to fit all the photovoltaic (PV) panels on and homes adorned by micro wind turbines.

When policy changed to allow a percentage of zero carbon energy to come from offsite sources low energy homes began to look more conventional. The industry quickly realised the most cost effective way to deliver low energy homes was to make the fabric as well insulated and airtight as possible. Achieving very high levels of airtightness and continuity of insulation has proved challenging to achieve onsite and housebuilders are still discovering the best way of achieving this. The current trend is to build homes near to the energy levels of level 4 of the Code for Sustainable Homes (25% better than 2010 Part L) and mitigate the remaining carbon emissions using scheme wide CHP schemes. This means homes don't look any different to those built to earlier energy standards.

One example is Linden Home's Graylingwell Park scheme near Chichester, which reduces carbon emissions by 60% over 2006 Part L. Crest Nicholson has adopted the same approach with its Centenary Quay scheme in Southampton. Achieving code level 5 on small schemes is challenging as district wide CHP is only suitable for schemes with more than 100 units. The solution is to use low carbon heating technologies such as heat pumps combined with renewable generation, usually PV. Achieving high code levels on high-rise apartments is also challenging because the ratio of roof space to accommodation is very small. The Bioregional Quintain scheme One Brighton has 172 units in two blocks 9 and 11 storeys high. The scheme has used biomass CHP combined with PV panels which meets half of the schemes energy needs. The remaining 50% of the schemes energy requirement is bought in from offsite sources. The DCLG recognises the challenge of building very low carbon high rise apartment schemes and is proposing the carbon reduction target for 2013 Part L doesn't change until a practical way can be found to reduce carbon emissions below current targets.

5.4.1 THE MARKET FOR LOW ENERGY HOMES

The numbers of homes built to meet the Code is dominated by the public sector. This is because it is a Homes and Communities Agency (HCA) requirement to build to level 3 of the Code.

According to DCLG statistics between April 2007 and September 2011 85% of homes with a post-construction certificate and 75% with a design stage certificate were public sector.

Of all the certificates issued 88% of completed homes had a code level 3 rating and 80% a design stage certificate to level 3, this reflects the impact of HCA requirements.

In numbers this equates to 37,913 post-completion certificates to level 3 and 68,944 design stage certificates to level 3.

By contrast only 34 homes have been built to level 6 with 329 design stage certificates to level 6. Of the completed level 6 homes 26% were built by the private sector. That means the private sector has only built nine homes to code level 6 in over five years. The private sector has plenty of level 6 certificated designs sitting on the drawing board as 329 homes have received design stage certification, 64% of those are private sector (Fig 19).

The reason for the tiny numbers of code level 5 and 6 homes is the much greater costs of compliance. According to the DCLG (Cost of Building to the Code August 2011) building a three-bedroom semi on a small brownfield site to code level 3 cost an extra 5.2% when Part L 2006 was in force. Code level 4 cost an additional 9.3% but building to code level 5 cost an extra £23,140 or 28% and code level 6 an extra £37,860 or 45%.

Building the same home with 2010 Part L in force brings the cost of the code level 3 home down to an extra cost of 1.3%, the level 4 home 5.3% but the level 5 home still costs an extra £20,000 or 23% and the level 6 home an extra £34,720 or 40%. Given the huge jump in costs from a level 4 to levels 5 and 6 it is hardly surprising so few private sector homes have been built as housebuilders cannot charge a premium for these homes.

5.4.2 SUSTAINABILITY AND THE VIABILITY OF NEW BUILD HOUSING

"Social landlords are more interested in long-term costs but their hands are tied"

Mark Farmer

EXPERT COMMENT, MARK FARMER, GROUP HEAD OF PRIVATE RESIDENTIAL, EC HARRIS

"Building to level 5 is a real step change position and is going to be very difficult. Water use drops to 80 litres a day per person which is a real challenge technically, as well as being an issue in terms of marketability with things like power showers and large baths being restricted. It is very debateable if there is any uplift in sales value as only a tiny sector of the market will pay extra for a green home. The means most housebuilders see green as a burden which means the costs either come straight off residual land values or it depresses the developers profit.

"Social landlords are more interested in long-term costs but their hands are tied with the new affordable housing financial model. They will comply with the requirements but can't go beyond that as they are so financially constrained because there are no significant grants anymore. With the new financial model they can charge 80% of the open market rent and borrow against the extra rental income. Social landlords are very reluctant to do this in many instances as they say it is unviable, if you charge 80% of the market rent people can't afford it.

It seems to me the government has backed off a bit from its initial planned pace of reducing carbon emissions with the new proposed 8% reduction comparing with the initially proposed 25% carbon reduction. This means there is going to be a bigger jump for 2016 if indeed zero carbon remains the standard. It does leave a question mark about the uplift in 2016 as the full carbon reduction targets are financially untenable in the current difficult UK wide new build residential market. It does potentially mean there could be a delay introducing true zero carbon requirements to 2019 or a total redefinition, which reduces the viability burden on industry.'

5.5 INFRASTRUCTURE

"Aviation has a high sustainability profile given the impact of airport operations on their surroundings" *Simon Rawlinson*

EXPERT COMMENT, SIMON RAWLINSON, HEAD OF STRATEGIC RESEARCH & INSIGHT, EC HARRIS

Expert comment, Simon Rawlinson, head of strategic research & insight, EC Harris

"Shortly after being appointed prime minister Cameron committed the coalition to being 'the greenest government ever'. This aspiration was subsequently converted into the Greening Government Commitments, a report setting out targets for reductions in greenhouse gas emissions, waste and water consumption as well as a commitment to reduce the impacts of the supply chain. However, a challenging economic environment has tempered recent public announcements with a more pragmatic approach that focuses on balancing affordability, return on investment and delivery of core sustainability indicators.

"UK infrastructure businesses have a key role to play in helping to deliver this new vision, but they need to balance their strategic sustainability focus with initiatives that help to improve the performance of existing assets. With the potential for further changes to the regulatory environments affecting capital investment programmes, they also need to anticipate how performance metrics might drive further transformation in the business."

Water

"Carbon accounting was first introduced into the UK water industry during the 2009 Price Review (PR 09). This saw water companies required to account for embodied and operational greenhouse gas emissions with a shadow price of carbon introduced into the business planning process, so that the sustainability impact of investment decisions could be demonstrably accounted for. As part of PR09 planning UK water companies also produced a 25-year strategic direction statement and many placed sustainability at the core of this roadmap. Water UK has also produces a series of sustainability indicators for the industry most of which relate to water supply performance but also include measures of total energy use, greenhouse gas emissions and renewable energy generation.

"These policies have helped to move things forward – one good example is the catchment management initiative. Other sustainability initiatives include investment in sustainable urban drainage systems (SUDS) and other measures to reduce surface water run-off, investment in more energy efficient plant and a greater focus on habitat preservation and investment in local employment creation.

Transportation

"Growth in demand for transport makes the sector a particular target for sustainability policy. With the sector responsible for 20% of the UK's total carbon emissions, participants, including the infrastructure providers have a responsibility in delivery.

"The Highways Agency is one organisation that has responded by developing a nine-point sustainability plan which includes commitments to work with the supply chain to meet targets for reduced carbon emissions, waste to landfill, water and use of finite resources.

"Local authorities also need to respond to the sustainability agenda, however given the impact of spending cuts, many are facing challenges around whole-life assessment and an understanding of the potential benefits of using recycled materials such as Reclaimed Asphalt Pavement.

"Other steps that are being taken to improve the sustainability performance of highways projects include: flood prevention through drainage, use of recycled content and low-energy processes such as cold asphalt working. Highways authorities are also reducing the impacts of their operations through use of bio-fuels and waste reduction programmes.

"Aviation has a high sustainability profile given the impact of airport operations on their surroundings. Due to the challenges airport operators face in securing consents for development, they have been very active in putting in place measures to reduce environmental impact.

"One good example of this green approach was the demolition of Heathrow Terminal 2 where 99% of the 100,000 tonnes of waste created was recycled. Airport operators also aim to use a high volume of off-site construction in their new-build work, minimising waste and on-site disruption. Other more innovative approaches range from BA's proposed JV with Solena to produce waste-derived aviation fuel and Berlin Schoenefeld Airport where bio-monitoring techniques, including kale and honey-bees, are being used to track air quality.

"While all of these examples demonstrate the UK infrastructure industry is looking beyond the narrow parameters of the cost of sustainability, developing the skills and metrics to make this process effective will take time as will pushing recommendations down to the workface. As with major infrastructure projects the sustainability agenda has to be a long-term play, requiring a concerted commitment from government, regulators and industry alike that extends beyond a regulatory period, political term or the current economic cycle."

6/WHAT OCCUPIERS THINK OF THEIR BUILDINGS

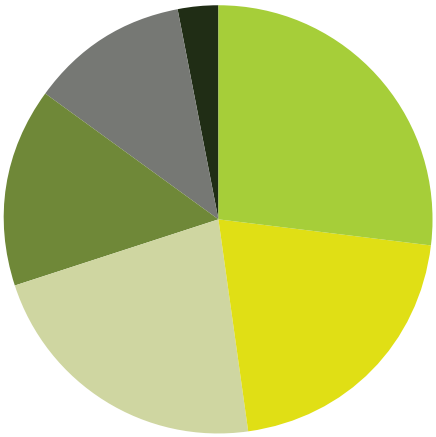
Building to increasingly high sustainability standards is pointless if buildings don't perform as designed. Post-occupancy data is difficult to obtain as clients and project teams are reluctant to see their projects subjected to public scrutiny if they are performing well below design predictions. Some post-occupancy data does get into the public domain and the results don't always make good reading. The Carbon Trust required buildings to be monitored as a condition of grants for low and zero carbon technologies and the results were published in Building magazine.

A naturally ventilated new build council office called West Suffolk House with state of the art low and zero carbon technologies was found to be emitting nearly three times as much carbon dioxide as the design prediction. Analysis revealed that heat had either gone straight out of the windows in the winter or the cooling system had been on at the same time as the heating. To add insult to injury staff complained the building was either too hot or too cold and the building was excessively noisy (article title: "Post occupancy: Is your building really so green?", www.building.co.uk)

But some buildings perform well. A low energy refurbished council office for Hampshire Council also benefitted from help from the Carbon Trust and performed close to the design prediction. The facilities team have taken steps to further improve performance. Staff were much happier with their refurbished building, this project demonstrated that refurbishment can cut carbon emissions in half and improve working conditions for staff. This project had the additional benefit of costing significantly less than a new build scheme and reduced embodied carbon too (article title: "Post occupancy: Is your green makeover really so green?", www.building.co.uk).

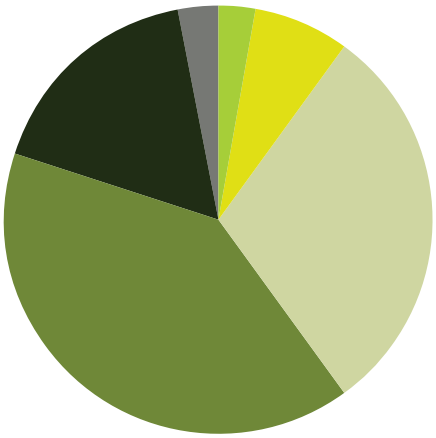
Post-occupancy data is difficult to obtain as clients and project teams are reluctant to see their projects subjected to public scrutiny

Fig 20. Taking the newest building you occupy, please state how old it is



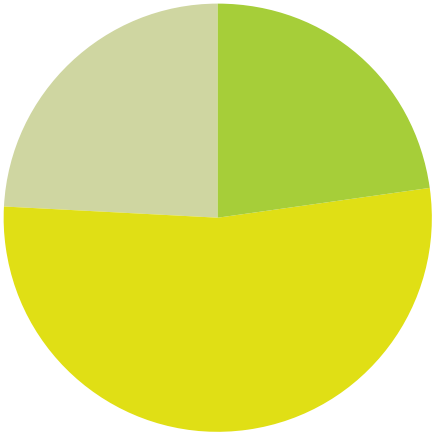
0-5 yrs	27%
6-20 yrs	21%
21-30 yrs	22%
31-50 yrs	15%
Over 50 yrs	12%
Don't know	3%

Fig 21. Does the building project a positive corporate image (All buildings)?



The building is …	
Very bad	3%
Bad	7%
About average	30%
Good	40%
Excellent	17%
Don't know	3%
… for our coporate image	

Fig 22. Does the building project a positive corporate image (Buildings five years old or less)?



The building is …	
Average	23%
Good	53%
Excellent	24%
… for our coporate image	

6.1 SURVEY RESULTS

A survey of occupiers was carried out for this white paper to find out what they thought of their newest buildings. The majority of respondents were office occupiers from a range of organisations including local authorities and private companies. The distribution of building age and size was evenly spread (Fig 20), these ranged in size from less than 2,500 ft² to over 50,000 ft².

6.1.1 CORPORATE IMAGE

Despite the wide range in building age most occupiers thought their buildings presented a positive corporate image (Fig 21). Unsurprisingly those occupying buildings less

than five years old were happier than those in older buildings (Fig 22).

6.1.2 ENVIRONMENTAL ASSESSMENT RATINGS

Environmental assessment ratings are widely used with just over half buildings less than five years old having an environmental assessment standard rating with ratings (Fig 23) evenly distributed (Fig 24). Unsurprisingly only a fifth of older buildings have an environmental assessment standard rating (Fig 25).

6.1.3 COMFORT

Occupiers were reasonably satisfied with their working environment is in terms of air quality, lighting and temperature across all building types (Fig 26). Those occupying buildings less than five years old were slightly happier than average. This is unsurprising given the sophistication of modern servicing solutions (Fig 28). Those occupying buildings with a BREEAM, LEED or Ska rating were marginally happier again with their buildings (Fig 27).

Surprisingly those occupying buildings less than five years old weren't any more impressed with their buildings energy performance

6.1.4 ENERGY EFFICIENCY

Respondents opinions on how energy efficient their buildings were clustered evenly around the median for all building ages (Fig 29). Surprisingly those occupying buildings less than five years old weren't any more impressed with their buildings energy performance given tough energy regulations applying to these. 18% described their building as inefficient and only 35% as good Fig 30. Buildings with BREEAM, LEED or Ska ratings should use less energy than other building types but occupiers were only

Fig 23. Does the building have an environmental assessment standard rating such as BREEAM, LEED or Ska? (buildings under five years old)

Yes	53%
No	18%
Don't know	30%

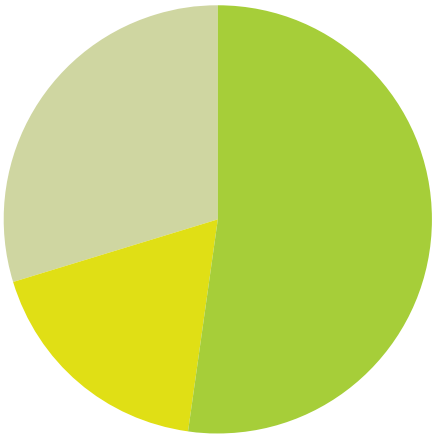


Fig 24. If the building has a BREEAM rating what is it? (Buildings less than five years old)

Outstanding	20%
Excellent	40%
Very good	30%
Good	10%

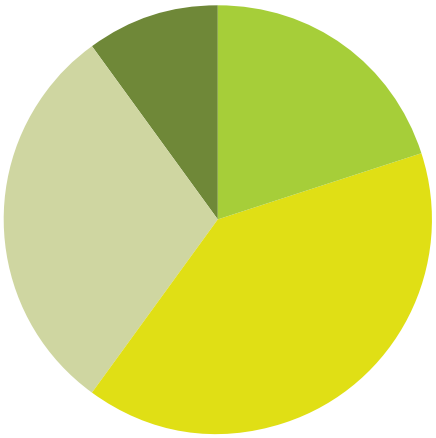


Fig 25. Does the building have an environmental assessment standard rating such as BREEAM, LEED or Ska? (Buildings over five years old)

Yes	20%
No	44%
Don't know	36%

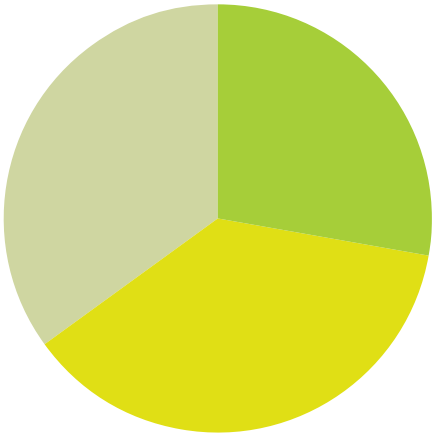
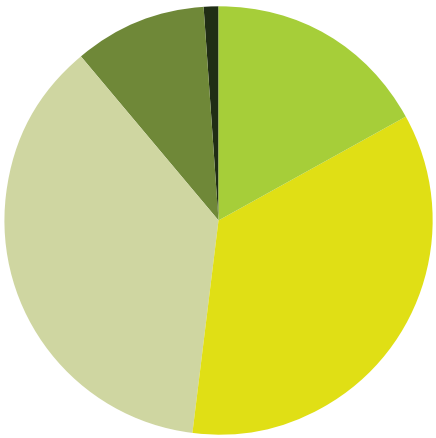


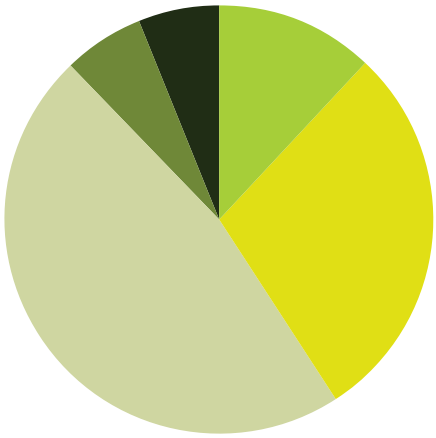
Fig 26. How comfortable is the working environment in terms of air quality, lighting and temperature? (All buildings)



The working environment is:

Uncomfortable	17%
Average	35%
Comfortable	37%
Very comfortable	10%
Don't know	1%

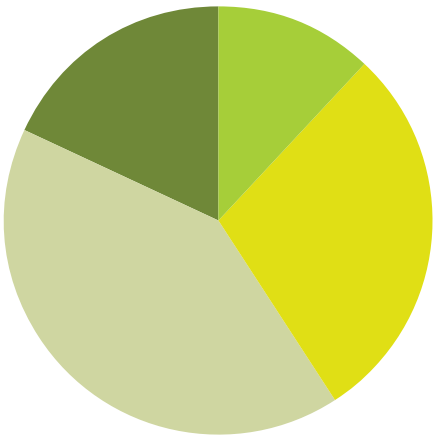
Fig 27. How comfortable is the working environment in terms of air quality, lighting and temperature? (Buildings less than five years old)



The working environment is:

Uncomfortable	12%
Average	29%
Comfortable	47%
Very comfortable	6%
Don't know	6%

Fig 28. How comfortable is the working environment in terms of air quality, lighting and temperature? (Buildings with BREEAM, LEED or Ska rating)



The working environment is:

Uncomfortable	12%
Average	29%
Comfortable	41%
Very comfortable	18%

slightly more satisfied than all buildings less than five years old – 41% described energy performance as good and 12% as inefficient (Fig 31).

6.1.5 OPTIMISING BUILDING PERFORMANCE

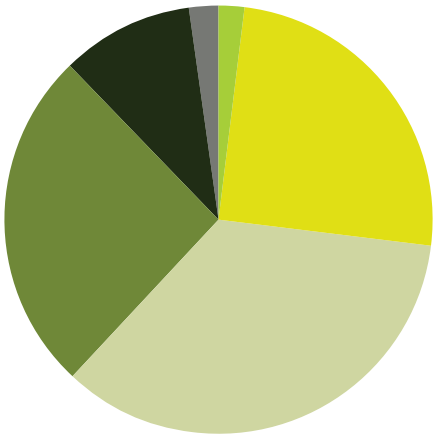
Many buildings need significant work after handover to optimise these for internal environmental quality and energy use. Too many occupiers are struggling with this, with significantly more respondents describing this as difficult than easy for all building types (Fig 32). Occupiers were also disappointed with how easy it was to optimise newer buildings for internal environmental quality and energy use (Fig 33) . Over a third had made changes to these newer buildings to improve energy performance or get these to work properly (Fig 34). On a positive note buildings with a BREEAM, LEED or Ska rating were slightly easier to optimise (Fig 35).

6.1.6 THE COMPLEXITY OF BUILDING SERVICES

Most of the complaints made by occupiers centred on the complexity and efficiency of modern building services. A respondent with a BREEAM 'Excellent' rated office building described it as not performing as expected saying it had proved difficult to optimise. This occupier had made changes to the ventilation system and automatic lighting controls plus had made many changes to the monitoring systems. The occupier of a PFI customer service centre less than three years old described energy performance as inefficient and difficult to optimise. Three visits were needed to optimise the building management system controlling the ventilation system. This occupier commented on the criticality of setting the building management system up properly in a highly insulated building to ensure it was comfortable and said the PFI contract needed "revisiting" to get the building recommissioned.

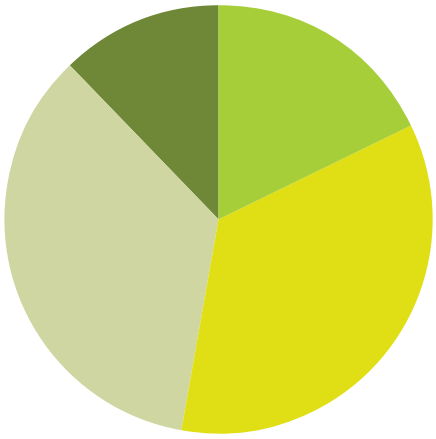
Another occupier described the automated window ventilation system as "useless" and added that the rainwater harvesting system on the building had to be disconnected after repeated pump failures.

Fig 29. How efficient is the building in terms of energy use? (all buildings)



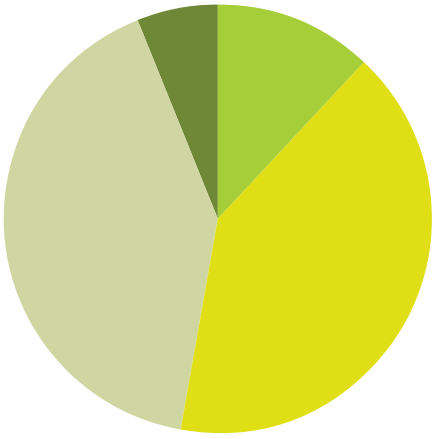
Very inefficient	2%
Inefficient	25%
About average	35%
Good	26%
Excellent	2%
Don't know	10%

Fig 30. How efficient is the building in terms of energy use? (Buildings under five years old)



Inefficient	18%
Average	35%
Good	35%
Don't know	12%

Fig 31. How efficient is the building in terms of energy use? (building with BREEAM, LEED or Ska rating)



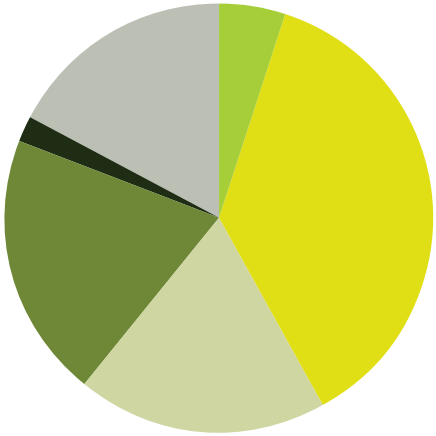
Inefficient	12%
Average	41%
Good	41%
Excellent	6%

Heat pumps didn't come out well, one occupier said these required expert knowledge to set up properly and another in a BREEAM 'Excellent' rated building (described as inefficient) said the air source heat pumps on their building were "useless" in cold weather and had to be turned off to save energy. These issues haven't escaped the notice of developers, of those whose corporate policy sets out minimum performance above that of Building Regulations 24% say they are concerned this could compromise building performance.

6.2 POST HANDOVER SUPPORT

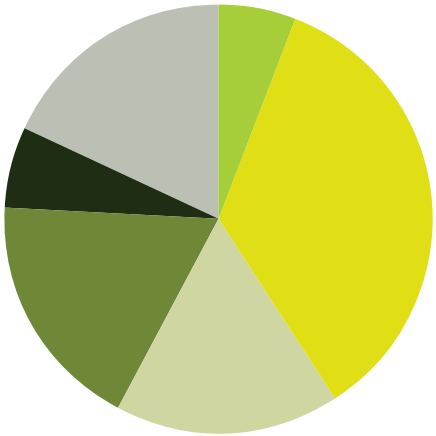
The survey reveals that many occupiers are only marginally happier with the energy performance of newer and low energy buildings. Many are also finding it difficult to get their buildings to perform properly with reports of poorly functioning low energy technologies and complaints about excessive complexity. These results extend beyond this survey as the poor performance of West Suffolk House demonstrates. Carbon Buzz, a collaboration between the RIBA and CIBSE where post-occupancy data can be posted anonymously contains dozens of examples of poorly performing buildings. This prompted BSRIA to launch a tool to improve post occupancy performance. Called Soft Landings, it is a framework followed by project teams and occupiers after handover. This includes fine tuning and debugging the building on handover and helping occupiers to understand how it works. The building is monitored for three years with project teams offering help and support to fine tune and improve energy performance. BSRIA says Soft Landings typically add 0.1%-0.25% of the cost of the building for the post handover support. Cyril Sweett calculates the process would need to yield a simple payback on energy bills over three years of 2.6%-19% for a basket of three building types. As many buildings are using two to three times more energy than predicted Soft Landings could be financially worthwhile for many organisations.

32. How easy has the building been to optimise in terms of environment (heat/ lighting and energy use)? (All buildings)



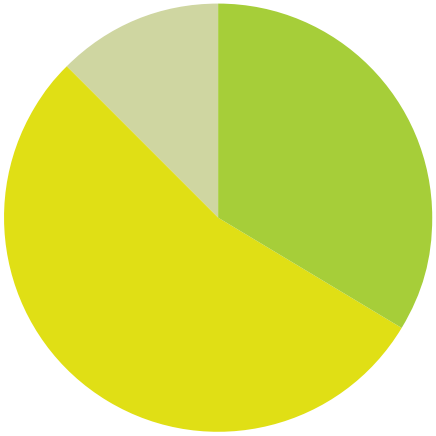
Very difficult	5%
Difficult	37%
Average	19%
Fairly straightforward	20%
Very easy	2%
Don't know	17%

33. How easy has the building been to optimise in terms of environment (heat/ lighting and energy use)? (Buildings under five years old)



Very difficult	6%
Difficult	35%
Average	17%
Fairly straightforward	18%
Very easy	8%
Don't know	18%

34. Have you made any changes to the building to improve its energy performance or to get it to work properly in terms of the environment (heat/air/lightings)? (Buildings under five years old)



Yes	35%
No	53%
Don't know	12%

35. How easy has the building been to optimise in terms of environment (heat/ lighting and energy use)? (Buildings with BREEAM, LEED and Ska ratings))

Very difficult	6%
Difficult	24%
Average	23%
Fairly straightforward	29%
Very easy	18%

"Some fundatmental and rapid changes are required throughout the construction industry and clients can make things happen by calling for robust thermal detailing"

Andy Ford

EXPERT COMMENT - TRAINING AND COLLABORATION IS THE ANSWER TO BETTER PERFORMING BUILDINGS

Andy Ford, president CIBSE, Mott MacDonald Fulcrum technical director for buildings and infrastructure

"The 2008 Climate Change Act commits the UK to delivering a 34% reduction in carbon dioxide emissions by 2020 and 80% by 2050. These challenging targets are written into law. Can they be achieved?

"New build could in theory be zero carbon today, with the right leadership from clients and the government. Leading clients are pushing us hard to drive down energy use and reduce carbon emissions. The country's best housing developers are seeking to counteract the impact of soaring energy costs on household budgets, while large businesses are anticipating the financial and possible public image consequences of a bad carbon reduction commitment ranking. However, the leaders are a small minority. In the main, the construction industry is neither interested nor geared up to act.

"Building Regulations exist to ensure that a certain level of performance is achieved. The majority of the industry designs to that standard rather than pushing beyond it. M&E engineers currently play a crucial role retrofitting low carbon M&E solutions to buildings so that they squeak past the legal minimum environmental performance standard.

"The UK's adopted an odd position on carbon reduction. Mainland Europe is successfully striving for low carbon new buildings while our government has set out to achieve zero carbon. M&E engineers can only take things so far. Even if we set our sights on delivering low instead of zero carbon buildings, we need architects, builders and clients to play a greater part.

"Architectural training does not at present pay sufficient attention to thermal performance. It falls to individuals to develop an interest and build the requisite knowledge to design buildings that are highly energy and carbon efficient.
Even the best educated professional is hampered by our industry's incomplete understanding of the way buildings work - for example, research by University College London has recently revealed significant, previously unidentified heat loss from housing through party walls.

"However well designed, efficiencies cannot be realised without support from the contracting sector. When corners are cut, workmanship isn't up to standard, materials are substituted or design details get changed, performance is affected.

"It's difficult to design an energy efficient building when you don't know exactly what the client needs. Often it's unclear how many staff will be in different locations at different times of the day and the types of IT equipment they'll be using, making it hard to work out heating, cooling, ventilation and lighting loads. When architects and engineers don't extract precise information from their clients or clients are vague, the resultant building services design gets geared to maximum theoretical loads - usually far greater than the actual loads.

"And energy consumption and resultant carbon emissions are often higher than designers anticipate because clients fail to operate the building as intended - sometimes because the building itself is not easy to use but often because the FM staff don't appreciate the importance of following set procedures and fine tuning the control systems.

"Some fundamental and rapid changes are required throughout the industry and clients can make things happen by calling for robust building physics in design and more reliable construction. Integration is key to developing high performance, buildable designs. Early contractor involvement and design-build construction show that excellent results can be achieved. So clients should be thinking about how they procure too.

"The consultation on Part L proposes a robust quality assurance process for energy performance, including post construction testing and feedback. Clients could make a real impact by getting behind this - BSRIA has a workable QA model so this ought to be easy to do.

"There are concerns that hitting the zero carbon target is unaffordable. But actually the design and construction of zero carbon buildings isn't rocket science. The challenge lies in developing the requisite knowledge and construction skills, underpinned by effective cross-disciplinary collaboration. And the advent BIM could provide a solution to this.

"BIM is all about integration of multiple disciplines and optimising design for construction. We're close to being able to hand over models to clients and asset managers post-completion to improve commissioning, operation, maintenance and repair. Performance data can be fed back into the model to inform subsequent design projects. Paul Morrell, the government's chief construction adviser, expects BIM to deliver ongoing cost-efficiency of around 20%. So the pursuit of zero carbon buildings ought to be matched by major design and construction cost savings.

7/WHAT MATTERS TO SPECIFIERS

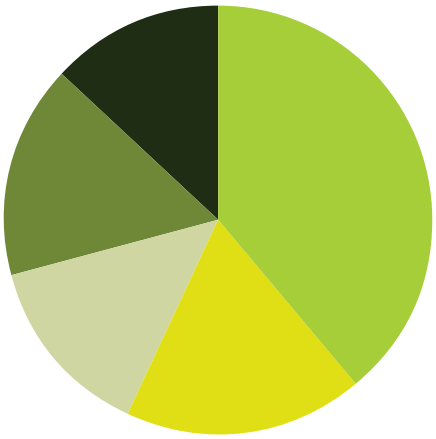
The environmental credentials of new buildings are determined by a combination of the regulations and environmental assessment methodologies. These are designed to and the products and systems specified to fulfil the requirements of those standards. As discussed above 38% of occupier's corporate policy states that any new building they occupy must have a minimum environmental assessment rating. Developers have taken this on board with 75% of those surveyed for this white paper saying their corporate policy states new developments must meet a minimum environmental assessment rating and 60% saying new development must exceed the minimum requirements of Part L. A survey of specifiers was carried out for this white paper to find out how these requirements are impacting on the specifier community in terms of product specification.

7.1 SPECIFICATION AND ENVIRONMENTAL ASSESSMENT METHODOLOGIES

Forty three percent of non domestic projects being worked on by survey respondents are subject to a BREEAM, LEED or Ska assessment (Fig 36) which is less than indicated by the occupier and developer surveys for this white paper. These focused on the larger retail and office occupiers and developers which would suggest environmental assessment ratings are used less widely on smaller projects. Less than 10% of the domestic projects being worked on by respondents (Fig 37) are subject to a code level 3 rating or higher which is consistent with DCLG data indicating that 80% of homes at the design stage and 88% of completed homes are subject to a code level 3 assessment

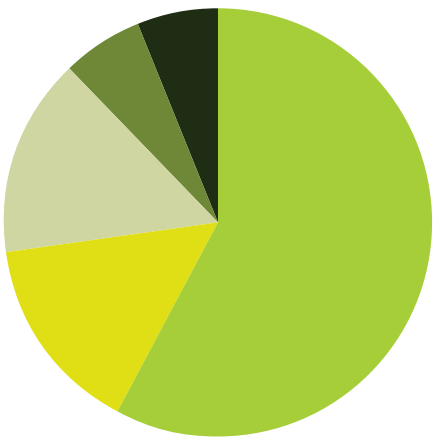
Of the 577,170 housing completions between April 2007 and September 2011 38,438 were built to meet code levels 1, 2 and 3, 6.6% of all housing completions which is consistent with DCLG data.

Fig 36. What percentage of your current non domestic projects are subject to a BREEAM, LEED or Ska assessment?



Less than 10%	39%
25-50%	18%
51-75%	14%
76-90%	16%
More than 90%	13%

Fig 37. What percentage of your current non-domestic projects are subject to a Code for Sustainable Homes rating of 3 or higher?



Less than 10%	58%
25-50%	15%
51-75%	15%
76-90%	6%
More than 90%	6%

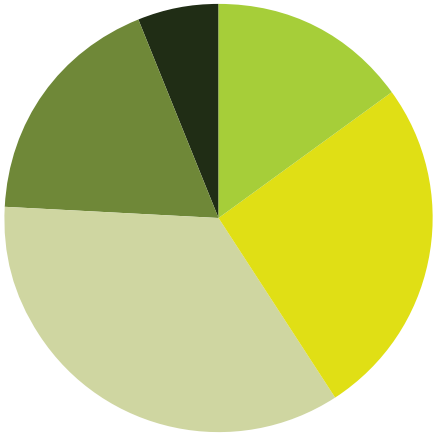
7.2 SPECIFICATION AND PRODUCT SELECTION TOOL AND CRITERIA

A significant number of specifications are performance based rather than product based as the median figure for performance based specifications is 51% to 74% of a firms work (Fig 38). Specifiers have to balance a complex set of requirements including aesthetics, durability and cost in addition to the contribution of the product to the energy or water efficiency to the finished building. Specifiers also need to demonstrate that products used on projects subject to formal environmental assessment ratings meet the criteria for material impacts and pollution.

The BRE's Green Guide to specification details the environmental impacts of commonly used product types. A minority of specifiers use it for product selection as 37% of respondents use on 10% or less of projects subject to environmental assessment ratings. Only 8% of respondents use it for product selection on 90% or more of projects subject to an environmental assessment rating (Fig 39). Respondents use a wide variety of other tools for specification; this includes energy modelling software, British Standards, practical experience and in many instances product manufacturers technical literature.

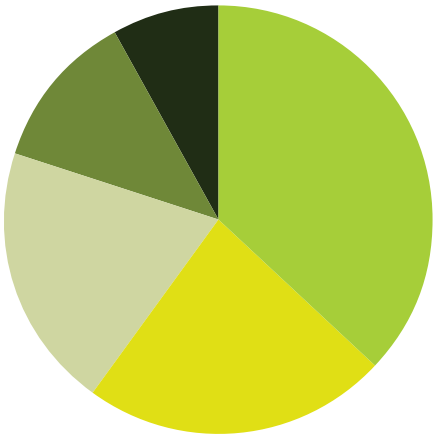
When it comes to product selection the survey reveals specifiers give almost equal weighting to five criteria including cost, previous experience of products, durability, appearance and product energy or water efficiency (Fig 40). Specifiers give less weighting to the embodied energy content of products but the survey suggests specifiers see embodied energy as rapidly gaining importance over the next five years. See the section 9 on embodied energy below for more on this.

Fig 38. What percentage of your specifications are performance rather than product based?



Less than 10%	15%
25-50%	26%
51-75%	35%
76-90%	18%
More than 90%	6%

Fig 39. What percentag of the products on these projects are selected using BRE's Green Guide to Specification?



Less than 10%	37%
25-50%	23%
51-75%	20%
76-90%	12%
More than 90%	8%

Fig 40. When compiling a specification what weighting do you give to the following parameters?

	Least important					Most important	Rating Average
Cost	2.0%	3.1%	8.2%	23.9%	25.5%	12.5%	7.04
Previous experience of the product	0.4%	3.1%	2.4%	10.2%	38.8%	20.8%	7.9
Contribution to energy or water efficiency of the finished building	1.2%	6.2%	7.4%	19.1%	27.2%	12.1%	7.05
Durability	0.4%	0.4%	2.7%	12.2%	42.7%	20.8%	8.05
Appearance	1.6%	2.3%	6.3%	8.6%	35.9%	26.6%	7.92
Embodied carbon	12.0%	10.5%	12.4%	23.3%	15.5%	6.2% (16)	5.71

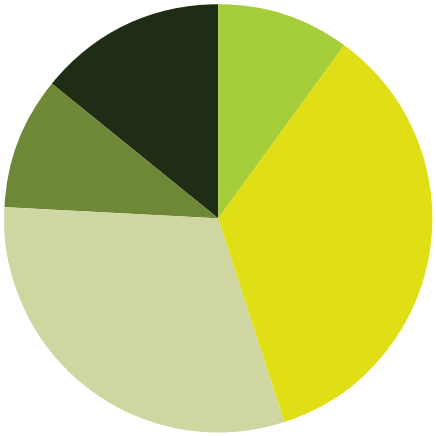
7.3 SPECIFICATION AND PRICE PREMIUMS FOR MORE EFFICIENT PRODUCTS

Mechanical, electrical and plumbing (MEP) systems are the primary consumers of building related energy and their efficiency makes a significant difference to overall carbon emissions. Encouragingly for manufacturers MEP specifiers are prepared to pay a premium for better performing products. Twenty four percent of respondents are responsible for MEP specification. Only 14% of respondents weren't prepared to pay any premium for better performing products with 10% prepared to pay 35% more (Fig 41).

7.4 SPECIFICATION AND INNOVATION

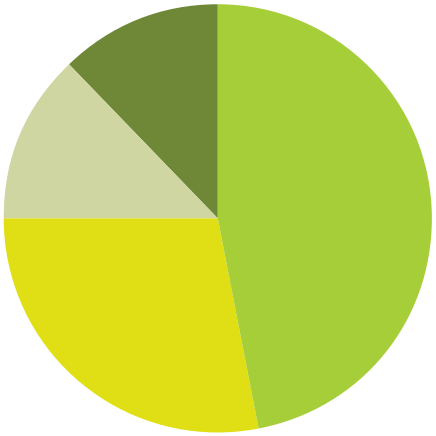
The construction industry is very conservative and risk averse so is often slow in adopting innovative new technologies. Innovation can help deliver better performing buildings but manufacturers are understandably reluctant to invest in new technologies if these aren't widely specified. This has led to initiatives including Innovate for Homes, a joint initiative by the Home Builders Federation and the Construction Products Association. This evaluates and trials innovative new products in a bid to give the industry confidence to use these more widely. Encouragingly for manufacturers 47% of respondents say they would specify innovative new products offering better sustainability performance for the same cost as traditional alternatives if these were backed by BBA or BRE certification. Only 11.6% of respondents say they would only specify an innovative new product if it had been used for five years without any reported problems (Fig 42).

Fig 41. When compiling an MEP specification how much of a premium are you prepared to pay for products that offer better energy efficiency than standard products?



Over 35% more	10%
20% more	35%
10% more	31%
5% more	10%
Nothing more	14%

Fig 42. How willing are you to specify an innovative new product that offers better sustainability performance compared the traditional alternatives for the same cost but has no proven track record?



Will definitely specify product if backed by BBA or BRE certification	47%
Will specify product once performance has been demonstrated by case studies	28%
Will specify product once it has been in use for two years without any reported problems	13%
Will specify product once it has been in use for over five years without any reported problems	12%

7.5 MAKING THE FUTURE - HOW PRODUCT MANUFACTURERS CAN HELP

"There are issues of products not performing, often because of poor installation or commissioning, frustrations with missing information and concerns over longevity" *John Tebbit*

EXPERT COMMENT, JOHN TEBBIT, INDUSTRY AFFAIRS DIRECTOR, CONSTRUCTION PRODUCTS ASSOCIATION

"It is easy to forget how often the helicopter view so beloved of management consultants manages to miss the dirty work going on in the trenches. So as you read this necessarily high level view of Part L 2013, do remember that. This is true not only for how individual products are affected but also for the overall strategy where lack of clarity in some areas can be a big issue for some parts of industry.

"Zero carbon new homes in 2016 and other buildings from 2019 is certainly easy to say. It is certainly also true that we can build to these standards – the bigger and more important question is whether we can do so consistently in a way that will perform long term and at a cost that purchasers will be prepared to pay.

"Looking at homes first, it is worth remembering that back in 2008 NHBC Foundation surveyed consumers to get their views on zero carbon homes. Bluntly consumers didn't understand or want zero carbon homes. The foundation has just published a new survey (Today's Attitudes to Low and Zero Carbon New Homes) that revisited those questions. No doubt people will draw different conclusions depending on their beliefs but even the most cynical soul has to now accept that occupiers place some value on low energy homes, especially once they are living in such homes.

"From my reading of the report it seems that the fabric first approach set out in the preferred option of the Part L homes consultation is the right way forward. Less heartening is that active systems for both energy, ventilation and water efficiency did not score highly with occupiers. In very broad brush terms, there are issues of products not performing, often because of poor installation or commissioning, major frustrations with poor or missing information and concerns over longevity. As someone who has recently completed a low energy new house with several such systems, I can certainly concur with much of the sentiment. It has been much harder that it should have been to get a lot of the kit working properly and there remains considerable room for improvement in provision of decent guidance or in ease of maintenance.

"If we are to be in a position for these technologies to be mainstream from 2016 onwards then we have to get the design, installation and commissioning sorted along with useable guidance for consumers.

"For non-domestic the picture is more complex as the range of buildings is so huge from cooling led offices and heat led industrial sheds to hotels where hot water is a major driver. It is clear that there is no single solution and at this stage one cannot say whether the Part L 2013 proposals are pitched in the right area. I have heard an argument that non-domestic buildings should be pushed further and faster than new homes because they generally have professional facilities manager (FM). I'm not convinced. I look at the new doctors surgery in my village, the starter industrial units and a new hall for a local school. None of these buildings have professional FM.

"As in the new homes area, the real issues in my view are not the products themselves. Even with lower cost PV, fuel cells, better renewables, windows, fabric systems and the like, the problems are exactly what Sir John Egan identified so many years ago, namely integration of suppliers, designers, builders. The success of the AIMC4 project which brought together housebuilders and suppliers (www.aimc4.com) has proved process as well as product improvement delivers higher standards cost effectively.

"Over the past few changes in Part L we have been able to achieve much of the higher performance by throwing more or new technology at the buildings, be it better heating systems, more insulation, low E double glazing and so on. For 2013 some products will need to improve further, some new products will become cost effective but we are now at the point where just throwing technology at the problem is not going to work, we have to improve the process throughout design, installation and commissioning as demonstrated by AIMC4 and other work.

"One cannot write about Part L without mentioning SAP and SBEM. Without getting into the details of the software, the main issue to be sorted is a robust governance and funding structure for these vital pieces of software. At present they are underfunded and consequently we have yet again the situation where we are being asked to respond to a consultation on SAP, at the same time as using a buggy SAP lite to assess Part L. It surely cannot be beyond the wit of DECC and DCLG to get this sorted out.

"So overall, Part L 2013 is technically achievable in most areas we think but the questions are more on costs of achieving the standards. Until we have finished crunching the numbers, that is really as much as we can say."

8/LEGISLATIVE PRESSURE ON CLIENTS AND DEVELOPERS

Project teams have to negotiate a complex set of environmentally driven legislative requirements when deciding the most cost effective approach to schemes. As a minimum all projects must comply with Part L of the Building Regulations. Additionally the government sees the planning system as an effective way of improving the environmental performance of projects over and above Part L, helping to meet its carbon reduction targets.

Local authorities can demand a variety of measures to improve building environmental performance as a condition of planning. This includes meeting a minimum percentage, typically 10%, of buildings energy needs from onsite renewables. Other local authorities require buildings to better Part L requirements by a minimum percentage, which can vary from 10% up to 25% in London. Some local authorities stipulate a minimum BREEAM or Code for Sustainable Homes rating as a condition of planning which is also a condition of funding for many public sector schemes.

The complexity and variety of local targets is unpopular with housebuilders and developers and is currently under review by Sir John Harman. The objective is to simplify the minefield of local standards and to ensure local authorities don't render sites unviable with unrealistic sustainability requirements.

8.1 PART L OF THE BUILDING REGULATIONS

Part L of the Building Regulations is the principal tool available to the government to drive down carbon dioxide emissions from the built environment. It is being used to help realise the UK's carbon reduction targets and in parallel meet European targets, specifically the European Performance of Buildings Directive (see section 8.9).

Prior to the launch of the Code for Sustainable Homes in 2006 many in the industry complained there was no certainty about the direction of future regulations, which made planning ahead difficult, particularly for manufacturers with their long product development times.

The code was much more than a voluntary sustainability standard for new homes. It signposted the dates of future revisions to Part L and included the percentage reductions in carbon dioxide emissions for homes. Revisions would occur every three years in 2010, 2013 and 2016 and the section of Part L applying to non-domestic buildings would be revised at the same time. The reduction in carbon dioxide emissions for homes over 2006 Part L was 25% in 2010, 44% in 2013 and zero carbon for homes in 2016. In 2008 the government announced all buildings would be zero carbon from 2019 signposting a 2019 revision of Part L to bring non-residential buildings in line with zero carbon homes.

The 2010 revision of Part L aligned with this strategy as carbon emissions were reduced by 25% for new buildings. For the first time differing targets were set for non-domestic buildings in recognition that it is more expensive and difficult to achieve an across the board 25% reduction in carbon emissions for all building types. The idea behind the so called aggregate approach was the additional costs of compliance would be the same for all building types. The 25% reduction applied equally to all types of housing. A consultation on proposed changes to Part L, due for introduction in 2013 was published at the end January. For the first time this will only apply to England, previously this applied to Wales too. Wales is expected to draw up its own energy regulations to replace Part L. Scotland already has its own energy regulations, known as Section 6 which has slightly tougher carbon reduction targets than the rest of the UK.

8.1.1 2013 PART L: NEW BUILD DOMESTIC

The consultation on 2013 Part L, which was published in January, diverges from the future targets set out in the Code for Sustainable Homes. The consultation sets out three alternative scenarios for homes and non-domestic buildings with the DCLG favouring an 8% reduction in carbon dioxide emissions for new homes. This is significantly lower than the 25% reduction set out in the code. The reason is the government has committed to reducing the burden on housebuilders during this Parliament.

The consultation proposes a new approach

The government sees the planning system as an effective way of improving the environmental performance of projects over and above Part L

to reducing emissions from homes based on the work of the Zero Carbon Hub. The Zero Carbon Hub, an industry body funded by government was tasked to establish how the homes zero carbon target can be met technically and financially.

It proposes a simple hierarchy with a set amount of emissions being mitigated by minimum standards for fabric energy performance, the so called fabric energy efficiency standard or FEES. Having achieved minimum standards for fabric energy efficiency further emissions reductions must be made with site based low or zero carbon technologies, or a more efficient fabric than stipulated by the FEES. The final step in the hierarchy is so called "allowable solutions" where remaining energy requirements comes from offsite sources.

The fabric energy efficiency standard is set as a maximum energy demand figure of 46kWhr/m^2/yr for semi-detached and detached properties and 39kWhr/m^2/yr for terraced homes and apartments. The

DCLG favours introducing the FEES for 2013 to give housebuilders time to become competent at delivering efficient envelopes for 2016. Improving building fabric is also cheaper than adopting low and zero carbon technologies. This is the first time Part L incorporates an absolute energy target rather than a percentage reduction on earlier versions of Part L. It is also the first time the aggregate approach has been applied to housing. To meet the proposed carbon reduction target homes will also need to have efficient servicing solutions. Reductions in emissions for efficient services will continue to be measured as a percentage reduction against 2010 Part L rather than as the absolute measure expressed as CO_2/m^2/year favoured by the Zero Carbon Hub.

8.1.2 2013 PART L: NEW BUILD NON-DOMESTIC

The approach adopted for non-domestic buildings is similar to 2010 Part L. The aggregate approach is retained with the DCLG favouring the continuation of measuring carbon reductions as a percentage reduction over earlier versions of Part L. The preferred target for 2013 is 20%, slightly less than the previously published carbon reduction target of 25%. The DCLG says 20% is at the limit of what carbon reductions can be achieved in non-domestic buildings without resorting to offsite carbon mitigation solutions. The targets vary according to building type from a 15% reduction for a five-star hotel to 23% for a deep plan office. The proposed 20% carbon reduction target assumes 1.6% of the building floor area will be covered by PV panels.

The compliance method for non-domestic buildings is retained from 2010 Part L. This compares the proposed building with a notional building of the same size and shape with a recipe of fabric and servicing standards. The carbon emissions from this notional building become the target for the proposed building, which must equal or better the notional building. 2010 Part L compliance was based on two notional buildings. A number of permutations of notional buildings are proposed for 2013 and include four fabric packages, and three servicing packages. This moves 2013 Part L towards the proposals outlined in Zero carbon non-domestic buildings Phase 3 final report published in July 2011 which suggests targets expressed kWhr/m^2/yr for the building fabric and efficient services as a percentage reduction over the 2006 version of Part L.

Forcing homeowners to upgrade the rest of their home when building an extension was seen as politically risky but the introduction of the Green Deal mitigates this risk

8.1.3 2013 PART L: EXISTING DOMESTIC

The 2013 consultation proposes that consequential improvements apply to all buildings under 1000 m^2, the existing cut off point. This is the requirement to upgrade the energy performance of the existing building when building an extension or upgrading the services. Removing the 1000 m^2 lower limit means consequential improvements would apply to house extensions or loft conversions requiring Part L approval. Domestic consequential improvements were proposed in the 2006 Part L consultation but were dropped from the approved document. The 2010 draft consultation also proposed consequential improvements but this was taken out by housing minister John Healey just before it was published.

Forcing homeowners to upgrade the rest of their home when building an extension was seen as politically risky but the introduction of the Green Deal mitigates this risk. Green Deal finance means home owners don't have to fund the capital cost of energy efficiency improvements as savings on bills pay back a loan. The consultation proposes 10% of the value of the extension works should be spent on upgrading the existing building subject to technical, functional and economic feasibility tests. The DCLG proposes this requirement should take effect from October this year in advance of the introduction of 2013 Part L. It also proposes consequential improvements when an old boiler is replaced or more than 50% of a home's windows are replaced. Improvements would be limited to non-disruptive work including cavity wall or loft insulation, draught-proofing and a hot water tank jacket. The consultation proposes this measure should take effect from April 2014.

These rules will also apply to small non-domestic extensions. A lower carbon reduction target is proposed for extensions than applies to an all new building.

8.1.4 2013 PART L: EXISTING NON DOMESTIC

The same rules applying to existing homes will also apply to small non-domestic buildings.

A lower carbon reduction target of 11% is proposed for non-domestic extensions. The rules applying to existing non-domestic buildings over 1000 m^2 remain unchanged.

8.1.5 2013 PART L: IMPROVING THE ENERGY PERFORMANCE OF FINISHED BUILDINGS

For the first time the 2013 consultation proposes to improve the energy performance of finished homes by introducing measures to bring these closer to design predictions. Research shows many new homes fall well short of design intent, tests carried out by Leeds Metropolitan University revealed a Joseph Rowntree Housing Trust development called Elm Tree Mews was losing 54% more heat than designed. A study carried out by the Energy Saving Trust tests on heat pump installations found over half of these were consuming more energy than allowed for in Part L energy calculations. This was down to poor quality installation.

In a bid to tackle this issue the consultation proposes housebuilders should have formal, quality assurance accreditation and follow a newly developed set of standards setting out how homes should be designed, built and tested. The consultation suggests

this could take the form of a publically available specification (PAS) covering the whole process from drawing board to finished home. The PAS would include best practice guidance on performance related issues including the robustness of energy calculations, site processes including ensuring the specification was followed, the competency of workers and guidance on testing. Housebuilders would also need to achieve a recognized quality standard such as IS09001.

Housebuilders can opt out of the accreditation process but will need to build homes 3% better than the proposed 8% carbon emission reduction target. The idea behind the so called "confidence factor'" is to ensure those homes are nearer the 8% target than they might otherwise have been. The 3% confidence factor will be reviewed for 2016 and will take account of testing results of buildings constructed using this approach.

The DCLG isn't proposing to adopt confidence factors for non-domestic buildings for 2013 but will review this for the 2016 revision of Part L.

8.1.6 FUTURE REVISIONS TO PART L: HOMES

The next revision of Part L will take place in 2016 when new homes must become zero carbon. If the fabric energy efficiency standard is adopted in full for 2013 Part L the main changes will focus on mitigating the remaining carbon emission target using onsite solutions and an offsite element, called "allowable solutions".

The Zero Carbon Hub has proposed 2016 domestic carbon compliance targets move from a percentage reduction to an absolute figure expressed in CO_2/m^2/year. The hub has also proposed homes must emit no more than 10kg CO_2/m^2/year for detached houses, 11kg CO_2/m^2/year for other houses and 14kg CO_2/m^2/year for low-rise apartments. The figure for high rise apartments is yet to be defined. The 2013 Part L consultation acknowledges raising the carbon reduction target above 2010 standards is difficult due to the relatively small amount of roof available on high rise apartment blocks for PV installations. To meet the proposed 2016 carbon compliance target housebuilders will need to consider going for a more efficient fabric than stipulated by FEES, development wide CHP and renewable technologies.

The remaining carbon emissions will need to be mitigated by allowable solutions, the offsite element of zero carbon. The Zero Carbon Hub proposed a framework for how this would work in July 2011. Carbon reduction measures could include setting up community heating schemes, investing in electric car charging infrastructure, improving the fabric of existing homes and investment in zero carbon power generation such as windfarms. The Zero Carbon Hub proposes local authorities formulate an allowable solutions policy. Housebuilders would have the choice of paying into the local authority scheme or to a private third party provider. This means housebuilders and developers could establish their own allowable solutions schemes. The change in the definition of zero carbon announced in the 2011 Budget announcement means the allowable solutions contribution will be much smaller as housebuilders no longer need to mitigate carbon emissions from appliances in the home. The government says it will set out how it intends to develop allowable solutions later in 2012.

8.1.7 FUTURE REVISIONS TO PART L: NON DOMESTIC

Work on defining zero carbon for non-domestic buildings has been done for the DCLG by Aecom in three phases with the last piece of work completed in July 2011. It proposes three possible carbon reduction targets for 2019 compared with 2006 Part L, 44%, 49% or 54%. Remaining carbon emissions would be mitigated using allowable solutions. Aecom propose a fabric energy efficiency standard which would also factor in energy savings from daylighting as this is more important for non-domestic buildings than homes. The metric used for expressing fabric efficiency will be U values rather than kW/m²/yr as used for homes because of the complexity and differences between non-domestic buildings. There will be a separate

The Zero Carbon Hub has proposed 2016 domestic carbon compliance targets move from a percentage reduction to an absolute figure expressed in CO_2/m^2/year

set of minimum efficiencies for building services. These will be driven by the Energy Related Products Directive, a European proposal to set minimum efficiencies for building services. The standards in 2019 Part L will need to equal or better the requirements of the directive which is expected to be finalised prior to 2019 Part L taking effect.

8.2 PART G OF THE BUILDING REGULATIONS

Part G sets covers sanitation, hot water safety and water efficiency and took effect in April 2010. The main changes affected homes as Part G contained a maximum water limit for homes for the first time. The limit is 125 litres of water per person per day. Part G also defines where non-drinkable water can be used in homes and sets outs rules on water storage to make installing rainwater and greywater systems easier.

8.3 PLANNING REQUIREMENTS

Many local authorities demand developments include additional sustainability measures over and above building regulations as a condition of planning permission. There are a plethora of different requirements. Planning policy statement 22 was used by many local authorities to demand a minimum percentage of a development's energy needs was met using onsite renewables. Typically this was 10% but could go as high as 20% in some instances. Since Planning Policy Statement 22 (PPS22) was published in 2004 many local authorities have moved away from this policy as it isn't always the most efficient way of reducing carbon emissions and can be impossible to implement on some sites.

The London Plan is a good example of how this approach has changed, prior to 2011 it included a target of 20% onsite renewables but this has been replaced by a requirement to better 2010 Part L by 25%. Since the introduction of the Code for Sustainable Homes many local authorities have demanded a minimum rating for new homes, typically level 3 or a minimum BREEAM rating for non-domestic buildings, typically a 'Very Good' or 'Excellent' rating.

Milton Keynes council runs a carbon offset fund where developers pay a one-off fee depending on the level of carbon emissions from the development. The money is used to upgrade the energy efficiency of existing buildings.

Since the introduction of the Code for Sustainable Homes many local authorities have demanded a minimum rating for new homes

Uttlesford District Council has been operating a consequential improvements requirement for new extensions since 2006, a policy now likely to be adopted as part of 2013 Part L.

The plethora of local building standards is disliked by developers because of its complexity. The government wants to simplify these requirements and has engaged Sir John Harman to review local building standards. The idea is to create a basket of simple, clearly defined packages which don't impinge on the viability of sites.

8.4 RATINGS

A variety of environmental assessment methodologies are available for rating the sustainability credentials of new homes and non-domestic buildings. There are also environmental assessment methodologies specifically for refurbishments and civil engineering projects. All these methodologies stipulate a minimum level of energy performance and water use. The environmental impact of materials, biodiversity and waste management are also included in the assessments.

The ratings systems are used by some local authorities to improve the sustainability credentials of new development over and above building regulations as a condition of planning. The survey of occupiers carried out for this white paper revealed 41% stipulate a minimum environmental rating in their CSR policy. This drives developers to adopt environmental assessments, the survey of occupiers carried out for this white paper reveals 56% set a minimum environmental assessment rating level for new developments. There are minimum BREEAM levels for many types of public building and social housing must meet level 3 of the code for sustainable homes as a condition of receiving funding.

8.4.1 BREEAM

BREEAM stands for BRE Environmental Assessment Method and is used to assess the environmental performance of a basket of building types with the exception of new homes. Building types covered by BREEAM include offices, schools, heathcare, retail, prisons, courts, industrial and data centres. There is also a category for other building types and multi-residential which covers building types including student halls of residence and care homes. BREEAM also covers refurbishment of homes and non-domestic buildings and a communities category assesses projects at the planning stage. BREEAM in use is aimed at helping building managers improve the environmental performance of existing buildings.

BREEAM covers 10 different categories including energy and water use, impact of materials, health and well being, management, transport, land use and ecology, waste and pollution. Up to 100 credits are available for meeting these categories. An additional 10 credits are available for innovation. There are five ratings, 'Pass', 'Good', 'Very Good', 'Excellent' and 'Outstanding'. An 'Excellent' requires 70 points and 'Outstanding' a minimum of 85 points.

A total of 49 issues are covered by the 10 categories. The credits vary according to the category, for example 19 credits are available under energy, five for water and four for waste.

Buildings are assessed at design stage then on completion to account for changes in the specification during construction.

BREEAM was established in 1990 with over 200,000 certified buildings so is by far the most established rating system in the UK. BRE has also rolled it out internationally, since 2008 there have been 111 overseas certifications. It is regularly updated with the last revision in July 2011. Changes included aligning the energy section with the definition of zero carbon. This prioritises building fabric, reducing energy use and finally cutting carbon emissions. Credits are now available for project teams who stay involved with the project after handover. Standards are tougher – to gain a BREEAM 'Excellent' buildings must perform 25% better than the version of Part L in force at the time of the revision. BREEAM 2011 is aligned with 2010 Part L whereas the previous 2008 version was aligned with 2006 Part L.

A minimum BREEAM rating is frequently stipulated by local authorities as a condition of planning, and for public sector projects a condition of funding. Many developers and clients also build to minimum BREEAM rating as part of their corporate and social

responsibility strategy. The CSR policies of larger occupiers often stipulate a minimum BREEAM rating of the buildings they occupy.

Central government projects must achieve a BREEAM 'Excellent' and major refurbishments must achieve a 'Very Good' rating. The Welsh Assembly and Northern Ireland Executive also specify a minimum 'Very Good' rating, the Welsh Assembly also requires projects to meet the energy requirements of an 'Excellent' rating. The Welsh Assembly requirements apply to buildings over 1000 m^2 on sites over 1 hectare in size.

All UK healthcare new build projects must achieve an 'Excellent' rating and major refurbishments a 'Very Good' rating.

All education projects in England valued at over £500,000 (primary schools) and £2m (secondary schools) must achieve a 'Very Good' rating under BREEAM Education 2008 to get funding.

The same rules apply to refurbishments where over 10% of the floor area of the school is being improved and to sixth form colleges.

The DfE wants to scrap minimum BREEAM ratings after the James Review branded these as being overly bureaucratic and expensive. The move has been criticised by the UK Green Building Council and has been questioned within government.

The Skills Funding Agency require an 'Excellent' rating for post-19 year old learning facilities.

All further education projects in Scotland must achieve an 'Excellent' rating.

In Northern Ireland new build education schemes must achieve an 'Excellent' rating and refurbishments a 'Very Good' rating.

8.4.2 LEED

This stands for Leadership in Energy and Environmental Design (LEED) and is a standard developed by the US Green Building Council. It is similar to BREEAM in that it has different categories including schools, retail, offices and healthcare. It has a category for buildings in use, categories for retail and office interiors and a category for homes. Energy, water, materials, indoor environmental quality, sustainability of the site are assessed. There are four levels of certification, 'Certified', 'Silver', 'Gold' and 'Platinum' with the latter category requiring a minimum of 80 points. Innovation credits are available too. LEED was launched in 1998 and is used widely in the USA. It is also used overseas including in the Middle East. There are over 11,000 LEED certified commercial buildings and 16,000 certified homes worldwide but LEED has been slow taking off in the UK with 21 certified buildings. Multinational clients often use LEED as the standard in their CSR policy that means developers increasingly want dual BREEAM and LEED certification.

8.4.3 SKA

Launched in 2009, Ska was developed by the Royal Institution of Chartered Surveyors (RICS) and is used for assessing the environmental performance of office fitout and as of March 2012 retail and restaurant fitout too. The RICS says it was developed as the alternative environmental assessment methods were expensive and not relevant to fitouts of existing buildings. Ska only measures the fitout, not the base building. It measures 104 impacts covering energy and CO_2 emissions, waste, water, materials, pollution, wellbeing and transport. There are three rating levels, 'Bronze', 'Silver' and 'Gold'. Like BREEAM it assesses the project at design stage and on completion. Twenty seven office projects have been assessed at design stage and 17 at completion and there are 250 projects approaching completion. There is also the option to measure how well the scheme is performing a year after completion.

8.4.4. CEEQUAL

CEEQUAL is an environmental assessment method similar to the others under discussion in this section. It assesses infrastructure projects, landscaping and the public realm for environmental performance and social responsibility. Twelve different impacts are measured including energy, material, waste, water, effects on neighbours and the historic environment.

There are three version, the first covers UK and Ireland, the second is brand new and covers international projects and the third long term maintenance contracts. The UK and Ireland version has five categories ranging from a whole project assessment to ones specifically for the client and designer, design, design and build and construction only. This was launched in 2003, 140 final and 40 interim awards have been achieved with 190 projects and contracts currently being assessed.

8.5 THE CODE FOR SUSTAINABLE HOMES

Launched in 2006 by the Labour government, the code was a voluntary environmental assessment tool for new homes that also signposted future changes to building regulations. Homes were assessed against nine criteria including energy and water use, surface water management, site waste management, household waste management, biodiversity, pollution, health and well being and use of materials. The code has six increasingly demanding levels with minimum requirements for each level. In 2006 a level 1 home was equivalent to energy building regulations in force at the time, a level 3 home was 25% better and a level 5 home needed to provide all the regulated energy from zero carbon sources and a level 6 home had to supply zero carbon energy for appliances too.

The code was revised in November 2010 to bring it line with changes to 2010 Part L. The energy requirements of levels 1 and 2 were raised to bring these in line with Part L as the base energy requirement for level 3 is now equivalent to 2010 Part L. It has also been tweaked to take account of the minimum fabric energy efficiency standards, which will become incorporated into future revisions of Part L. The code requirement for a site waste management plan has been dropped as this is now mandatory for all jobs with a value over £300,000. Level 6 homes must now comply with the Lifetimes Homes standard unless on a steeply sloping site.

Questions have been raised about the

future of the code as the energy and water requirements of levels 1 to 3 are now part of Building Regulations and housing minister Grant Shapps has said the code could be merged into Building Regulations. Level 6 will never become part of Building Regulations as the definition of zero carbon was changed in March 2011 to exclude appliances, which means Part L will never exceed the energy standards in level 5. However the DCLG said in the 2013 Part L consultation that the code will be revised in parallel. Additionally the code is still relevant for the eight non-energy categories and could be retained as a national standard for the overall sustainability credentials of new build housing, an issue that is part of the Harman review into simplifying local building standards.

The codes predecessor, EcoHomes is still used as an environmental assessment tool for housing refurbishment. It is essentially a BREEAM for homes with the same ratings ranging from 'Pass' to 'Excellent'. It about to be superseded by BREEAM Domestic Refurbishment which will include an 'Outstanding' rating.

Social housing must be built to code level 3 to comply with HCA design and quality standards. New social housing in Northern Ireland must also be built to level 3. All new homes in Wales must be built to level 3 as a condition of planning.

8.6 CARBON TRUST STANDARD

To achieve the Carbon Trust Standard businesses need to measures their carbon footprint and reduce it each year. The standard needs renewal every two years. Over 600 organisations have the standard including retailers responsible for over 50% of UK retail turnover. Many big developers have achieved the standard, product manufacturers and some consultants. The Carbon Trust Standard can also be used as one of the three metrics needed for compliance with the CRC.

8.7 ENERGY AND CARBON PRICES

One of the biggest barriers to improving the energy performance of buildings is that energy is a relatively minor cost compared with the salaries of employees which exceed 80% of the overall lifecycle costs of an office. This means occupiers are reluctant to pay a premium on leases for commercial buildings. But research suggests low energy buildings retain value better than those constructed to lower standards. Research carried out by Maastricht University in the Netherlands Sustainability and the Dynamics of Green Building found the rental values of buildings with Green Star and LEED certification were less affected by the downturn between 2007 and 2009. It also found certificated buildings analysed after 2009 commanded rental premiums and had asset prices significantly higher than non-certificated buildings.

Despite rising energy prices homebuyers are similarly reluctant to pay a premium for a low energy home. According to the NHBC Foundation report, Today's Attitudes to Low and Zero Carbon Homes, published in February this year reports housebuilders as saying very few occupiers are prepared to pay a premium for energy efficient homes. However the same report states that occupiers say they would be prepared to pay a premium if this was directly linked to savings on energy bills. The report recommends housebuilders should emphasise the energy savings from low energy homes as part of their marketing strategy.

These findings suggest current energy prices are having a positive effect on the values of more sustainable buildings, a trend that can only accelerate as energy prices increase. A report from DECC published in November 2011 suggests energy prices will rise by 12% by 2020. The report factored in the impacts of generating a greater proportion of our power from renewable sources, the Green Deal and other energy reduction initiatives. With these impacts included household bills are predicted to be 7% lower on average due to benefits from initiatives such as the Green Deal but the bills of medium sized businesses are predicted to be 19% higher because of carbon pricing and the costs of the renewables obligation. Although the report anticipates a 12% increase in energy bills by 2020 it also makes the point that gas bills rose by 25% during 2011 and electricity bills by 16%. This indicate there is a risk energy prices could be considerably higher than 12% by 2020.

The unpredictability of future energy and carbon prices is reflected in the attitudes of occupiers and developers in the survey carried out for this white paper.

Just over half, 51% of occupiers in our survey described the impact of rising energy and carbon prices on building running costs as high or very high risk. Forty nine percent described this as neutral or low risk (Fig 43).

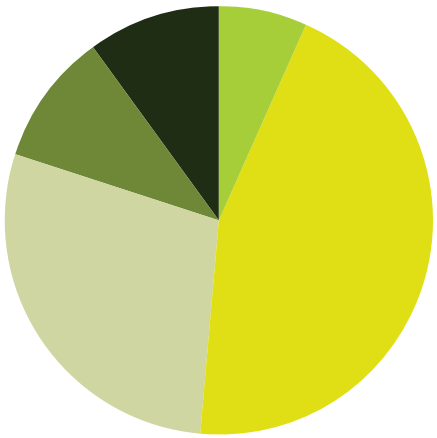
Attitudes of developers towards the risk of energy and carbon prices rising over the next five years is similarly mixed, 44% of respondents described this as high or very high risk and 51% said it was a neutral or low risk. Four percent weren't sure (Fig 44).

Social housing providers have more reason to provide energy efficient homes as they are committed to ensuring tenants aren't affected by fuel poverty. They have to build to level 3 of the code but the current squeeze on housing grant means most social housing providers aren't in a position to build to higher standards.

8.8 CARBON REDUCTION COMMITMENT

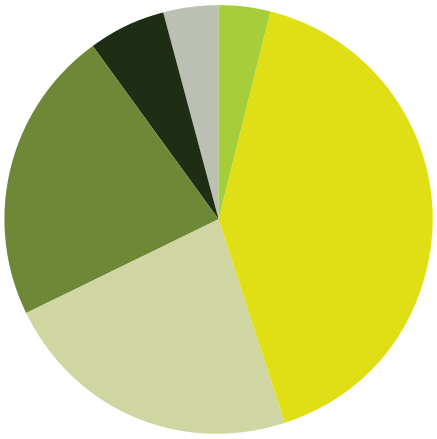
The CRC is effectively a carbon tax affecting organisations using more than 6,000mWh of electricity a year and took effect in April 2010. This affects medium-sized organisations including larger developers, central and local government, healthcare trusts and big retailers. These organisations are responsible for 10% of the UK's annual carbon emissions. They must monitor energy use and buy permits from the government to cover the carbon emissions from that energy use. The first permits will be available from April and will be priced at £12 per tonne. A publically available league table ranks companies by the actions they are taking to reduce emissions. Originally the money used to buy the credits was going to be redistributed with

Fig 43. How would you rate the risk presented by the impact of rising energy and carbon prices on your portfolio over the next five years? (occupiers)



Very high risk	6%
High risk	45%
Neutral risk	29%
Low risk	10%
Very low risk	10%

Fig 44. How would you rate the risk presented by the impact of rising energy and carbon prices have on your portfolio over the next five years? (developers)



Very high risk	4%
High risk	41%
Neutral risk	23%
Low risk	22%
Very low risk	6%
Not sure	4%

companies performing better than average in the league table receiving a cash credit from the below average organisations. The scheme was changed in the October 2010 spending review so all organisations have to buy credits regardless of their position in the league table. The government will now keep also all the money raised from buying carbon credits without any recycling, which has turned it into a carbon tax. The carbon price will increase in future years which means the CRC will become an increasingly powerful mechanism to drive energy efficiency improvements.

8.9 THE ENERGY PERFORMANCE OF BUILDINGS DIRECTIVE

This is a European directive dating from 2002 that sets minimum energy standards for new buildings and was the instrument that requires energy performance and display energy certificates. It also set out a requirement for the regular inspection of air conditioning systems and boilers, currently every five years. The minimum energy requirements are incorporated into Part L. The EPBD was recast in 2010 and has set tough new requirements. This includes a requirement that all new or refurbished public sector buildings must be near or zero carbon by 2019 and all other buildings by 2021, minimum energy standards applying to all existing buildings when these are refurbished and progressively lower thresholds for requiring an energy performance certificate. Most of these requirements fit with the zero carbon agenda and will be incorporated in Building Regulations.

8.9.1 ENERGY PERFORMANCE CERTIFICATES

All buildings need to be assessed for energy efficiency before being sold or rented. The energy performance of the building fabric is assessed and given an energy rating on an A to G scale with A being the best. Energy performance certificates are the recognised energy efficiency performance metric for a range of other measures. The revised feed-in tariff will require homes to meet a minimum EPC rating of D before qualifying for the feed-in tariff from 1 April.

The Energy Act 2011 proposes that EPC ratings should be made publicly available which will enable Green Deal providers to target the worst performing homes. The EPC is also being redesigned to include estimated energy costs as the home stands, and what the costs might be if the home was upgraded, again to promote the Green Deal. The Energy Act also contains a provision making it illegal to rent out a property with an EPC rating worse than E after April 2018. From April 2012 anyone selling or renting a property must obtain an EPC within seven days of marketing the property rather than the current 28 days. Trading standards officers will also be able to inspect EPCs and issue fines of up to £5,000 if these can't be produced.

8.9.2 DISPLAY ENERGY CERTIFICATES

Buildings over 1,000m^2 that are occupied by public bodies and those where large numbers of the public visit, such as universities, need to display a certificate showing how much energy is actually being used. This is called a Display Energy Certificate (DEC) and is based on the size of energy bills. The draft Carbon Plan published in March last year proposed extending the requirement for a DEC to all commercial buildings by the end of 2012. This was included as an amendment in the energy bill. There was widespread industry support including from the CBI and the British Property Federation but Osborne threw out the proposal in September 2011.

9/EMBODIED CARBON AND OTHER IMPACTS

As regulations drive down the operational emissions of buildings the contribution of the embodied energy towards lifetime carbon emissions goes up. In theory the lifecycle emissions of a zero carbon building come solely from the energy needed to make the materials and construct it. This means clients, consultants and contractors are increasingly focusing on embodied carbon as it grows in relative significance. The Low Carbon Construction Innovation and Growth Team (IGT) report, which was published in November 2010 recommended that the public sector procurement guide, the Green Book should contain a whole life carbon assessment once a suitable methodology was available. This would have marked the first stage towards regulating embodied carbon but the government rejected the recommendation in its response to the report last year.

9.1 MEASURING EMBODIED CARBON

Until a standardised way of measuring embodied carbon is agreed on it won't be possible to provide meaningful comparisons between different approaches to building construction. The problem is embodied carbon measurement is complicated because it depends on what is included in the calculation. For example, does it include transporting the finished product from factory gate to site? An aluminium window from one manufacturer may contain significantly less embodied carbon than another because the electricity used to make it came from hydroelectricity rather than coal. Or perhaps that window is made from a high proportion of recycled aluminium which is much less energy intensive than virgin material. To date most embodied energy calculations have been based on generic, non-product specific data available from the University of Bath. Work is advancing on a new European standard called CEN/TC 350 which is being put together by standards setting body CEN. This is being driven by the Construction Products Directive and the related Environmental Product Declaration which will mandate the inclusion of carbon data at the factory gate as part of the declaration process. In practice this will mean products will eventually declare embodied carbon content derived from a standardised form of measurement, paving the way towards meaningful comparisons between different products. The first suite of CEN/TC 350 standards is due out this year.

Products will eventually declare embodied carbon content derived from a standardised form of measurement

9.2 MEASURING LIFE CYCLE CARBON

A whole life cycle carbon calculation needs to contain the carbon embodied in the materials, the carbon produced from construction operations and operational carbon emitted over the building's lifetime. Again a standardised methodology is the only way meaningful comparisons can be made between buildings.

Various tools are being developed by a variety of organisations. The IGT report called on the industry to accept a tool called Redefining Zero, which is being developed by RICS. This will measure embodied carbon produced from the design, materials, distribution, site assembly, in use emissions and ultimately demolition. It is planning to launch an initial draft in March 2012. The Technology Strategy Board has funded the development of several other tools that will calculate the carbon footprint of buildings. This includes a tool called Impact which is being developed by software specialist IES with BRE, Faithful + Gould, the Construction Products Association, Willmott Dixon and consultant AEC3. This is designed to plug

into existing CAD systems to show the embodied energy content of materials in a design.

Another tool is being developed by building defects insurer BLP with Cambridge University. BLP has a comprehensive database showing how long products last and has already used this to develop a tool enabling housebuilders to calculate the lifecycle costs of homes. This is being extended to calculate embodied and operational energy and carbon. The idea behind both tools is that users will be able to adjust one building element and each tool will automatically calculate the impacts elsewhere.

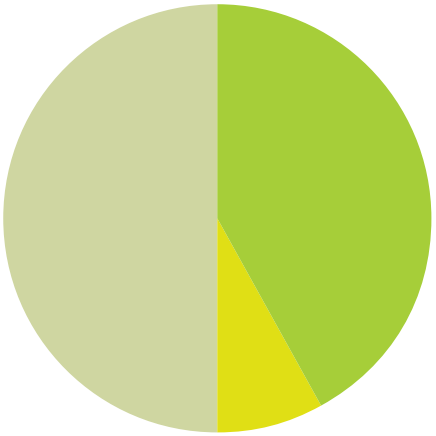
9.3 ATTITUDES TOWARDS EMBODIED ENERGY – SURVEY DATA

A survey was carried out for this white paper to evaluate the attitudes of specifiers towards embodied energy. A significant majority, 80% said they thought building elements should be assessed for embodied energy content as part of the specification process but just 31% currently do so. The main reason why specifiers don't currently assess embodied carbon content is because clients aren't interested (Fig 45). Of those who said they didn't assess embodied carbon content because no simple and reliable method of assessing this existing, 70% said they would select products based on the embodied or whole life carbon content of projects once a consistent and comparable methodology to measure this was available. These figures indicate there is an overwhelming desire on the part of specifiers to carry out whole life carbon assessments providing the tools are available.

Three quarters of specifiers expect to carry out embodied carbon assessments of building elements in the next five years with only 12% expecting never to do this (Fig 46).

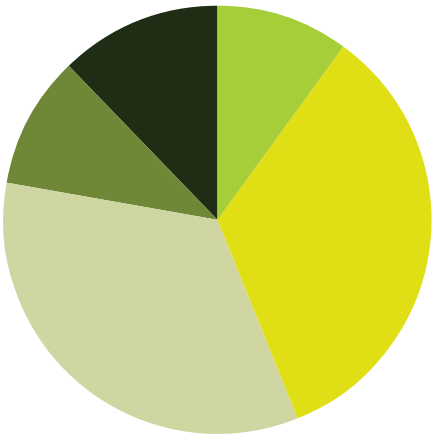
When asked whether the proportion of embodied carbon influenced the specification of five key building elements, respondents said services had the maximum influence and substructure the least.

Fig 45. Please select whch option best explains why you don't assess building elements for embodies carbon content



No simple and reliable method of assessing this exists	42%
It's too expensive and time consuming	8%
Clients are not interested	50%

Fig 46. At what point in the future do you envisage carrying out embodied carbon assessments of building elements?



In the next 12 months	10%
in the next 2 years	34%
in the next 5 years	34%
in the next 10 years	10%
Never	12%

10/INCENTIVES

The combination of relatively cheap energy and the high capital costs of reducing carbon emissions mean the government is unlikely to hit its carbon reduction targets without subsidy. This has resulted in several incentive schemes intended to drive take up of green technologies. The government's renewables energy strategy sets a target of generating 15% of the UK's energy from renewable sources by 2020. This includes electricity generation from wind, hydro and solar power and heat from biomass, solar and heat pumps. These technologies are expensive making adoption very slow so the government has introduced incentives to increase their adoption. The two incentives relevant to the built environment are the feed-in tariffs (FIT) and the renewable heat incentive (RHI).

According to December 2011's Carbon Plan 37% of all UK emissions came from existing buildings. It states emissions from buildings must be close to zero by 2050 if the government is to meet its 80% carbon reduction target by 2020. To help achieve this target the government is introducing a scheme to fund the upfront cost of energy reduction measures in existing buildings called the Green Deal. There are also other incentive schemes available including enhanced capital allowances which grant 100% tax relief in the year of installation on a basket of approved energy saving measures.

10.1 FEED-IN TARIFF

The FIT was introduced in April 2010 and pays generators a fixed rate per unit of electricity generated from a basket of renewable energy sources. This includes PV, wind, hydro, anaerobic digestion and microCHP. The rate varies according to the type and size of technology. When introduced PV installations on existing homes with an output under 4kW received 41p per kilowatt hour of electricity generated. This is payable for 10 to 25 years depending on the source and is linked to the retail prices index. FIT for wind power are payable for 20 years and 25 years for PV. Generators also receive 3p per kWhr for energy exported to the grid. FITs sparked a boom in installations as small scale PV retrofits produced a return on investment of 7.6%, comfortably beating most other types of investment. The FIT also paid 29p for PV installations, including standalone from 100kW up to 5MW, prompting a boom in planning applications for solar farms. The FIT was good news for clients procuring new buildings as it paid 32p for installations up to 50kW on buildings, producing a return on investment of up to 9%. This made compliance with local targets for onsite renewables generation far more palatable as the rates of return negated the borrowing costs of capital.

The government always intended the FIT rates to reduce each year to reflect the reducing capital costs of installation. The theory was increased market for PV would drive costs down.

Although the first review of tariffs wasn't due until 2012 the government announced in June 2011 it was slashing the rate payable to large standalone installations from 30p down to 8.5p. It said the boom in solar farms was using up the pot of money intended to installations on buildings. At the end of October the government announced it was cutting the FIT rate payable for small domestic installations from 43p per kWh to 21p from April 2012 with installations completing after 12 December only benefitting from the higher rate until April.

Of more relevance to the industry were the cuts in rates for installations between 10kW and 50kW. This was cut from 33p to 15p and installations between 50kW and 100kW were cut from 33p to 13p. The solar industry and Friends of the Earth took the government to court and successfully overturned the decision so installations made up to 3 March 2012 would benefit from the old rate. The government is appealing to the Supreme Court to have this decision overturned. The outcome of this legal challenge will only determine the FIT rate payable to installations between 12 December 2011 and 3 March 2012. All installations under 4kW after this date will receive 21p and will need an EPC rating of at least D or better to qualify. The government is also proposing to cut feed-in tariff rates again from 1 July. Critics of the government's action point to the uncertainty created by the sudden changes in rates. If the government's appeal is successful this means it can change the rates when it chooses.

10.2 RENEWABLE HEAT INCENTIVE

The renewable heat incentive is similar to the feed-in tariff in that it pays heat generators a fixed rate per kWh of heat produced. It is being introduced in two phases with large scale installations benefitting from the RHI from last July and domestic installations from October 2012 to align with the launch of the Green Deal. It applies to any system installed since July 2009. It applies to biomass systems, ground source heat pumps, solar thermal and biomethane and is payable for 20 years. Rates for small biomass systems are 7.6p per kWh although this reduces after it has been operating for 1,314 hours. The amount payable is based on the rated capacity of the system thereafter the rate reduces to 1.9p. Solar thermal receives 8.5p per kWh and small heat pump installations 4.3p. Rates for domestic installations haven't been published yet.

Grants called the renewable heat premium payment have also been available since August last year to pay for the installation costs of domestic systems. The amount available varies from £300 for solar thermal to £1250 for a ground source heat pump installation and closes at the end of March 2012. Although the RHI is welcome it doesn't provide a positive payback over the lifetime of the tariff for a 2.8kW solar thermal or 6kW ground source heat pump system.

10.3 ENHANCED CAPITAL ALLOWANCES

The ECA scheme provides a 100% first year allowance, which can be set against tax liabilities for new M&E systems. Normally allowances are set at a maximum of 20% a year on a reducing basis meaning the ECA scheme offers significant cash flow advantages because all the relief can be claimed in the first year. ECAs are only available for approved items on energy and water technology lists and includes boilers, lighting systems, pipework insulation, rainwater harvesting systems and water efficient taps.

10.4 THE GREEN DEAL

The 2011 Energy Act established the Green Deal, the government's flagship scheme to reduce emissions from the existing stock. The initial investment needed for energy saving measures is a major disincentive, which the Green Deal aims to tackle by providing loans that are paid back by savings on energy bills. It will be launched in October 2012 although the timetable appears to be slipping slightly, and will be available to domestic and non-domestic energy bill payers. A range of energy saving measures will be eligible including condensing boilers, heating controls, insulation and double glazing.

To be eligible for finance the measures must meet the 'Golden Rule' where the savings on bills must be equal to or greater than the costs of the improvements and finance. Existing energy company obligations such as CERT where grants are available for installing insulation will be replaced by a financing scheme called ECO. This will make an additional £1.3bn available a year to subsidise measures that otherwise wouldn't meet the golden rule such as internal insulation for solid walled properties.

Green Deal providers will offer Green Deal plans to customers, arrange finance, organise the work to be done and provide ongoing customer service. A range of companies including Marks & Spencer, Tesco and Homebase are interested in becoming Green Deal providers plus local authorities including Birmingham who are already shortlisting firms to do the work and housing associations.

In practice a Green Deal adviser will advise property owners on what energy measures would be appropriate and meet the golden rule. An accredited Green Deal installer would do the work and the money would be collected via the electricity bill over 25 years. The Green Deal is attached to the property rather than the owner.

Great claims are being made for the Green Deal: it is worth £14bn, will create 65,000 jobs and is designed to cut carbon dioxide emissions by 2 million tonnes a year. The figures look positive for homes. Data from Sweett show many of the proposed measures will easily meet the golden rule based on Green Deal Finance Company interest rates of 6% over 25 years. Sweett also says measures expected to require subsidy including solid wall insulation will meet the golden rule. But the figures for non-domestic properties are less positive. Sweett and Kingspan assessed energy improvements to an office, a school, a retail warehouse and an industrial unit. The only building type to meet the golden rule was the retail unit. There have also been criticisms that ECO is a less cost effective tool for reducing carbon dioxide emissions than CERT and other initiatives including Warm Front. DECC's own impact assessment show cavity wall installations could fall by 70% and loft installations by 93% because these are no longer subsidised by CERT.

The biggest barrier to Green Deal take-up is property owners do not benefit immediately from the improvements. They have to undergo all the disruption of having the work done and then wait for up to 25 years to start enjoying direct savings on bills. The Treasury has announced a £200m fund to encourage uptake and Green Deal providers will be allowed to provide cash incentives of up to £150.

Compulsion could be a key part of the Green Deal. The consultation on 2013 Part L proposes introducing consequential improvements for all buildings. Homeowners would have to upgrade the energy efficiency of the existing element of their home when building an extension. DECC says if landlords don't take up the Green Deal tenants may be able to force them to do it after April 2015. The Energy Act proposes to outlaw the letting of F and G rated buildings after 2018. All these measures would drive take up of the Green Deal among the private sector. The public sector is embracing the Green Deal more positively with several councils including Newcastle, Leeds, Bristol and Manchester drawing up plans for Green Deal provision as local authorities and housing associations can improve their housing unhindered by the lack of capital.

11/OPPORTUNITIES ABROAD

The UK's demanding low carbon agenda has had the benefit of making the industry learn the skills needed to design and deliver more sustainable buildings. UK architects and engineers also enjoy an excellent reputation abroad for their skills and experience. This means many consultants already have an established international presence and are well positioned to expand their businesses where sustainability skills are in demand.

China is investing heavily in low carbon buildings and technologies and firms that are established there are expanding their workforces. For example Atkins/Faithful & Gould had one sustainability professional in China four years ago but now has 24 full-time people. There are opportunities in other growing economies such as India. This country doesn't have quite the same centrally driven sustainability agenda as China but increasing numbers of commercial buildings are LEED certified to appeal to the multinational corporate market who have minimum environmental standards for the buildings they occupy.

China is investing heavily in low carbon buildings and technologies and firms that are established there are expanding their workforces

The Middle East is another growth hotspot, particularly in Qatar, Saudi Arabia and Abu Dhabi. Sustainability has rapidly risen up the agenda and Abu Dhabi has its own environmental assessment methodology called Estidama. All new buildings must conform to this standard. Qatar also has its own compulsory sustainability assessment system and this will be rolled out in Saudi Arabia too. UK and American consultants are already very well represented in the UAE so opportunities to new entrants are limited. Construction standards in this region are often poor which could be a problem as buildings will be tested on completion to see if they conform to these standards. There could be opportunities for people experienced in construction quality management. Buildings are frequently badly maintained in the Middle East so there could be opportunities for FM professionals experienced in running buildings efficiently.

Opportunities in mature markets including the USA and Europe are limited as LEED is well established in the US and the Europeans are experienced in low carbon construction – Passivhaus has been used in mainland Europe for 20 years.

One area where the UK excels is developing low carbon communities with Masdar being a prime example. Consultant Mott MacDonald is working on several eco cities in China and this model is being adopted by other countries including Saudi Arabia. Although the UK has strong skills in this area it is not alone, Sweden has built low energy communities including Malmo and Hammarby and Germany has done the same. The UK is disadvantaged as it doesn't have an equivalent to show off its skills, which could be an argument for pushing on with the eco cities programme here.

12/COST EFFECTIVE SOLUTIONS FOR 2013 PART L AND BEYOND

Aecom leads the technical and analytical support to the DCLG in the 2013 review of Part L of the Building Regulations. This includes technical analysis for improving the carbon and energy efficiency standards for new and existing buildings and cost benefit analysis of the different policy options. The impact assessment accompanying the consultation included the headline costs of complying with 2013 Part L. Below Aecom provides the details behind the figures and identify the most cost effective solutions for four different building types to comply with 2013 Part L. The buildings are a deep plan airconditioned office, retail warehouse, secondary school and a hotel.

Written by Jim Proctor, senior consultant, Davis Langdon, an Aecom company, and Sam Archer, associate director – sustainability, building engineering, Aecom Europe.

12.1 PROPOSED CHANGES AND CALCULATION METHODOLOGY TO PART L 2013

The consultation proposals for the 2013 Part L regulations for non-domestic buildings propose two options: a 20% reduction in carbon emissions when compared with the 2010 regulations (this is the government's preferred option) or an 11% reduction when compared with 2010. As for 2010, the reduction will be achieved as an "aggregate" reduction across the build mix, meaning that some building types will be required to achieve higher savings than others where they can cost-effectively achieve these higher savings.

The regulations continue the concurrent recipe approach adopted in 2010 where the carbon emissions calculated for the actual building (the Building Emission Rate – BER) are compared with carbon emissions from a notional building of the same size and shape as the actual building but with standard U-values and building services efficiencies (the target emission rate) - see Fig. A. For the first time, there is a proposal (under the 20% uplift option, but not the 11% option, which can be achieved with fabric and services improvements only) to include renewable energy generation technologies in the notional building – namely a photovoltaic panel array equivalent to 1.6% of the floor area of the building. Just as for the rest of the notional building specification, this is only to set the target emission rate for the building under consideration – the designer would not be required to use PVs, or any renewables at all, if other measures were more cost-effective.

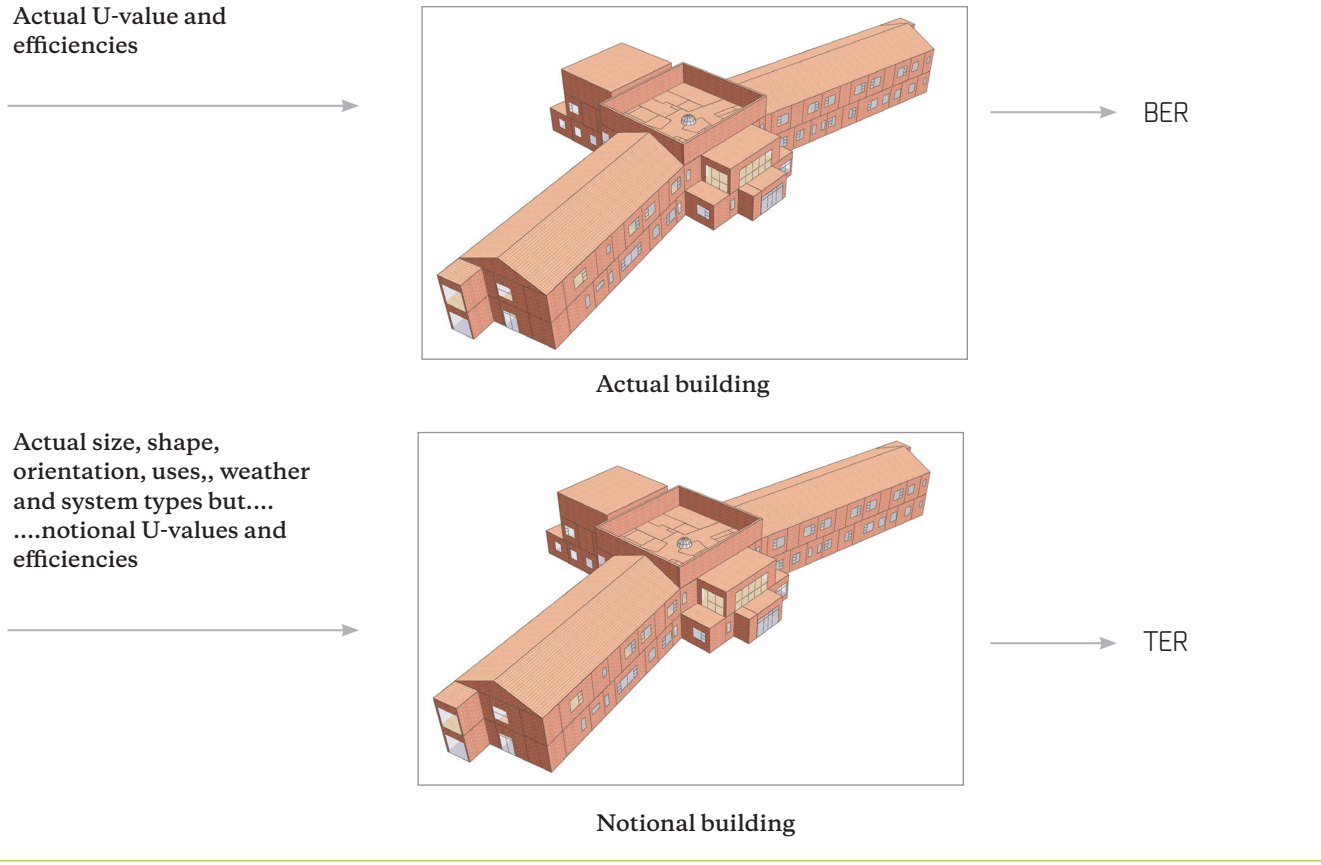
For 2013, four notional buildings are proposed: top-lit (warehouses, for example), side-lit and predominantly cooled and side-lit and predominantly heated (offices, hotels, schools), and unlit (theatres, cinemas and windowless areas in other buildings). Full details of the different specifications are set out in the proposed changes to the National Calculation Methodology (http://www.communities.gov.uk/documents/planningandbuilding/pdf/2077485.pdf). It is possible to pass Part L by building to these standard U-values and building services efficiencies (the recipe) but this may not be the most cost-effective approach in every case. A full cost benefit analysis of the effectiveness of each carbon saving measure can show which measures are delivering carbon savings at least cost.

12.2 TECHNICAL AND COST ANALYSIS

The analysis that underpins Part L is fundamentally looking to identify cost-effective levels of improvement where the additional costs of energy efficiency measures are justified by the resultant fuel savings.

At the back of the Impact Assessment published alongside the consultation is a suite of "carbon abatement cost curves", showing how much it costs to reach a certain carbon saving relative to a building built to the 2010 regulations.

FIG. A



The curves were produced by modelling the fuel savings achieved by individual measures such as an additional 50mm of insulation, more efficient lighting or improved chiller performance, and then ranking these measures in order of the capital cost of saving 1 kg of CO_2. This way, the least expensive carbon-saving measures are implemented first. The emphasis on capital costs reflects the fact that the costs of meeting higher regulatory standards fall principally on developers, and thus most developers will look to achieve compliance at least capital cost rather than least lifecycle cost.

In general, the transition from Part L 2006 to Part L 2010 saw a reduced emphasis on U-value improvements as the high internal gains in most non-domestic buildings (particularly offices) make these improvements less influential. This tendency continues for 2013 with an increasing reliance on higher efficiency chillers, lighting and air-conditioning units.

12.2.1 SYNERGISTIC EFFECTS

One problem with modelling measures individually is that it doesn't capture the combined effects of implementing measures together. To give an example, improving lighting efficiency reduces internal heat gains and this in turn increases the benefit of adding more insulation.

In order to account for these synergistic effects measures were first modelled individually and ranked according to the cost of carbon. Then a second modelling run was undertaken where the measures were added one by one to the energy model in sequence. This approach more closely models the carbon savings resulting from implementing all of the measures together.

12.2.2. COSTS

An example of the cost data prepared by Davis Langdon for Part L is shown in Fig B (in this case for the 30,000m² deep plan air-conditioned office). What the cost data shows is the extra overall cost of the measure relative to the reference building. So a wall U-value of 0.15 W/m².K costs £1.53/m² (of GIA) more than a U-value of 0.35 W/m².K translating into a total additional cost of nearly £46,000.

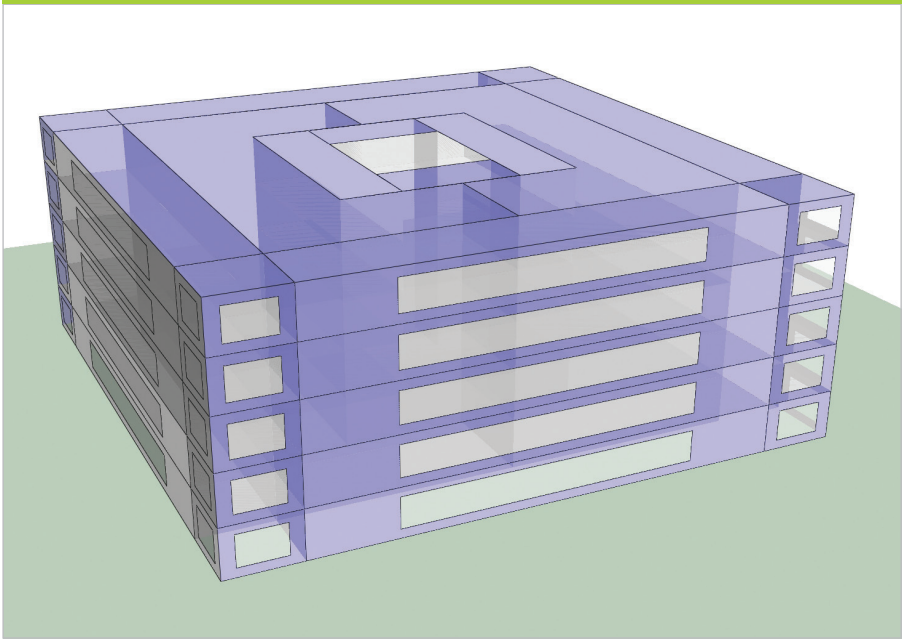
FIG B. TYPICAL ADDITIONAL COSTS OVER REFERENCE VALUE		
Element (Reference value in green)	£	£/m² GIFA
Floor		
U value - 0.25	Reference	-
U value - 0.20	81,000	2.70
U value - 0.15	216,000	7.20
U value - 0.10	405,000	13.50
Roof		
U value - 0.25	Reference	-
U value - 0.20	18,000	0.60
U value - 0.15	27,000	0.90
U value - 0.10	33,000	1.10
External Wall		
U value - 0.35	Reference	-
U value - 0.25	19,000	0.63
U value - 0.20	32,000	1.07
U value - 0.15	46,000	1.53
Windows		
U value - 2.0	Reference	-
U value - 1.6	123,000	4.10
U value - 1.3	148,000	4.93
U value - 0.9	340,000	11.33
Air-tightness, m3/hr/m2 (Excludes the cost of testing)		
7	Reference	-
3	20,000	0.67
Lighting		
55lm per W	Reference	-
65lm per W	62,000	2.07
Lighting occupancy sensing		
None	Reference	-
With lighting occupancy sensing	300,000	10.00
Daylight dimming		
None	Reference	-
With daylight dimming	240,000	8.00
Lighting occupancy sensing and daylight dimming	390,000	13.00
Gas boiler seasonal efficiency		
0.84	Reference	-
0.86	9,000	0.30
0.88	15,000	0.50
0.91	15,000	0.50
Heat Recovery Efficiency (AHU)		
0	Reference	-
0.4 (Runaround coil)	45,000	1.50
0.5 (Plate Heat Exchanger)	57,000	1.90
0.7 (Thermal Wheel)	92,000	3.07
Cooling - SEER - Air cooled chiller		
2.5	Reference	-
3	64,800	2.16
3.5	81,000	2.70
4	145,000	4.83
4.5	221,000	7.37
Central AHU specific fan power		
2.2	Reference	-
2	9,000	0.30
1.8	26,000	0.87
Terminal unit specific fan power		
0.6 (Based on AC motor)	Reference	-
0.3 (Based on EC/DC motor)	120,000	4

12.3 SOME EXAMPLE BUILDINGS

A total of six building types were modelled for the Part L 2013 analysis: a deep plan air-conditioned office, a narrow plan air-conditioned office, a secondary school, a hotel, a retail warehouse and a distribution warehouse. Clearly the non-domestic building stock includes many more types of building but our analysis suggests that these six building types represent over 70% of the total floor space expected to be built each year for the next 10 years. However, the DCLG is asking for comments on how other building types might be affected, and a consultation version of the Simplified Building Energy Model is available on the National Calculation Methodology website (http://www.2013ncm.bre.co.uk/) so that other building types can be modelled.

Reproduced below are cost breakdowns for four of the building types examined for the 20% aggregate improvement scenario. We begin by describing the basebuild assumptions for each of the building types including what is assumed to be implemented for compliance with the current Part L 2010. We then describe which measures we have found to be most cost-effective for achieving the relevant individual target for the building and their associated costs.

FIG C. DEEP PLAN AIR-CONDITIONED OFFICE (5 OUT OF 10 STOREYS SHOWN) THERMAL MODEL



12.3.1 DEEP PLAN AIR-CONDITIONED OFFICE

The deep plan air-conditioned office is a 10 storey city centre office development with a gross internal area of 30,000m^2. Construction is assumed to be a curtain walling system with solid spandrel panels and glazing. Basebuild construction cost of £1,640/m^2 to meet Part L 2010 (Fig C).

FIG D. OFFICE BASEBUILD DATA

The following measures are included in basebuild costs to meet Part L 2010:

Measure	What's included
■ Lighting with an average efficiency of 65 luminaire lumens per circuit watt	■ High quality recessed linear T5 fluorescent lighting to main office areas. Recessed compact fluorescent. elsewhere.
■ Air permeability of 3 m^3/m^2/hour Window with whole window U-value of 1.6 $W/m^2.K$	■ Best practice level. Allowance for additional supervision, training and management
■ Central air-handling unit with a specific fanpower of 1.8 W/l/s	■ Assumed to be achievable through reselection of AHU. No allowance made in costs for larger ducts
■ T erminal unit specific fan power of less than 0.3 W/l/s	■ Fan coil units fitted with EC/DC motors
■ Heat reclaim in the air-handling unit with an efficiency of 50%	■ Assumed to be a plate heat exchanger
■ Chiller with a seasonal energy efficiency ratio of 3.5	

FIG E: OFFICE – PART L 2013 PROPOSED CHANGES DATA

To achieve the 20% aggregate uplift, this building would need to achieve a 23.4% improvement on its equivalent 2010 target emission rate. The following measures were then found to be the most cost-effective way of meeting this target:

Measure	**What's included**	**Extra over cost £**	**Extra over cost £/m^2**	**Cumulative cost of compliance £/m^2**
Heat reclaim in the air-handling unit with an efficiency of 70%	Assumed to be a thermal wheel	35,000	1.17	1.17
Chiller with a seasonal energy efficiency ratio of 4.5		140,000	4.67	5.84
1500m^2 mono-crystalline photovoltaic panels	Represents panel area eq. to 50% of roof area	507,000	16.9	22.74
	Total cost	**682,000**	Total cost as % of basebuild costs	1.39%

FIG F. RETAIL WAREHOUSE THERMAL MODEL

12.3.4 RETAIL WAREHOUSE

4,900m² double height retail warehouse unit, assumed to be air-conditioned. Construction is assumed to be profiled sheet steel roof with rooflights and brick/block cavity wall with profiled metal cladding system. Basebuild construction cost of £745/m² to meet Part L 2010.

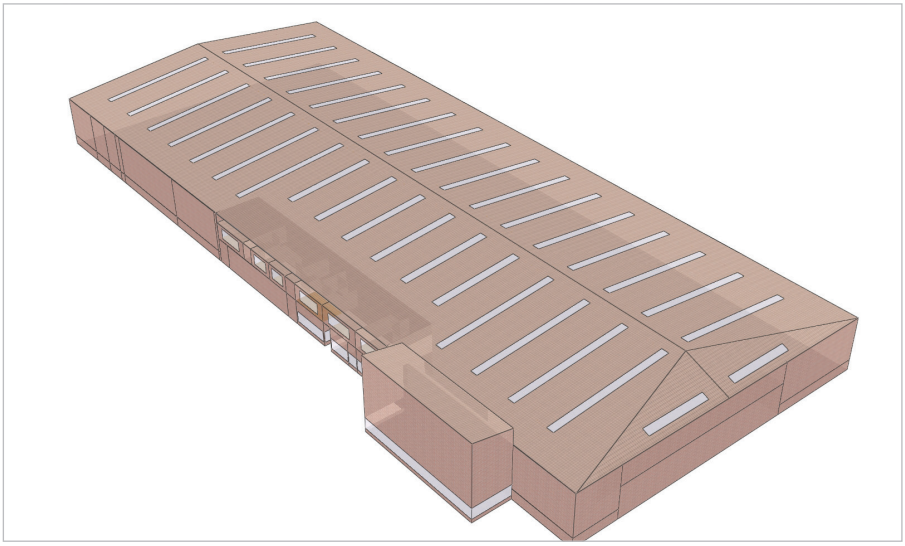


FIG G: RETAIL WAREHOUSE BASEBUILD DATA

The following measures are included in basebuild costs to meet Part L 2010

Measure	What's included
■ Lighting with an average efficiency of 65 luminaire lumens per circuit watt	■ High quality high-bay metal halide fittings
■ Air permeability of three m³/m²/hour	■ Best practice level. Allowance for additional supervision, training and management
■ Daylighting controls to lighting Central air-handling unit with a specific fan power of 1.8 W/l/s	■ Assumed to be achievable through reselection of AHU. No allowance made in costs for larger ducts
■ Terminal unit specific fan power of less than 0.3 W/l/s	■ Suspended fan coil units fitted with EC/DC motors
■ Heat reclaim in the air-handling unit with an efficiency of 70%	■ Assumed to be thermal wheel
■ Chiller with a seasonal energy efficiency ratio of 3.5	

FIG G: RETAIL WAREHOUSE – PART L 2013 PROPOSED CHANGES DATA

To achieve the 20% aggregate uplift, this building would need to achieve a 16.2% improvement on its equivalent 2010 target emission rate. The following measures were then found to be the most cost-effective way of meeting this target:

Measure	What's included	Extra over cost £	Extra over cost £/m²	Cumulative cost of compliance £/m2
Chiller with a seasonal energy efficiency ratio of 4.5		20,000	4.08	4.08
Display window with whole window U-value of 0.9 W/m2.K		9,000	1.84	5.92
Heating efficiency of 91%	Gas-fired condensing boiler. LTHW heating to suspended fan-coil unit	5,500	1.12	7.04
Rooflight with whole-rooflight U-value of 1.6 W/m².K		8,000	1.63	8.67
300m² mono-crystalline photovoltaic panels	Represents panel area eq. to 6% of roof area	98,100	20.02	28.69
	Total cost	**140,600**	**Total cost as % of basebuild costs**	**3.85%**

12.3.5 SECONDARY SCHOOL

11,000m² new-build secondary school over two and three storeys. Construction is assumed to be brickwork at low level and architectural cladding at higher levels with a lightweight metal clad roof. Basebuild construction cost of £1,354/m² to meet Part L 2010 (excluding landscaping and grounds).

FIG H. SECONDARY SCHOOL THERMAL MODEL

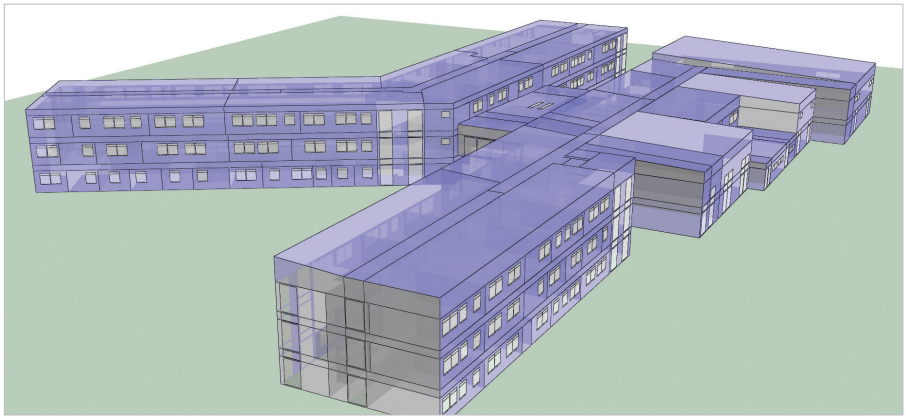


FIG I. SECONDARY SCHOOL BASEBUILD DATA

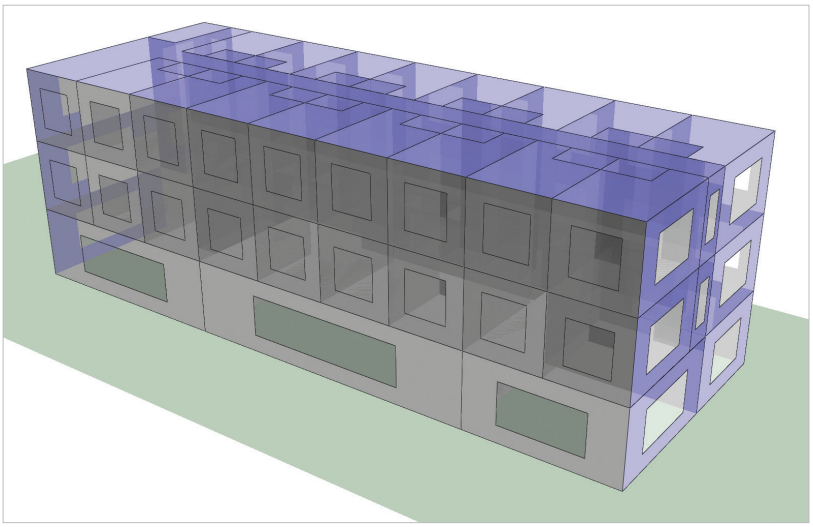
Measure	What's included
■ Air permeability of three m³/m²/hour	■ Best practice level. Allowance for additional supervision, training and management
■ Lighting with an average efficiency of 65 luminaire lumens per circuit watt	■ High quality suspended linear T5 fluorescent lighting to main teaching areas. Recessed compact fluorescent elsewhere
■ Heating efficiency of 91%	■ Gas-fired condensing boiler. LTHW heating with radiators
■ Wall U-value of 0.25 W/m².K	

FIG J. SECONDARY SCHOOL PART L PROPOSED CHANGES DATA

To achieve the 20% aggregate uplift, this building would need to achieve a 17.4% improvement on its equivalent 2010 target emission rate. The following measures were then found to be the most cost-effective way of meeting this target:

Measure	What's included	Extra over cost £	Extra over cost £/m²	Cumulative cost of compliance £/m²
420m² mono-crystalline photovoltaic panelsMeasure	Represents panel area eq. to 7.5% of roof area	137,000	12.45	12.45
	Total cost	**137,000**	**Total cost as % of basebuild costs**	**0.92%**

FIG K. HOTEL SIMPLIFIED THERMAL MODEL SHOWING PART OF THE BUILDNG



12.3.6 HOTEL

Five-star hotel, 200 beds over 15,200m². Construction is assumed to be steel frame with precast rendered concrete panels. Basebuild construction cost of £2,618/m² to meet Part L 2010.

FIG L. HOTEL BASEBUILD DATA

Measure	What's included
■ Air permeability of three m³/m²/hour	■ Best practice level. Allowance for additional supervision, training and management
■ Lighting with an average efficiency of 65 luminaire lumens per circuit watt	■ Generally high quality recessed compact fluorescent lighting
■ Heating and hot water efficiency of 91%	■ Gas-fired condensing boilers and direct gas-fired condensing water heating. LTHW heating to fan-coil units
■ Window with whole window U-value of 1.6 W/m².K	
■ Heat reclaim in the air-handling unit with an efficiency of 70%	■ Assumed to be a thermal wheel
■ Central air-handling unit with a specific fan power of 1.8 W/l/s	■ Assumed to be achievable through reselection of AHU. No allowance made in costs for larger ducts

FIG M. HOTEL PART L 2013 PROPOSED CHANGES

To achieve the 20% aggregate uplift, this building would need to achieve a 15% improvement on its equivalent 2010 target emission rate. The following measures were then found to be the most cost-effective way of meeting this target:

Measure	What's included	Extra over cost £	Extra over cost £/m²	Cumulative cost of compliance £/m²
Wall U-value of 0.25 W/m².K		15,000	0.99	0.99
160kW(e) gas-fired CHP		142,000	9.34	10.33
Roof U-value of 0.10 W/m².K (from 0.25 W/m².K)		14,000	0.92	11.25
	Total cost	**171,000**		**0.43%**

12.4 PART L BEYOND 2013

The 2013 Part L consultation must be seen in the context of longer term proposals to make all new non-domestic buildings zero carbon from 2019. This is in line with European Union expectations set out in the recast of the Energy Performance of Buildings Directive. Further updates to Building Regulations in 2016 and 2019 can therefore be expected to require greater on-site carbon savings together with potential consideration of offsite measures (so-called allowable solutions).

13/CONCLUSION

Although there is some uncertainty about this government's commitment to maintaining the carbon reduction trajectory set in place by the previous administration this hasn't completely stalled. The proposed emissions reductions targets in the 2013 Part L consultation are 20% for non-domestic buildings, which is just 5% short of previously published targets. Housebuilders get off relatively lightly with an 8% reduction target because of the dire state of the housing market. Although this could mean the zero carbon targets for new housing could be delayed by three years there is no doubt future sustainability standards will get progressively more demanding because the government has got legally binding targets in place.

Additionally the government is determined to make the Green Deal work via a combination of regulation and persuasion as tackling emissions from existing building is a priority. As a minimum consultants and contractors must become adept at delivering buildings that meet or exceed minimum standards if they want to stay in business. Organisations that can deliver better performing buildings for the same cost will gain significant competitive advantage over those who struggle with this challenge.

The 2013 Part L consultation proposes for the first time to introduce measures to tackle the significant gap between design and as built energy performance. As there is little point increaswing carbon reduction targets if energy use is two to three times greater than designed one option open to government is to further regulate as built performance in future iterations of Part L. This means designers and contractors will have to become more competent in delivering robust solutions or risk expensive remedial work. It also means teams will need to work more closely together using building information modelling (BIM) tools to ensure designs are robust and are realised accurately onsite.Once again teams that can successfully meet this challenge will gain significant competitive advantage.

The government is determined to leverage the Green Deal which if successful will mean significant amounts of work for the industry. The DECC says this could be worth £14bn over the next decade and create 65,000 jobs by 2015. There is some evidence local authorities see the Green Deal as a good way of improving their housing stock without impacting on their capital budgets. Local authorities are also embracing district heating schemes as these can reduce emissions from existing buildings by 20% with the private sector funding, building and operating these schemes. These opportunities are likely to increase over the next eight years as the 2020 target to reduce carbon dioxide emission by 34% compared with 1990 approaches.

14/APPENDIXES: BEST BREEAM PROJECTS & TEAMS IN 2011

14.1 WHICH PROJECTS HAVE THE HIGHEST BREEAM RATINGS IN 2011 AND 2010?

Building teamed up with the BRE and Barbour ABI to show which organisations are associated with the highest BREEAM rated projects in 2011 and 2010. The data below is presented by BREEAM category which includes Bespoke, Industrial, Office, Retail, Healthcare, Schools, Further Education, Higher Education, International and Multi-residential. Each category includes the client, developer, architect, M&E engineer, contractor and others associated with the project. Each entry also includes the BREEAM rating. Where data was not available the entries have been left blank.

Building would like to thank BRE and Barbour ABI for their help in compiling this data.

APPENDIX A: BEST OF BREEAM IN 2011

BESPOKE

Development name	Assessors	Developer	Client	Architect	Contractor	M & E	Service Engineer/ Consultant	Structural Engineer/ Consultant	Others	Score	Rating
Dogs Trust Re-Homing Centre	Inbuilt Ltd	Dogs Trust	Dogs Trust	Napier and Co	McPhillips Limited	Mott MacDonald Fulcrum	Mott MacDonald Fulcrum			91.3	Outstanding
YMCA Multi-Use Centre, Bridgewater	Inbuilt Ltd	Bridgewater YMCA	Bridgewater YMCA	Smith Gamblin	Pollard Ltd	WYG Bristol	WYG Bristol	WYG Bristol		87.47	Outstanding
Crownbridge SEN School	2050 Environmental Assessments Limited	Kier Western Limited	Kier Western Limited	Powell Dobson Associates	Kier Western Limited	Hoare Lea	Hoare Lea	Bingham Hall Partnership		79.84	Excellent
New Records Office (The Keep)	Atkins (Faithful & Gould)	Kier	East Sussex County Council	Atkins	Kier	Kier Process & Engineering	Kier Process & Engineering	Kier Process & Engineering.		78.57	Excellent
Worcester Library & History Centre	Max Fordham LLP	Galliford Try	Galliford Try & Worcester City Council	Fielden Clegg Bradley Studios	Galliford Try Construction	Max Fordham LLP	Max Fordham LLP	Hyder Consulting Ltd	Grant Associates (Landscape Architects)	78.31	Excellent
My Place, Oswestry	Halcrow Group Limited	Shropshire County Council	Shropshire County Council	Howls Associates	Interclass	ESDP	ESDP	Bridges Pound	Engineering Services Design Practice Ltd (Building Services)	77.53	Excellent
Yeovil Sterile Services Department	Blue Sky Design Service Ltd	CFES Ltd	Yeovil District Hospital NHS Foundation Trust	CFES Ltd / ADG	CFES Ltd		Acies Structural Engineers		MPH Building Systems	77.39	Excellent
University of Bristol Students' Union	Building Design Partnership BDP	University of Bristol	University of Bristol	Fielden Clegg Bradley Studios	Cowlin Construction	AECOM	AECOM	Capita Symonds	Faithful & Gould (QS) Nicholas Pearson Associates (LA) Proveilo (Project Man)	76.41	Excellent
East Midlands Airport Hotel	Hulley and Kirkwood Consulting Engineers	Manchester Airport Developments	Manchester Airport Developments	Leach Rhodes Walker LLP	Bowmer and Kirkland	Hulley & Kirkwood	Hulley & Kirkwood	Capita Symonds		76.3	Excellent
The Francis Crick Institute	URS Corporation Limited	UKCMRI Construction Ltd	The Francis Crick Institute	HoK Architects, PLP Architecture	Laing O'Rourke	Arup	Arup	Adams Kara Taylor		76.16	Excellent

INDUSTRIAL

Development name	Assessors	Developer	Client	Architect	Contractor	M & E	Service Engineer/ Consultant	Structural Engineer / Consultant	Others	Score	Rating
Forester Hill New Energy Centre	Mott MacDonald Ltd	NHS Grampian	NHS Grampian	Keppie Designs	Laing O'Rourke				Mott MacDonald (Building Services)	83.32	Excellent
BBC Production Studio	Ove Arup and Partners	Igloo Regeneration / Welsh Assembly Government	Igloo Regeneration	Holder Mathias Architects	Vinci Construction UK	Arup	Arup	Bay Associates	Davis Langdon (Project Management)	82.72	Excellent
Corby Enterprise Centre	Building Services Design (Cambridge) Ltd	BeLa Partnerships Ltd	Corby Borough Council	DLA Architects	Kier Marriott	Building Services Design	Building Services Design	Clarke Bond		78.45	Excellent
Decontamination Unit	AECOM	Bedford Hospital NHS Trust	Bedford Hospital NHS Trust	The Design Buro	Laing O'Rourke		Thermal Transfer Limited		Laing O'Rourke (QS)	77.91	Excellent
BFI Master Store	SDS Energy	Gilbert Ash	British Film Institute	Edward Cullinan Architects	Gilbert Ash	Crouch Perry Wilkes	Crouch Perry Wilkes	Curtins Consulting		76.43	Excellent
Newhouse Distribution Centre	Goodrich Projects	ProLogis Development Ltd	Winvic Construction ltd	Stephen George & Partners LLP	Winvic Construction Ltd					76.32	Excellent
Project Majestic	Goodrich Projects	Hampton Brook Developments	Winvic Construction ltd	Tew and Smith	Winvic Construction Ltd					75.71	Excellent
Newhouse Distribution Centre	Goodrich Projects	ProLogis Development Ltd	Winvic Construction ltd	Stephen George & Partners LLP	Winvic Construction ltd					74.98	Excellent
Morrisons Regional Distribution Centre	AECOM	Morrisons	Morrisons	DLA Architecture Ltd	Bowmer and Kirkland Ltd	Milton Mechanical Services	NG Bailey	3E Consulting Engineers	Johnson Controls Inc (Refrigeration Engineers)	73.43	Excellent
O&M Facility, Ramsgate	Wakemans Ltd	London Array Limited	London Array Limited	BBLB	Mansell					73.35	Excellent

OFFICES

Development name	Assessors	Developer	Client	Architect	Contractor	M & E	Service Engineer/ Consultant	Structural Engineer / Consultant	Others	Score	Rating
Green Incubator	RPS	South Tyneside Council	South Tyneside Council	+3 Architecture'	Robertson Construction (NEE) Ltd	RPS Group plc	RPS Group plc	Capita Symonds		87.77	Outstanding
Harton Staithes	AECOM	South Tyneside Council	South Tyneside Council	+3 Architecture'	Miller Construction Ltd	AECOM	AECOM	AECOM		78.07	Excellent
Monmouthshire HA HQ	WYG	Monmouthshire Housing Assoc Ltd	Monmouthshire Housing Assoc Ltd	B3 Architects	Dawnus Construction	WYG Engineering	WYG Engineering	RVW Consulting		77.75	Excellent
AmEx House	Inbuilt Ltd	Sir Robert McAlpine	American Express	EPR Architects	Sir Robert McAlpine	NG Bailey		Buro Happold		77.67	Excellent
NWH Offices	Green Build Consult Ltd	Commercial Development Projects Ltd	Marshall CDP Ltd	BMS Ltd	Marshall Construction (West Yorkshire) Ltd	FHP Partnership				76.7	Excellent
Countryside Council For Wales Offices	CDP (Carpenter Davies Partnership Limited)	Watkins Jones & Sons	Watkins Jones Group on behalf of Planehouse Ltd	Watkins Jones Construction	Watkins Jones Construction					76.02	Excellent
More London Fire Station	Ove Arup and Partners	More London Limited	More London Limited	Keith Williams Architects	MACE					75.52	Excellent
Grove House - Refurbishment	Watkins Payne Partnership	Grove House UK Limited	Grove House UK Limited	Allford Hall Monaghan Morris	Wates Interiors	Watkins Payne & Partners	Watkins Payne & Partners	Elliott Wood Partnership	Jackson Coles (QS)	75.51	Excellent
Corby Enterprise Centre (Plot E2)	Building Services Design (Camridge) Ltd	BeLa Partnerships Ltd	Corby Borough Council	DLA Architects	Kier Marriott					75.48	Excellent
British Geological Survey Phase 2	Pick Everard	British Geological Survey	Natural Environment Research Council	Pick Everard	Kier	Crouch Perry Wilkes	Crouch Perry Wilkes	BWB Consult		75.14	Excellent

RETAIL

Development name	Assessors	Developer	Client	Architect	Contractor	M & E	Service Engineer/ Consultant	Structural Engineer / Consultant	Others	Score	Rating
Waitrose Stratford	Synergy BSS Ltd	Waitrose Ltd	Waitrose	Bamber & Reddan Architects	RG Carter Projects Limited			Hurst Pierce & Malcolm	Synergy BBS Limited (BS Consultant)	89.27	Outstanding
John Lewis Chester	Synergy BSS Ltd	John Lewis	John Lewis Partner-ship	Brooker Flynn Architects	RG-Group	BWS Consulting	BWS Consulting	BWB Consulting (Employers Agent)		78.15	Excellent
Waitrose Wimbledon	Synergy BSS Ltd	Waitrose Ltd	Waitrose	Bamber & Reddan Architects	RG Carter Projects Limited	Synergy BBS Ltd			Synergy BBS Limited (Elec Con-tractor)	76.94	Excellent
Waitrose Poundbury	Synergy BSS Ltd	Waitrose Ltd	Waitrose	Lewis & Hickey	Longcross				Paul Earl (Elec D&B Contrac-tor) J A Sylvester (Mech D&B Contractor)	76.11	Excellent
Winterhill Retail Park	Eight Associates	Winvic Construc-tion Ltd	Routeco Properties Ltd (owner)	Woods Hardwick Architects	Winvic Construc-tion Ltd	Lewis and Beddows (Electrical) Howvale (Mechani-cal)				75.68	Excellent
The Warren C2	Richard Hodkinson Consul-tancy	Berkeley Homes (Urban Re-naissance) Ltd	Berkeley Homes (Urban Re-naissance) Ltd	Stephen Marshall Architects	Berkeley Homes (Urban Re-naissance) Ltd					75.63	Excellent
The Warren C1	Richard Hodkinson Consul-tancy	Berkeley Homes (Urban Re-naissance) Ltd	Berkeley Homes (Urban Re-naissance) Ltd	Stephen Marshall Architects	Berkeley Homes (Urban Re-naissance) Ltd					75.63	Excellent
Waitrose Palm-ers Green	Synergy BSS Ltd	Waitrose Ltd	Waitrose	Lewis & Hickey	Longcross				KBS (Elec-trical D&B Contractor)	75.59	Excellent
Waitrose Raynes Park	Synergy BSS Ltd	John Lewis Partner-ship	Waitrose	Bamber & Reddan Architects	Bowmer and Kirk-land				Underwood Carpen-ter Ltd (Employer's Agent)	75.52	Excellent
Waitrose Amer-sham	Synergy BSS Ltd	Waitrose Ltd	Waitrose	Lewis & Hickey	RG-Group				Paul Earl (Electrical D&B Con-tractor)	75.03	Excellent

HEALTHCARE

Development name	Assessors	Developer	Client	Architect	Contractor	M & E	Service Engineer/ Consultant	Structural Engineer / Consultant	Others	Score	Rating
Houghton Primary Care Centre	Willmot Dixon Re-Thinking Limited	Willmott Dixon Construction Ltd	Sunderland Teaching Primary Care Trust	P + HS Architects Ltd	Willmott Dixon Construction	Mott MacDonald	Breathing Buildings	Cundall Johnston & Partners LLP	Southern Green (Landscape Arch) Turner & Townsend (Cost Consultants)	85.31	Outstanding
Blackburn Health Centre	Blue Sky Environmental	Eric Wright Construction Ltd	Blackburn with Darwen PCT	Nightingale Associates	Eric Wright Construction	JRB Environmental	JRB Environmental	Booth King Partnership		78.23	Excellent
Speke Health Care Centre	WYG	Liverpool & Sefton Health Partnership	Liverpool & Sefton Health Partnership	Taylor Young Architects	Galliford Try Construction	Hulley & Kirkwood Consulting Engineers	Hulley & Kirkwood Consulting Engineers	TRP Consulting		77.85	Excellent
Hodge Hill Health and Well Being Centre	One Creative Environments Limited	Prime Plc	BaS LIFT	One Creative Environment	Lkier Moss	One Creative Environment	One Creative Environment	One Creative Environment		75.21	Excellent
Westcliff, North Road	Ferguson Brown Sustainability	South East Essex Primary Care Trust	South East Essex Primary Care Trust	Murphy Phillipps Architects	Galliford Try Construction	Elementa Consulting	Elementa Consulting	Thomasons Partnership	Calford-seaden (Project Manager), Elementa Consulting Ltd (Building Services)	75.2	Excellent
College Road Surgery	Ambient Energy &Environment Ltd	Doctor Horton and Partners	Doctor Horton and Partners	Taylor Young Architects	G F Tomlinson Ltd	Steven A Hunt & Associates	Steven A Hunt & Associates	Keith Palmer Associates	Poole Dick Associates (Project Manager)	74.83	Excellent
Westcliff, Valkyrie	Ferguson Brown Sustainability	South East Essex Primary Care Trust	South East Essex Primary Care Trust	Murphy Phillipps Architects	Galliford Try Construction	Elementa Consulting	Elementa Consulting	Thomasons Partnership	Calford-seaden (Project Manager), Elementa Consulting Ltd (Building Services)	74.7	Excellent
Attwood Green Health Centre	One Creative Environments Limited	Prima 200	BaS LIFT	One Creative Environments Ltd	Mansell Construction Services Ltd	One Creative Environment	One Creative Environment	One Creative Environment	Franklin & Andrews (QS)	74.6	Excellent
Bluebell Lane GP Surgery,	WYG	Renova Developments Ltd	Knowsley Primary Care Trust	JM Architects	Galliford Try Construction	The Associates Consulting Engineers (TACE)	Tace	WYG Engineering		74.55	Excellent
Biddulph PCC	One Creative Environments Ltd	Prima 200	Prima 201	One Creative Environments Ltd	Seddons Construction Ltd	One Creative Environment	One Creative Environment	One Creative Environment	One Creative Environment (QS)	73.99	Excellent

EDUCATION SCHOOLS

Development name	Assessors	Developer	Client	Architect	Contractor	M & E	Service Engineer/ Consultant	Structural Engineer / Consultant	Others	Score	Rating
Crouch Hill Community Park	Gifford	London Borough of Islington	London Borough of Islington	Penoyre & Prasad LLP	Willmott Dixon	Gifford London	Gifford London	Adams Kara Taylor Limited	Gifford (Engineer)	90.49	Outstanding
1Elizabeth Garrett Anderson School	Building Design Partnership BDP	Transform	Islington Council	BDP	Balfour Beatty Construction Limited"	BDP	BDP	BDP	BDP (inc Lighting, Acoustics, Planning Consultant and more)	76.54	Excellent
Islington Arts and Media School - New Build	Building Design Partnership BDP	Islington Council	Islington Council	BDP	Balfour Beatty Construction Limited"	BDP	BDP	BDP	BDP (inc Lighting, Acoustics, Planning Consultant and more)	74.01	Excellent
Point Primary School	URS Corporation Limited	FMP Construction Joint Venture	Sgoiltean Ura LLP	3D Reid	FMP	Wallace Whittle	Wallace Whittle & Partners	Goodsons Associates	Faithful & Gould (QS)	71.67	Excellent
Malmesbury Primary School	Richard Hodkinson Consultancy	London Borough of Tower Hamlets	London Borough of Tower Hamlets	London Borough of Tower Hamlets	Jerram Falkus Construction Limited					71.53	Excellent
Bolnore Villge Primary School	DBK Group	West Sussex County Council	West Sussex County Council	Re Format	ROK	Gifford		WYG Engineering Ltd	WYG (Project Manager)	71.3	Excellent
Islington Arts and Media School- Refurbishment	Building Design Partnership BDP	Islington Council	Islington Council	BDP	"Balfour Beatty Construction Limited"	BDP	BDP	BDP	BDP (Lighting / Acoustics/ Public Health/ Landscape Architect/ Planning Consultant)	70.89	Excellent
Chieveley School	GB ESPM	West Berkshire Council	West Berkshire Council	Pottinger Architects	Midas Group Limited	BJP Consulting	BJP Consulting Group Ltd	JDL Consultants	Kiley iates(Project manager & QS)	70.88	Excellent
Netherhall Primary School	Ingleton Wood	CYPS Cambs County Council	CYPS Cambs County Council	Capita Architecture	Willmott Dixon Construction					70.86	Excellent
Balivanich Primary School	URS Corporation Limited	FMP Construction Joint Venture"	Sgoiltean Ura LLP	3D Reid	FMP	Wallace Whittle	Wallace Whittle & Partners	Goodsons Associates	BRE Scotland (Sustainability Advisors)	70.72	Excellent

EDUCATION FURTHER EDUCATION

Development name	Assessors	Developer	Client	Architect	Contractor	M & E	Service Engineer/ Consultant	Structural Engineer / Consultant	Others	Score	Rating
SusCon	Eight Associates	ProLogis Development Ltd	Dartford Borough Counci	Stephen George & Partners	Winvic Construction Ltd				North West Kent College (tenant)	88.85	Outstanding
Smart Life	Pick Everard	Cambs County Council and Cambridge Regional College	Cambs County Council and Cambridge Regional College	Pick Everard	Kier Marriott	Pick Everard	Pick Everard	Pick Everard		74.95	Excellent
Coleg Menai Energy and Fabrication Centre	RSK Group plc	Lend Lease Projects	Lend Lease Projects	Lend Lease Design	Anwyl Construction Co Ltd	Lend Lease Limited	Lend Lease Limited	Campbell Reith Hill		73.47	Excellent
CAM Extension, Coleg Menai	RSK Group plc	Lend Lease	Coleg Menai	Lend Lease Design	Anwyl Construction Co Ltd					72.57	Excellent
Bridgwater College - Energy Skills Centre	Jones King Partnership	Kier Western	Bridgwater College	DKA	Kier Western Limited	Jones King Partnership	Jones King Partnership	Structures 1	Hills Ltd (Project Manager & Cost Consultants)	72.08	Excellent
Goodwin Learning Resource Centre	Energy Building Ltd	The Goodwin Development Trust	The Goodwin Development Trust	Westray Keith Phelps Ltd	Geo. Houlton & Sons Ltd	2-Can Ltd				72.06	Excellent
LIFE	Stride Treglown PLC	Torfaen County Borough Council	Torfaen County Borough Council	Powell Dobson Architects	Kier Western	Hoare Lea	Hoare Lea	Bingham Hall Partnership		71.86	Excellent
Horticultural Science Building	DBK Group	Berkshire College of Agriculture	Berkshire College of Agriculture	SMC Charter Architects	Warings Contractors Ltd	Inertia Construction Engineering	Inertia Construction Engineering Limited	Jenkins & Potter	King Sturge LLP (Project Manager)	61	Very Good
Berkshire Collage of Agriculture	DBK Group	Berkshire College of Agriculture	Berkshire College of Agriculture	SMC Charter Architects	Warings Contractors Ltd	Inertia Construction Engineering	Inertia Construction Engineering Limited	Jenkins & Potter	King Sturge LLP (Project Manager)	56.5	Very Good

HIGHER EDUCATION

Development name	Assessors	Developer	Client	Architect	Contractor	M & E	Service Engineer/ Consultant	Structural Engineer / Consultant	Others	Score	Rating
Lancaster Institute Contemporary Arts	Hoare Lea	Lancaster University	Lancaster University	Sheppard Robson	Morgan Sindall	Hoare Lea	Hoare Lea		Hoare Lea (Building Services Consultant)	87.81	Outstanding
LSE Student Centre	BSRIA Limited	London School of Economics and Political Science	London School of Economics and Political Science	O'Donnell & Toumey Projects Ltd"	Osborne	BDSP	BDSP Partnership	Dewhurst Macfarlane	Northcroft (QS) Turner & Townsend (Project manager)	86.45	Outstanding
Glasgow School of Art	Ove Arup and Partners	Glasgow School of Art	Glasgow School of Art	Steven Holl and JM Architects	Sir Robert McAlpine & Sons	Arup	Arup	Arup	Arup (Engineers)	74.15	Excellent
Mathematics and Lecture Theatre Building	Gleeds Management Services Ltd	University of Nottingham	University of Nottingham	William Saunders	Kier Marriott	Was BSP but gone into liquidation. Now called B3 Building Services	Was BSP but gone into liquidation. Now called B3 Building Services	Curtins	BSP(M&E Design) Gleeds (Project Manager)	71.65	Excellent
Engineering Hub	Wm Saunders Partnership LLP	University of Lincoln	University of Lincoln	Allies and Morrison	BAM Construction Ltd	URS/Scott Wilson	Mott MacDonald	Ward Cole Consulting Engineers	Mott MacDonald (clients M&E Designer & Engineer)	71.21	Excellent
Engineering & Science Learning Centre	Southfacing Services Ltd	University of Nottingham	University of Nottingham	Hopkins Architects	Mansell	Arup	Arup	Arup	Gardiner & Theobald (Project Manager & Cost Consultant)	71.13	Excellent
Trinity St Davids Teaching & Learning Block	Ove Arup and Partners	The University of Wales Trinity St David	The University of Wales Trinity St David	Boyes Rees Architests	Kier Western	Arup	Arup	Jubb Consulting Engineers Ltd	Arup (BS Engineers) Davis Langdon (Cost Consultants)	70.93	Excellent
Art and Design - New Building	Ove Arup and Partners	Manchester Metropolitan University	Manchester Metropolitan University"	Feilden Clegg Bradley Architects	Morgan Sindall	Arup & Partners	Arup & Partners	Arup	Arup (BS & Acoustic Engineers, Ecologist) Turner & Townsend (Project Manager & Cost Consultant)	70.19	Excellent
School of Chemical Engineering & Analytical Sciences Building	AECOM	University of Manchester	University of Manchester	Halliday Meecham Architects	Galliford Try Construction North	Jacobs	Jacobs	WYG Planning And Design	Jacobs (Building Services) WYG (Civil Engineers)	62.18	Very Good
Exercise & Sports Science Centre, MMU Cheshire	Hoare Lea	Manchester Metropolitan University"	Manchester Metropolitan University"	Fletchers	Eric Wright Construction Ltd	Hoare Lea	Hoare Lea		Hoare Lea (Building Services Consultant)"	60.87	Very Good

INTERNATIONAL

Development name	Assessors	Developer	Client	Architect	Contractor	M & E	Service Engineer/ Consultant	Structural Engineer / Consultant	Others	Score	Rating
Tour Majunga, France	IOSIS Concept	SNC LEFOUL-LON	SNC LEFOUL-LON	Jean-Paul Viguier SA	Groupe-ment Eiffage Construc-tion / Groupe Goyer					77.43	Excellent
Vaci Campus Building A, Hungary	Buro Hap-pold Polska Sp. z o.o.	Atenor Group	Atenor Group	TIBA Epitesz Studio Kft, SMG-Sisu Kft, Vibro-comp Kft					TIBA Epitesz Studio Kft, SMG-Sisu Kft, Vibrocomp Kft (design team)	76.16	Excellent
Crystal Tower, Romania	Build Green Romania	Plaza De-velopment SRL	Plaza De-velopment SRL	AS Project Birou Individual Arhitectura	AWV Group Construct SRL					75.6	Excellent
UCD Science East & Hub, Ireland	AG Con-sulting	Univer-sity College Dublin	Univer-sity College Dublin	RKD Archi-tects		Delap & Waller		Arup	Fintan Bracken, Tim Ryle (ecologist)	73.79	Excellent
Roscommon Decentralised Offices, Ireland	Buro Hap-pold	JSL Group Ltd		Coady Part-nership	JSL Group Limited			Buro Happold	JSL Group Lim-ited (project man-ager)Tobins Consulting Engineers (Civil engineer)	72.86	Excellent
Les Terrasses du Port, France	RFR Ele-ments	Groupe Hammer-son	Groupe Hammer-son	4A	Vinci					72.36	Excellent
PABEL-LON BUESA ARENA, Spain	LKS Ingenieria S.Coop	Alava Agencia de Desarollo	Diputacion Foral de Alava	Jose Luis Caton Santaren	UTE Buesa Arena				LKS Ingenieria S.Corp (technical assistance to design team)	69.98	Very Good
Piri Reis Üniver-sitesi, Turkey	Turkeco Consulting	DENİZ TİCARET ODASI		Kreatif Mimarlik Ltd Sti	Bahadir Insaat A.S	HB Teknik Ltd STI (Mech), GN Muhenislik Ltd. STI (Elec)				67.22	Very Good
FORUM II, Belguim	B4F	Immobel SA	Immobel SA	Archi 2000	Les Enterprises Louise de Waele				TPF En-gineering (Building Services) JNC (Ecologist), VK-Engi-neering (Stability Engineer, Venac (Ac-oustician)	67.08	Very Good
DYO C Block, Piri Reis Üniver-sitesi, Turkey	Turkeco Consulting	Turkish Education and Marine Founda-tion	Piri Reis University	Kreatif Mimarlik Ltd Sti	Bahadir Insaat	GN En-gineering (Mechani-cal)				64.46	Very Good

MULTI RESIDENTIAL

Development name	Assessors	Developer	Client	Architect	Contractor	M & E	Service Eng/Consultant	Struc Engineer / Consultant	Others	Score	Rating
Sustainable Student Village, Bradford University	GWP Project Services Ltd	Listerhills SSV Limited	Listerhills SSV Limited	GWP Architecture Ltd	GB Building Solutions Ltd	Balfour Beatty Eng Services Ltd (Contractor) Jackson Coulson (Consultant)	Jackson Coulson	Robinson Design	Ecores	95.05	Outstanding
Students Residence, University of Glamorgan	McCann & Partners Consulting Engineers"	University Of Glamorgan	University Of Glamorgan	Boyes Rees Architects	Vinci Construction Ltd	Hicks Titley Partnership		Nicholson Jones Partnership Ltd	Faithfull & Gould (Project Manager, QS & Cost Consultant)	75.1	Excellent
Northfields	Scott Hughes Design	University of Sussex	University of Sussex	Pascall and Watson	Ocon	Hoare Lea		GSP Grove	Land Use Consultants (Ecologist) Currie & Brown (Project Manager)	74.75	Excellent
Isledon Road	MTT Sustain	UKSA Isledon Road Sarl	UKSA Isledon Road Sarl	TP Bennett						73.86	Excellent
Higher Drive	CEN Services Ltd	Fairlie House	Fairlie House	Orme Architecture	Castleoak					73.78	Excellent
Crewe YMCA	Inbuilt Ltd	YMCA England	Crewe YMCA	Terence O'Rouke	Bowmer & Kirkland				B & K Building Services Ltd (Project Manager)	73.68	Excellent
Botley Alzheimers Home	Halcrow Yolles	Vale Housing Association Ltd	Vale Housing Association Ltd	GBS Architects	Feltham Construction			AKS Ward	Halcrow Group Ltd (Building Services)	73.33	Excellent
Blackhall Assisted Accommodation	DSSR Consulting Engineers	Barr Limited	Renfrewshire Council (Housing & Property Services)	Barr Technical Services	Barr Limited	George Birchall Ltd	George Birchall Ltd	T Lawrie & Partners	Barr Quantity Surveyor Renfrewshire Council Project Manager	72.31	Excellent
North Star House	Edmond Shipway	UNITE Group plc	RG Group	Hadfield Cawkwell Davidson	RG Group					71.36	Excellent
Wadhurst Manor Care Home	McCann & Partners Consulting Engineers	Castleoak Care Developments	Castleoak Group	Carless & Adams Partnership	Castleoak Care Developments	McCann & Partners	Castleoak Care Developments	Jenkins and Potter Consulting Engineers	Castleoak Care Developments (Project Manager)	71.06	Excellent

APPENDIX B: BEST OF BREEAM IN 2010

BESPOKE

Development name	Assessors	Developer	Client	Architect	Contractor	M & E	Services Engineer/ Consultant	Structural Engineer / Consultant	Others	Score	Rating
University of Bradford, Sustainablity & Enterprise Centre	Atkins (Faithful & Gould)	University of Bradford	University of Bradford	Farrell & Clark	GB Building Solutions Limited	Silcock Leedham	WSP Consulting Engineers	Silcock Leedham	Gleeds Management Services Ltd (Project Manager) Faithful & Gould (QS)	94.95	Outstanding
Brockholes Wetlands Nature Reserve	Scott Hughes Design	The Wildlife Trust	The Wildlife Trust	Adam Khan Architects	Mansell Construction Services Ltd"	Max Fordham Consulting Engineers"	Max Fordham Consulting Engineers"	Price & Myers	The Wildlife Trust (Ecological Consultant) Bovis Lend Lease Consulting (Project manager)	85.19	Outstanding
University of St Andrews, BMS Annex	Turner & Townsend	University of St Andrews	University of St Andrews	Boswell Mitchell and Johnston Architects	Sir Robert McAlpine	RSP Consulting Engineers	RSP Consulting Engineers	Grontmji Engineers	Turner & Townsend Ltd (Project manager) DI Burchell & Partners (QS)	83.51	Excellent
Ironmonger Row Baths	Building Design Partnership BDP	Islington Council	Islington Council	Tim Ronalds Architects	Wates Development Limited	Max Fordham Consulting Engineers	Max Fordham Consulting Engineers	Alan Baxter & Associates	Synergy Construction & Property Consultatants (Project Manager) Northcroft (QS)	76.56	Excellent
Pinderfields Education Centre	WYG Engineering Ltd	The Mid Yorkshire NHS Trust	The Mid Yorkshire NHS Trust	Avanti Architects	Balfour Beatty Construction Ltd	Jackson Coulson Partnership	Jackson Coulson Partnership			72.96	Excellent
Culture Fusion, Bradford	Silcock Leedham LLP	City of Bradford YMCA	City of Bradford YMCA	Bowman Riley Architects	BAM Construction Ltd	Silcock Leedham	Silcock Leedham	WSP Consulting Engineers	Rex Proctor & Partners (Project Manager) Faithful & Gould (QS)	72.19	Excellent
Plot 3, Netpark, Sedgefield	WYG Engineering Ltd	Durham County Council	Durham County Council	Devereux Architects	Surgo Construction Ltd	Desco (Design Consultancy) Ltd	Desco (Design Consultancy) Ltd	Billinghurst George & Partners	Turner & Townsend Ltd (Project Manager)	71.74	Excellent
St Mary of the Angels Childrens' Centre	Ingleton Wood	Speller Metcalfe Limited	Westminster City Council	Ingleton Wood LLP	Speller Metcalfe Limited	Ingleton Wood LLP	Ingleton Wood LLP			70.64	Excellent
Robert Gordon University - Nursery	K J Tait Engineers	The Robert Gordon University	The Robert Gordon University	BDP						66.38	Very Good
Travelodge, St Giles House	MRB Consulting Engineers	Parklake Ltd	Parklake Ltd	JWA Architects	Barnes Construction					65.55	Very Good

INDUSTRIAL

Development name	Assessors	Developer	Client	Architect	Contractor	M & E	Service Engineer/ Consultant	Structural Engineer / Consultant	Others	Score	Rating
New Premises for Clear Flow	csa-architects	Clear Flow Ltd	Clear Flow Ltd	Robertson Partnership	Cathedral Builders				Business Location Services (Project manager)	74.76	Excellent
Lands End Direct Warehouse	Capita Symonds Limited	Lands End UK Ltd	Lands End UK Ltd	Pinnegar Hayward Design	Quantum Construction Ltd		Fusion Building Consultant		Warehouse Systems Ltd (Project manager)	72.51	Excellent
Royal Mail Sorting Office Coventry	Halcrow Yolles	John Sisk & Son Limited	Royal Mail	Synergy Architects	John Sisk & Son Limited				DBK Partners LLP	65.05	Very Good
Glenmorangie New Office and Bottling Facility	K J Tait Engineers	Glenmorangie Company Limited	Glenmorangie Company Limited	Blyth & Blyth	Kier Construction Limited					64.04	Very Good
Safestore Self Storage Warehouse	RPS	Safestore Ltd	Safestore Ltd	Tew & Smith Associates	R G Carter	The Jones Partnership	The Jones Partnership	GGP Consulting Engineers	Underwood Carpenter (Project Manager) The Jones Partnership Swansea Ltd (Building Services)	63.87	Very Good
Plot O, Felin Fach	Encon Melin Partnership	Procum Harrow	Procum Harrow	Gillies, Henning & Associates Ltd	Graven Construction Limited				Meiron Howells Project Management (Project Manager) RDM Electrical Services Ltd (Building Services)	63.75	Very Good
Units 6 and 8 Prospect Way	Eight Associates	Hi-Force	Daventry District Council	Daventry District Council	Interserve					63.02	Very Good
Leeming Bar Food Enterprise Centre, Units B1-B4	Gammond Evans Crichton Ltd	William Birch & Son Ltd	Hambleton District Council	Gowers Bell Ltd	William Birch & Son Ltd	Hambleton District Council	Hambleton District Council	Hambleton District Council	H & C Moore (Services Consultant)	62.28	Very Good
Skyline Industrial Unit NX4	AECOM	Countryside Properties (Special Projects) Ltd	Countryside Properties (Special Projects) Ltd	Paul Johnson Architects	Harmonix Construction Ltd	AWA Building Consultants	AWA Building Consultants			61.37	Very Good
Leeming Bar Food Enterprise Centre, Units A1 - A6	Gammond Evans Crichton Ltd	William Birch & Son Ltd	Hambleton District Council	Gowers Bell Ltd	William Birch & Son Ltd	Hambleton District Council	Hambleton District Council	Hambleton District Council	H & C Moore (Services Consultant)	59.2	Very Good

OFFICES

Development name	Assessors	Developer	Client	Architect	Contractor	M & E	Service Engineer/ Consultant	Structural Engineer / Consultant	Others	Score	Rating
Lion House	3 Planets Ltd	DEFRA	DEFRA	Gibberd and Frank Shaw Architects	Kier North East			AECOM	AECOM (Building Services) Davis	87.28	Outstanding
The Co-operative HQ	Buro Happold	The Co-operative Group	The Co-operative Group	3D Reid Architects	BAM Construction Ltd	Buro Happold	Buro Happold	Buro Happold	SKM (Ecologist) Sol Acoustics (Acoustician) Gardiner & Theobold (Project Manager)	85.36	Outstanding
Monmouthshire Housing Association HQ	WYG Engineering Ltd	Monmouthshire Housing Association	Monmouthshire Housing Association HQ	B3 Architects	Dawnus Construction	White Young Green	White Young Green	RVW Consulting	Faithful & Gould (QS)	79.38	Excellent
North South Ministerial Offices Armagh	Buro Happold	Armagh City and District Council	Armagh City and District Council	Scott Wilson	John Sisk and Sons Contractor					78.1	Excellent
Finance and Registry Building	Atkins Limited	Coleg Llandrillo Cyrmu	Coleg Llandrillo Cyrmu	Atkins	Extraspace	Atkins Group	Atkins Group	Atkins Group		75.39	Excellent
Chiswick Green	BAM Design Ltd	BAM Properties Ltd	BAM Construction Ltd	Vincent & Gorbing Associates	BAM Construction Ltd	BAM Properties Ltd	BAM Properties Ltd	BAM Properties Ltd		74.93	Excellent
Network Rail National Centre	Scott Wilson Ltd	Network Rail	Network Rail	GMW Architects	BAM Construction Ltd	URS Scott Wilson	URS Scott Wilson	Waterman Group	Mace Construction (QS)	74.65	Excellent
QUB Anatomy Wing Extension	WYG Engineering Ltd		Queens University Belfast	BMJ Architects	McLaughlin & Harvey Ltd	WYG Ireland				73.4	Excellent
Wakefield Civic Offices	Gleeds Management Services Ltd	English Cities Fund	English Cities Fund	Cartwright Pickard Architects	Clegg Group Limited	Buro Happold	Buro Happold	Buro Happold	Gleeds (Cost Managers)	73	Excellent
Centre for Disability Studies	Southfacing Services Ltd	Disability Essex	Disability Essex	Simmonds Mills	DCH Construction	Alan Clarke				72.83	Excellent

RETAIL

Development name	Assessors	Developer	Client	Architect	Contractor	M & E	Service Engineer/ Consultant	Structural Engineer / Consultant	Others	Score	Rating
Waitrose Leeds Meanwood	Synergy BSS Ltd	Waitrose	Waitrose	"Bamber and Redman Architects"	RG Group	Synergy	Synergy	WA Fairhurst & Partners	Synergy BSS Ltd (Building Services Consultants)	70.97	Excellent
Booths	AECOM	EH Booth and Co Limited	EH Booth and Co Limited	Wilson Mason Partners	Eric Wright Construction Ltd	Greenway Electrical	AECOM	AECOM	S C Horsfield Building Service Engineers Limited (Building Services) Hamilton Clarke (Refrigeration Engineers)	70.96	Excellent
Waitrose Cambridge	Synergy BSS Ltd	Waitrose	Waitrose	Lewis & Hickey	Schweitzer Limited	HVAC Ltd (Mechanical) Paul Earl Ltd (Electrical)			Synergy BSS Ltd (Building Services Consultants)	60.77	Very Good
Waitrose Cheam	Synergy BSS Ltd	Waitrose	Waitrose	Lewis & Hickey	RG Group	Kershaw Mechanical Services			T Clarke (Electrical D&B Contractor)	60.58	Very Good
Waitrose Wellington	Synergy BSS Ltd	Waitrose	Waitrose	Lewis & Hickey	RG Group				Underwood Carpenter (Employer's agent)	60.13	Very Good
Waitrose Lutterworth	Synergy BSS Ltd	Waitrose	Waitrose	Bamber & Reddan Architects Ltd	RG Carter Projects Ltd				Synergy BSS Ltd (Building Services Consultants) Underwood Carpenter (Employer's Agent)	58.6	Very Good
Waitrose Banstead	Synergy BSS Ltd	Waitrose	Waitrose	Bamber & Reddan Architects Ltd	RG Carter Projects Ltd				Synergy BSS Ltd (Building Services Consultants) Underwood Carpenter (Employer's Agent) Oaksmere Refrigeration (Refrigeration Consultant) EC Harris (Cost Consultants)	57.97	Very Good
Lidl York	Future Energy Surveys Ltd	Lidl UK GmbH	Lidl UK GmbH	Humphreys Teal Ltd	2MS Construction					55.77	Very Good
Lidl Dagenham	Cyril Sweett Ltd	Lidl UK Ltd	R G Carter	Lapworth Architects Limited	R G Carter Building Ltd					55.38	Very Good
The Parade Swindon	Cundall	Shearer Property Group	UK Commercial Property Trust Limited"	Leslie Jones Architect	John Sisk & Son Limited	Cundall LLP (Engineers)	Cundall LLP (Engineers)	Cundall LLP (Engineers)	Cundall LLP (Engineers)	46.18	Good

HEALTHCARE

Development name	Assessors	Developer	Client	Architect	Contractor	M & E	Service Engineer/ Consultant	Structural Engineer / Consultant	Others	Score	Rating
Oriel Drive Health Centre	WYG Engineering Ltd	Liverpool & Sefton Health Partnership	Liverpool Primary Care Trust	Triangle Architects	Galliford Try	Paul Moy Associates	Paul Moy Associates	TRP Consulting		78.34	Excellent
City Centre Health Facility	3 Planets Ltd	Coventry Care Partnership	Coventry Care Partnership	Sonnemann Toon Architects	Galliford Try	Crouch Perry & Eilkes	Crouch Perry & Eilkes	Mark Brock Consulting Engineers	Ecology Solutions (Ecologists)	74.4	Excellent
Saltley PC and WB Centre	One Creative Environments Limited	Prima 200	BaS Lift Co	"One Creative Environments Ltd"	Mansells Construction Services Ltd	One Creative Environment	One Creative Environment	One Creative Environment	Franklin & Andrews (QS)	73.99	Excellent
Meir Primary Care Centre	One Creative Environments Limited	Prime PLC	Prima 200	One Creative Environments Ltd"	Wates Construction Limited	One Creative Environments Ltd	One Creative Environments Ltd	One Creative Environments Ltd		73.92	Excellent
Glebefields Primary Care Centre	One Creative Environments Limited	Thomas Vale Construction	Sandwell Lift Co	HLN Architects Ltd	Thomas Vale Construction	Avus Consulting Limited	Avus Consulting Limited	Mark Brock Consulting Engineers		73.72	Excellent
Nottingham University Hospitals NHS Trust, LINAC Facility	3 Planets Ltd	Nottingham University Hospitals NHS Trust"	Nottingham University Hospitals NHS Trust"	P + HS Archtects	Medicing Simons JV	Crouch Perry & Eilkes	Crouch Perry & Eilkes	BGP Consulting	Cyril Sweet Group (Client Rep) Delta-Simons Env Consultants (Ecologists)	72.57	Excellent
Sparkhill Primary Care Centre	One Creative Environments Limited"	Prime PLC	BaS Lift Co	One Creative Environments Ltd	Wates Construction Limited	One Creative Environment	One Creative Environment	WSP Group		72.39	Excellent
Finchley Memorial Hospital	Ferguson Brown Sustainability	Assura Lift	Assura Lift	Murphy Phillips	Galliford Try	Elementa Consulting	Elementa Consulting	Elementa Consulting	Assura Lift (Project Man & Technical Advisor) Elementa Consulting (Building Servs Engineers)	72.17	Excellent
Pennine Decant Ward, Arnold Lodge	AECOM	Nottinghamshire Healthcare NHS Trust	Nottinghamshire Healthcare NHS Trust	Gilling Dodd Architects	Laing O'Rourke				AECOM (Civil Engineers & Building Services)	72	Excellent
Clatterbridge Centre	WSP Environmental Ltd.	Clatterbride Centre for Oncology"	Clatterbride Centre for Oncology"	AFL Architects	Laing O'Rourke	WSP Buildings	WSP Buildings		WSP Environmental Ltd	71.94	Excellent

EDUCATION: SCHOOLS

Development name	Assessors	Developer	Client	Architect	Contractor	M & E	Service Engineer/ Consultant	Structural Engineer / Consultant	Others	Score	Rating
Mayflower Primary School Extension	London Borough of Tower Hamlets	London Borough of Tower Hamlets	London Borough of Tower Hamlets	London Borough of Tower Hamlets	J & C Meadows	London Borough of Tower Hamlets	London Borough of Tower Hamlets	London Borough of Tower Hamlets	Frankham Consultancy Group Limited Building Services)	74.02	Excellent
Malmesbury Primary School	London Borough of Tower Hamlets	London Borough of Tower Hamlets	London Borough of Tower Hamlets	London Borough of Tower Hamlets	Jerram Falkus Construction Limited	London Borough of Tower Hamlets	London Borough of Tower Hamlets	London Borough of Tower Hamlets		72.85	Excellent
Smithy Street Primary School	London Borough of Tower Hamlets	London Borough of Tower Hamlets	London Borough of Tower Hamlets	"London Borough of Tower Hamlets	J & C Meadows	London Borough of Tower Hamlets	London Borough of Tower Hamlets	London Borough of Tower Hamlets		72.6	Excellent
Goodmayes Primary School	MTT Sustain	London Borough of Redbridge	London Borough of Redbridge	Architects Plus	Neilcott Construction	London Borough of Redbridge	London Borough of Redbridge	London Borough of Redbridge	Anthony Jay Partnership (Building Services Consultant)	71.58	Excellent
Bygrove School Extension	Richard Hodkinson Consultancy	London Borough of Tower Hamlets"	London Borough of Tower Hamlets	London Borough of Tower Hamlets	Lakehouse	London Borough of Tower Hamlets	London Borough of Tower Hamlets	Colin Toms & Partners		71.51	Excellent
Tilehurst Childrens' Centre	Halcrow Yolles	West Berkshire Council	West Berkshire Council	The Bush Consultancy	Leadbitter	PJP Engineering	PJP Engineering	JDL Consultants	Kiley Associates (Project Manager) ProAir Ltd (Building Services Engineer)	71.34	Excellent
Burghfield Childrens' Centre	Halcrow Yolles	West Berkshire Council	West Berkshire Council	The Bush Consultancy	Leadbitter	PJP Engineering	PJP Engineering	JDL Consultants	Kiley Associates (Project Manager) ProAir Ltd (Building Services Engineer)	70.94	Excellent
Maplefield School	Building Services Design (Camridge) Ltd	Bovis Lend Lease	Northampton County Council	Gotch Saunders & Surridge	Graham Construction	Building Services Design	Building Services Design	BCAL Consulting	GSS Architecture (QS)	67.87	Very Good
Broadford Primary School	Jacobs Engineering UK Ltd	London Borough of Havering	London Borough of Havering	Jacobs UK Ltd	Buxton Building Contractors Limited	Jacobs UK Ltd	Jacobs UK Ltd	Jacobs UK Ltd	Jacobs UK Ltd (Ecology & Landscaping)	67.3	Very Good
Hampton School	Eight Associates	Hampton School	Hampton School	Nichols Brown Webber	Feltham Construction Ltd	Omega Building Services	Omega Building Services	WF Browns	The Brinkfell Partnership / Omega and Argyle (Building Services)	59.89	Very Good

FURTHER EDUCATION

Development name	Assessors	Developer	Client	Architect	Contractor	M & E	Service Engineer/ Consultant	Structural Engineer / Consultant	Others	Score	Rating
Stirling Campus Redevelopment	AECOM	Forth Valley College	Forth Valley College	Reiach and Hall	Miller Construction	KJ Tait	KJ Tait	Halcrow Yolles	Turner & Townsend (QS)	73.69	Excellent
Coleg Menai Energy and Fabrication Centre	RSK Group plc	Bovis Lend Lease	Bovis Lend Lease Consulting	Lend Lease Design	Anwyl Construction Company Limited	Lend Lease Design	Lend Lease Design	Campbell Reith Hill		73.22	Excellent
Alloa Campus Redevelopment	AECOM	Forth Valley College	Forth Valley College	Reiach and Hall	Miller Construction	KJ Tait	KJ Tait	Halcrow Yolles	Turner & Townsend (QS)	72.2	Excellent
Newcastle-Under-Lyme College, Skills and Technology Centre	Hoare Lea	Newcastle Under Lyme College	Newcastle Under Lyme College	Ellis Williams Architects	BAM Construction Ltd				Operis Group plc (QS)	70.2	Excellent
Blackburn CollegeBuilding	John Packer Associates	Blackburn College	Blackburn College	Buteress Fuller Alsop Williams Architects Ltd	Bardsley Construction	Walmsley Associates / Hirst & Danson Electrical	Walmsley Associates / Hirst & Danson Electrical	WYG Planning And Design	Walmesley Associates (Building Services)	57.67	Very Good

HIGHER EDUCATION

Development name	Assessors	Developer	Client	Architect	Contractor	M & E	Service Engineer/ Consultant	Structural Engineer / Consultant	Others	Score	Rating
Centre for Environment and Energy, North Highland College	EBBA Consultants Ltd	Robertson Highland	North Highland College	HRI Architects	Morrison Construction Limited	Pick Everard	Pick Everard		Gardiner and Theobald (Project Manager)	80.18	Excellent
Penglais Campus, Aberystwyth University	RAMBOLL WHITBY-BIRD	Aberystwyth University	Aberystwyth University	Pascall & Watson	Willmott Dixon Construction Ltd	Austin Company of UK Limited	Austin Company of UK Limited	Clark Smith Partnership	David Langdon (Project Manager) The Austin Company of UK Ltd (Building Services)	75.27	Excellent
Learning Commons, University of Manchester	Jacobs Engineering UK Ltd	University of Manchester	University of Manchester	Sheppard Robson	Wates Construction Limited	RPS Group Plc	RPS Group Plc	Gifford & Partners	AA Projects Ltd (Project Manager) Jacobs UK (QS) RPS Gregory (Building Services)	73.92	Excellent
Gogerddan Campus, Aberystwyth University	RAMBOLL WHITBY-BIRD	Aberystwyth University	Aberystwyth University	Pascall & Watson	Dawnus Construction Limited	Austin Company of UK Limited	Austin Company of UK Limited		David Langdon (Project Manager) The Austin Company of UK Ltd (Building Services)	72.13	Excellent
Epsom Campus, University of the Creative Arts	Mott MacDonald Ltd	University for the Creative Arts	University for the Creative Arts	Bond Bryan Architects	Leadbitter	Mott MacDonald	Mott MacDonald	Mott MacDonald	Huntley Cartwright (QS)	55.8	Very Good

MULTI-RESIDENTIAL

Development name	Assessors	Developer	Client	Architect	Contractor	M & E	Service Engineer/ Consultant	Structural Engineer / Consultant	Others	Score	Rating
Benwell Court Extra Care Day Centre	calford-seaden	Notting Hill Housing Group	Higgins Construc-tion Plc	PRP Architects	Higgins Construc-tion Plc					58.72	Very Good
Broadfield House	Lovell Partner-ships Ltd	Lovell Partner-ships Ltd	Boston Mayflower	The Design Partner-ship	Lovell Partner-ships Ltd	T Clarke East	T Clarke East			57.27	Very Good
Childrens Ser-vices, Outgang Lane	Sustainable Services Limited	Jack Lunn (Construc-tion) Ltd	Jack Lunn (Construc-tion) Ltd	Halliday Clark Architects	Jack Lunn (Construc-tion) Ltd					56.69	Very Good
Vine Court	Energy Council	Wates Living Space	South Staf-fordshire Housing Associa-tion	Kenn Scaddan Associates Ltd	Wates Living Space					55.58	Very Good

INTERNATIONAL

Development name	Assessors	Developer	Client	Architect	Contractor	M & E	Service Engineer/ Consultant	Structural Engineer / Consultant	Others	Score	Rating
53 Rue du Port	GreenAffair	Bouygures Immobilier & Archon Group	SCCV Lavoisier	Di Fiore					Auris (Design Manager) Berim (HVAC / Electrical & Plumbing Engineer)	90	Outstanding
Akademia Park Officium	Buro Happold	SCD Pasarét Kft.	SCD Pasarét Kft.	Lukacs & Vikar Architect Studio Ltd / Domokos Balazs	Lukacs & Vikar Architect Studio Ltd / Domokos Balazs (Design Team)					78.18	Excellent
SCIENCE MONTOYER	Bopro PM & QS	FEDIMMO	FEDIMMO	Artepolis		I.R.V.R			Bopro PM & QS (Project Manager / Health & Safety Co-ordinator) GroupDDD (Stability Engineer)	78	Excellent
Eiffel Commercial Center	GreenAffair	SNC Lavalin	Unibail-Rodamco	Epstein & Glaiman					Nexity (Project Manager) Semarelp (Project Manager)	73.12	Excellent
Meudon Green Office	URS Corporation Limited	Bouygues Immobilier	Bouygues Immobilier	Atelier 2M Architects		Arcoba			Atelier 2M Architects (Design Team)	72.18	Excellent
FROISSART 95-99	Bopro PM & QS	FEDIMMO	FEDIMMO	Architectes Mahieu et Ass			CES/ Waterman TCA / AUREA		Bopro PM & QS (Project Manager / Health & Safety Co-ordinator) Architectes Mahieu et Ass (Design Team)	72.14	Excellent
Impératrice	Dirk Somers	Befimmo cva	Befimmo cva	Crepain Binst Architecture nv		VK Engineering		Estabilis	VENAC (Acoustical Engineer) Avant Garden & ARIES (Landscaping and ecology)	71.67	Excellent
Toyota Stajerski Avtodom Maribor	DEKRA Industrial GmbH	Toyota	Toyota Adria d.o.o	Miha Milic Biro Arhitekt	Granit d.o.o	Logo-tech d.o.o			Ferlinc d.o.o (Building services) Hidria IMP Klima d.o.o (HVAC Engineers) Biro Arhitekt (Design Team)	70.91	Excellent
Donauzentrum (Extension)	URS Corporation Limited	Unibail Rodamco	DZ-Donauzentrum Besitz-und Vermietungs-Gmbh	Arch Riedl Ziviltechniker GmbH	Ingenieurburo Kainz Planungs GmbH					63.19	Very Good
1a Estación de Servicio Sostenible-Repsol	Eurocontrol	Repsol	Repsol	Ciete	Ferrovial					61.58	Very Good

APPENDIX C: METHODOLOGIES

Four surveys were carried out for this white paper. Building teamed up with client organisation Corenet to find out the attitudes of building occupiers towards the environmental performance of their building portfolios. There were a total of 56 responses to this survey. Respondents included large and small private companies, local authorities and educational institutions.

The second survey asked occupiers how satisfied were they with the performance of their newest buildings. There were a total of 70 responses to this survey; the respondent profile was similar to building occupiers attitudes towards the environmental performance of their portfolios survey.

The third survey was carried out in partnership with the British Property Federation and asked developers about their attitudes towards the environmental performance of their building portfolios. There were a total of 83 responses to this survey, participants included office, retail, residential and industrial unit developers. Respondents included London-based developers with portfolios more than 20 million ft^2 and smaller developers with portfolios under 5 million ft^2.

The forth survey asked specifiers about the environmental criteria set by clients for their current projects and attitudes of specifiers towards the products they specify. There were a total of 341 responses to this survey, participants included architects, architectural technicians and engineers.

Building would like to thank Corenet and the British Property Federation for their assistance with the surveys.