TheFuturesGroup
The New Homes "Think Tank"

Building Better Homes for the Customer

Produced by the Futures Group April 2012

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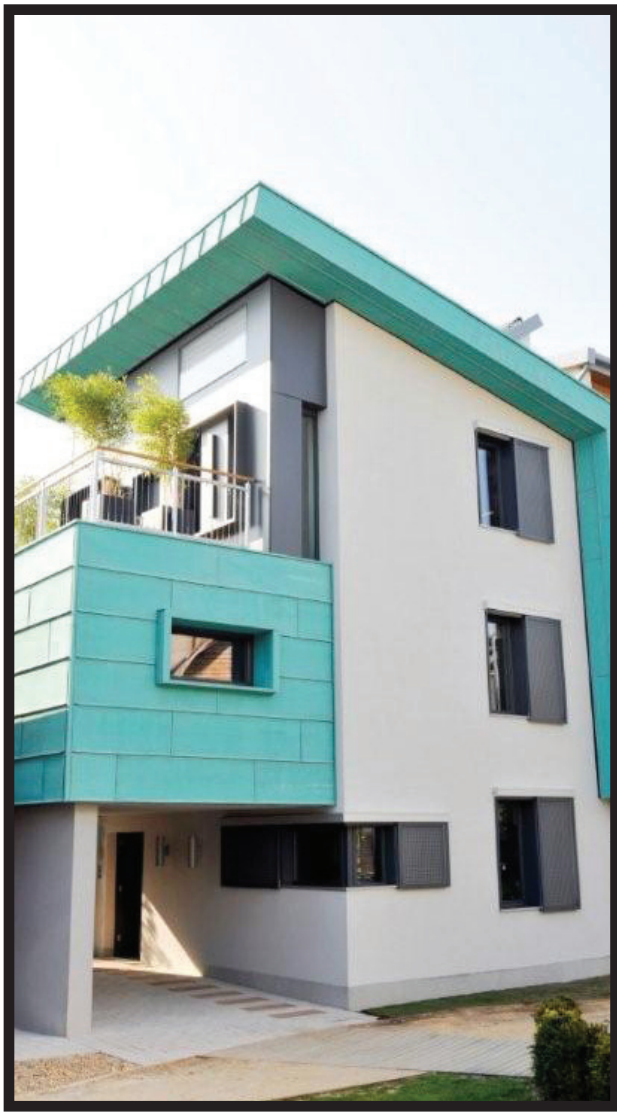

Executive Summary

Contributors to the Futures Group include leading experts from national house builders, manufacturers and regulatory bodies.

This means the Futures Group can provide Government with expert and practical advice on the continuous improvement of the built environment and services. This will result in the construction of better homes, both now and in the future.

Clarity of policy direction is critical to provide the commercial environment to invest in product development and volume manufacture. Unfortunately, such regulatory stability has not been evident to date. The Futures Group can support Government by providing a direct link to expert resource within the industry who can advise on the commercial impact of proposed regulatory changes, based on extensive, cumulative hands-on experience rather than pure theory.

It is important, for the UK PLC economy, that we make best use of tried, tested and trusted materials, produced in the UK, for the construction of homes both now and in the future.

This is the first in a series of reports the Futures Group will submit to meet the low carbon challenge. Unlike many other interest groups, the constitution of the group also enables us to pay particular attention to the principles of responsible sourcing of products.

The traditional consultation process giving voice to many disparate interest groups can create a confusing and unbalanced picture. Members of the Futures Group believe that this has on some occasions resulted in misguided and questionable policy decisions being made which have led to significantly increased cost for the industry and unintended consequences.

With this in mind, the Futures Group strives to approach each of the issues in a balanced and considered way. Critically, it provides several solutions that the industry believes can work in practice, meet the financial and sustainability tests that are vital to the implementation of structured change on a mass market scale, and elevate the needs of the home occupiers to the primary consideration.

The Futures Group favours an evidenced based and safe approach, designed to ensure that the homes we build today will be a lasting legacy for future generations.

The Futures Group is a true co-operative focused on delivering practical sustainable solutions to meet the ever growing housing crisis in the UK. Housing delivery is often considered in limited context neglecting vital parts of the mix including the supply chain and the customer.

The Group recognises that housing is a massive driving force for the UK economy. It is important that we make the best use of tried, tested and trusted materials which are produced in the UK and that manufacturers are encouraged to develop innovative, robustly tested products for the customer as part of our role as a "Think Tank" for the industry.

Recommendations

- **The level of overall carbon emissions for new dwellings in the 2013 amendments to Part L, should not be changed from the 2010 Part L emissions.**
- **Introduce FEES as a metric for homeowners.**
- **Until comprehensive data has been accumulated to test the as-built vs designed assessment of new homes built under the 2010 regulation, The level of overall Carbon emissions for new dwellings in the 2013 amendments to Part L should not be changed from the values set in 2010 Part L**
- **We recommend the immediate establishment of an independent Board of Governance for SAP. For the longer term, Government may wish to look at other ways of managing SAP whilst remaining mindful of the vast amount of data and experience that resides with the current provider.**
- **Bring parts of the Code for Sustainable Homes into regulations and withdraw the Code completely. This will reduce red tape and remove duplication saving time and money.**
- **It is inappropriate to establish a detailed ACD scheme until research shows there is an issue with the use of psi values other than the default situation. However, the Futures Group does consider that a register of details should be available for designers.**

Background

This report offers expert advice to Government on several key issues that will affect the industry between now and 2020.

It is designed to supplement the many consultations that are planned and provide a series of joined up recommendations that, when taken together, would be supported by the vast majority of home builders, manufacturers and regulators.

A key aim of the Futures Group is to research and disseminate information to the smaller home builders who often struggle to deal with the volume and complexity of regulation.

The Group has provided help and advice in the production of what is now regarded as the definitive guide to meeting the requirements of Part L 2010.*

This report is concerned with new dwellings in England and provides housing industry feedback on suggestions for the development of Regulations and the associated Approved Document for the 2013 amendments to Part L.

The Futures Group recommendations are supported with reasoned arguments to assist the Government in its promotion of better quality homes for occupiers.

Context

The Futures Group wishes to build upon previously successful industry-led initiatives, which were designed to assist Government and inform decisions that affect all stakeholders striving to deliver more sustainable communities.

The industry has a long track record of innovative work, tailored to find practical ways to meet changing demands. This includes valuable contributions to several important issues covering industry accreditation and new product development through to certification, new construction methods and specification.

Despite the large body of research work undertaken by home builders, the industry has found itself poorly represented in the key strategic and regulatory consultation process that led to the proposed amendments to Part L of the Building Regulations.

The need to physically restrict numbers attending consultations meetings has inevitably led to a greater proportion of representatives from a diverse selection of commercial interests and pressure groups. Broad based input is welcome, but it should be recognised that respondants who do not have a good understanding of the build process or the economics of the industry may find it harder to contribute meaningfully. This may in turn affect the validity of consultation responses.

As is evident from the examples provided in Appendix A, members of The Futures Group have much to offer Government, particularly with regards to practical and commercially viable solutions.

Despite the large body of research work undertaken by home builders, the industry has found itself poorly represented in the key strategic and regulatory consultation process that led to the proposed amendments to Part L of the Building Regulations.

*Thermal performance; Part L1A- the road to 2016' www.masonryfirst.com.

PART L 2013 - Proposed level of Improvement in Carbon Emissions

Recommendation:
The level of overall carbon emissions for new dwellings in the 2013 amendments to Part L should not be changed from the 2010 Part L emissions.

Carbon Emission Targets for 2013 and 2016

The Futures Group has carefully considered the key question of what should be the appropriate carbon target for the 2013 amendment to Part L. It has been mindful of the current knowledge and state of the home building industry.

Furthermore this would meet the Coalition committment not to add further regulatory burden to SME's in this Parliament.

The previous Government set targets for carbon dioxide emissions from new homes of:

- 25% improvement on Building Regulations Part L (2006) for 2010
- 44% improvement for 2013
- 'Zero Carbon' target for 2016 – approximately 150% improvement on Part L (2006)

Crucially, these targets included regulated and unregulated energy use. Since then, the Coalition Government has revised the 'Zero Carbon' target for 2016. In doing this it eliminated the unregulated energy element and set a new target which approximates to a 100% improvement over the 2006 benchmark.

Since the 2016 target is now lower than originally planned. It would seem reasonable to proportionately relax the original 2013 target decrease of 44%.

This logical approach would in effect set a new 2013 carbon emissions target of around 30% reduction from the 2006 Part L level.

2010 Part L Target Carbon Emissions

In the amended 2010 Part L for new housing, a 25% carbon emission reduction was applied after making all party walls zero heat loss. The improvement provided by designing to achieve zero heat loss in party walls is not accounted for.

According to the 2010 Approved Document L for new dwellings, unfilled cavity party walls have an 'equivalent U value' of 0.5W/m^{2}K.

When fabric improvements are applied to ensure zero heat loss in the party wall the total current carbon emission improvement delivered is actually greater than 30%.

It is known from registrations to Robust Details Limited, that cavity party walls are the most common form in attached dwellings, be they built in masonry or framed construction and new build statistics for England show that some three quarters of houses are attached in some way or another.

This means the industry is effectively already delivering to our proposed revised 2013 figure and we submit that further regulation changes are unnecessary at this time.

Lack of Industry experience of constructing homes to 2010 Part L

Futures Group Members have been involved with the Industry Advisory Group looking at suggestions for the 2013 changes.

The Group found it difficult to establish what specifications the industry is currently using to meet Part L 2010, since the majority of new homes are still being constructed to Part L 2006 standards assessed using SAP 2005.

This is supported by Building Control Alliance statistics on completions of new dwellings, built to the 2010 standard and assessed by SAP 2009, which indicate less than 1% of homes were constructed to the latest standard by the end of 2011. Furthermore, it is erroneous to evidence figures for new homes built to Level 3 of the Code for Sustainable Homes, because changes to successive versions of the Code and Standard Assessment Procedure make accurate comparisons with Part L (2010) totally impractical. The confusion is compounded by the award of code credits for the installation of renewables, often driven by the need to meet planning-led Merton Rule type policies, which may result in a build specification which compensates by employing less demanding fabric standards. Lack of this crucial, verifiable benchmark data concerning the practicality and effectiveness of Part L 2010 design solutions, challenges the wisdom of introducing further enhanced performance standards at this time.

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Notification of a New Metric

Recommendation:

Introduce FEES as a metric for homeowners

En route to meeting the 2016 objective, there is opportunity to prepare the industry for improvements to fabric which will be required to meet the Fabric Energy Efficiency Standard (FEES), but this cannot take place with any certainty until the industry has gained full understanding of where current performance registers in comparison.

In the meantime, to effectively market the benefits of new homes it is also vitally important that customers are clear on the performance of their homes and the Futures Group sees benefit in making available to the customer a modified EPC showing the new metric of measurement of kWhr/m^2/yr, which is a more accessible metric than tons of CO_2 emitted. However, we reiterate that in terms of the 2013 Part L, we recommend retention of the carbon emissions level demanded by the 2010 regulations.

Cost of Building

The report published in August 2011 by DCLG entitled "Cost of building to the Code for Sustainable Homes - Updated cost review" suggests that in increasing the energy performance only, from level 3 to level 4, adds an additional cost of some £3K per dwelling on average.

Even at the current low build rates, this effectively creates an extra £300m-£350m cost burden nationally. This would unduly impact growth in the weakened housing sector by undermining land viability, already under pressure from cumulative regulatory costs.

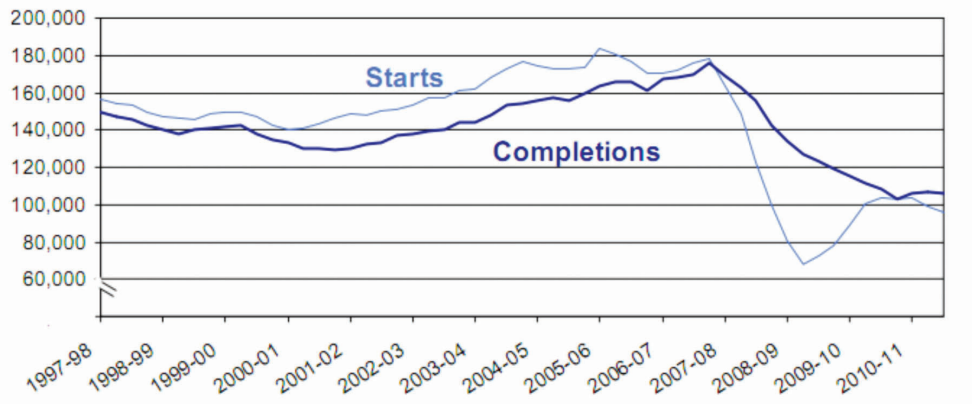
This is evident today in the poorest areas of England where arguably new homes are most desperately required and where land values cannot support development.

Unless this trend is reversed, development in the more affluent South East will become progressively more attractive, resulting in reduced supply to the most needy areas and widening the much-publicised gap between the North and South.

The fragility of the housing recovery and extent of the present housing crisis can be seen in the latest Government housing statistics.

Housing starts are currently running at half the level seen in the 2005 peak. Annual starts in England reached just 96,070 in the 12 months to September 2011. This is down by 7% on the similar period up to September 2010, which was another extremely difficult year for the industry and home buyers.

We must not be responsible for delivering buildings that fail to work in practice. In the worst case scenario, failure to meet expected performance requirements may even damage residents' health. We should also consider that information we have from Scotland where instances of teenage asthma are the worst in Europe. The Zero Carbon Hub Air Quality Group and the NHBC Foundation are both researching this issue, with the former due to report on its investigation in 2012. It would be premature to further amend regulations before its findings to give a clearer understanding of the impacts.



Home Owner Considerations

The private new homes market depends on customer demand and satisfaction. To date, customers have been insufficiently considered in the changes to design resulting both from regulatory change and non-regulatory measures imposed through planning or third party involvement.

It is recognised that there is a need for lifestyle choices to alter if our society is to be more sustainable, but this has to be balanced against basic customer expectations such as a healthy environment in the home. One of the key issues arising from recent regulatory change is that of air quality in very airtight homes.

An NHBC Foundation report into Future Homes built in Milton Keynes in the early 90's highlights some serious concerns regarding the correct operation and maintenance of new technologies such as MVHR.

Even at the current low build rates, this effectively creates an extra £300m-£350m cost burden nationally. This would unduly impact growth in the weakened housing sector by undermining land viability, already under pressure from cumulative regulatory costs.

Secondly, concern is being expressed about summer overheating in well-insulated new homes. Evidence is anecdotal in the main, with little published, verifiable information available, but studies to date suggest that SAP is inadequate in this area and an approach employing more complex dynamic modeling is required to more accurately assess and understand the mechanisms involved.

Adequate and industry accepted tools need to be available to model and assess changes to future regulations..

Feedback received from customers on sites incorporating new energy-saving technologies indicates that many home owners and tenants find these installations challenging.

Effective communication between the builder and the customer regarding the design and operation of their home's service systems provides part of the solution; however, there is the issue of ongoing maintenance to consider after handover to the first and successive property owners.

As with conventional heating and ventilation systems, renewable energy technology generally requires regular maintenance to maintain peak operating performance. If ignored, design performance and system longevity is compromised.

Maintenance of innovative technologies can be more onerous and costly than conventional systems because of system sensitivities and additional health and safety concerns relating to the location of the technology. Industry evidence regarding traditional gas boiler installations is that routine maintenance is often ignored by home owners.

Manufacturers must also work together to improve the interface with installers and users by developing simplified controls, monitoring systems, and appropriate guidance for service installations which may involve integration of a number of technologies. There should also be increased focus on ensuring an adequate level of skill and understanding within the construction and customer support workforce. For all those involved this presents a radical educational and cultural change.

There is a real need to consider a low risk affordable strategy to provide customers with homes, which they understand and which provide them with a healthy environment.

Adequate and industry accepted tools need to be available to model and assess changes to future regulations.

As Built vs Designed Assessment and Regulatory Tools

Recommendation:

Until comprehensive data has been accumulated to test the as-built vs designed assessment of new homes built under the 2010 regulation, the level of overall Carbon emissions for new dwellings in the 2013 amendments to Part L should not be changed from the values set in 2010 Part L

Evidence Base

Concerns have been raised regarding the as-built energy performance of new homes in comparison to designed values. The evidence for this comes almost exclusively from the work of Leeds Metropolitan University who accumulated data from 16 homes between 2005 and 2009.

The dwellings concerned were designed to standards that ranged from the Part L 2006 Building Regulations to energy/carbon levels 4 and 5 in the Code for Sustainable Homes. In the case of the Stamford Brook project, the homes were built to an enhanced pre-2006 building regulations standard.

This sample relates to only 0.0064% of the housing stock constructed and therefore cannot be seen as being representative. However, set against this data, The Futures Group has found growing evidence that the performance of newer homes is improving. This is illustrated in other regulatory areas by the improved acoustic performance results recorded by Robust Details for Part E compliance over the last few years.

The Futures Group accepts that homes may not perform as the designer intended and there is growing concern within the industry that the design parameters for new homes, driven by regulation, have become overly academic, complex and assumption based and are progressively diverging from the practicalities and realities of on-site construction.

A real and comprehensive set of benchmarking data is urgently required before further revisions to regulation can be sensibly contemplated.

As a matter of urgency, research must be conducted to compare the energy performance of a national sample of newly completed dwellings.

This should cover the core configurations being produced with mechanisms to gather performance data on a continuing and routine basis.

Co-heating Tests

In its present format, the co-heating test does not provide a practical or economic method for wide-scale measurement of as-built energy performance.

There are several reasons for this:

- Test costs of £30k to £50k are common. This sum equates to between a half and three quarters of the dwelling cost. This excludes the cost of heating during the test and is clearly not commercially viable.
- The test takes 3-4 weeks and the property must be unoccupied, leaving properties vulnerable to vandalism and squatters, as well as being commercially unacceptable.
- It only measures the immediate value, which may improve or deteriorate over time.
- There have not been sufficient tests to be fully confident of reliability and there is no industry standard laid down for the test procedure.
- The test can only be carried out at certain times of year where low external temperatures provide a sufficient differential to internal temperatures.

Research Projects

The Futures Group is aware of a number of projects with the NHBC Foundation, BBA and BRE which are currently investigating designed vs actual performance comparisons and appropriate test methods. The HBF is also well advanced in discussions with the Technology Strategy Board on a research proposal to test around 1000 homes.

We strongly believe a more effective, viable and standardised method of performance measurement is urgently needed. Until this issue is thoroughly investigated, we advocate no further significant regulatory revisions if a legacy of performance shortfalls and associated customer issues is to be avoided.

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Assessment tools

Recommendation:

We recommend the immediate establishment of an independent Board of Governance. For the longer term, Government may wish to look at other ways of managing SAP whilst remaining mindful of the vast amount of data and experience that resides with the current provider.

Members of The Futures Group are concerned about the governance of SAP and the lack of accountability. This is a vital tool for the industry and the fact that new versions are often not available on time is a major issue.

Standard Assessment Procedure

The Home Builders Federation has set up a Forum to discuss the Standard Assessment Procedure (SAP). This looked into the current approved SAP software packages, compared the outputs from common data input and provided recommendations. The Futures Group supports the general conclusions drawn by the HBF and we reproduce parts of the Executive Summary from the report here.

'The previous two revisions of Part L have presented the industry with problems surrounding the issuing of revised SAP software. In both these issues, delays have occurred and software was not delivered in a timely manner to allow models to be run and applications made to building control bodies to demonstrate compliance.

Ownership of SAP has caused varied debate, but we are informed that the responsibility for SAP lies with DECC and that BRE are the current approved contractor, appointed by DCLG to administrate, check and review, not only their own, but other software packages.

We also need to remember that a number of assumptions and predictions are made by house builders on the back of modelling carried out using the SAP software.

These predictions are continually called into question as a result of the constant updates and changes to conventions within the software packages. This in turn leads to a lack of confidence and affects viabilities and long term land investments. All of this has the ability to impact on housing delivery. The Forum has opened up discussions with the software suppliers and DCLG have asked that they be kept informed.'

The SAP consultation published in January 2012 did not have the software available.

Accredited Construction Details (ACDs)

Recommendation:

It is inappropriate to establish a detailed ACD scheme, until research shows there is an issue with the use of psi values other than the default situation. However, it is accepted that it is appropriate to have a register of details available for designers.

What is needed?

The industry is clear in that it wishes to have the ability to use existing ACDs as published by DCLG, but with assessed psi values, rather than default values that have been attributed to the details in Appendix K of SAP.

Any proposed scheme must have the flexibility to enable the industry to develop its own psi values which deliver improvements over default values. Parts of the industry have already invested in developing their own details, using accredited approved software and competent persons to calculate the values for both generic and bespoke details.

This is a market-driven approach that provides the information that will assist designers.

Focus in this area is necessary if optimum carbon emission savings are to be realised because it is estimated that on average every change in SAP 'y value' of 0.01 is worth some 1% of carbon emission. The industry wishes to have the ability to publish these details, contained in a single register in the format of a library with security codes for individuals who wish to keep the Intellectual Property of the detail.

A consistent approach is required and a protocol be developed, which allows the junctions to have some flexibility with a range of U values available. Checklists to help designers and site personnel should be assigned to each detail.

The default values can be retained for those who wish to use assessed junctions or who cannot confirm that they were used on site, as well as for the smaller builder who may not have access to the junction details.

We cannot see any justification at this stage to include a penalty on individual psi values of 0.02 (which is a significant increase at low psi values) or 25%. These may or may not be relevant to potential discrepancies between assessed and measured performance. Presently, there are also construction junctions that are simply ignored since there is no ACD or psi value given in SAP. From a designer's point of view, a psi value needs to be made available that the designer can trust. This could be assisted by establishing a register of accredited thermal modellers enabling greater consistency. We do not have any indication of the range of construction U values associated with the SAP psi values. Assessment tools should not be limited to a single software source to avoid a monopoly situation arising.

We support the view that there should be a unique central register of details with psi values for junctions. We do not believe that inspection or quality assurance schemes for site are necessary at this point in time.

In summary, we believe that a database of as constructed details needs to be established prior to the introduction of any formal scheme. If evidence is produced indicating that the actual values are not achieving their design and assessed values, the data collected would properly inform development of an effective scheme.

In the meantime the industry should be allowed to use its own details or published versions until such time as evidence is produced to indicate that the actual values are not achieving their design and assessed values.

Red Tape Challenge

Recommendation:

Bring parts of the Code for Sustainable Homes into regulations and withdraw the Code completely with substantial cost savings and no significant impact on outcomes

General

A working group has been set up, chaired by Sir John Harman, to look at the issue of de-regulation and will feedback to DCLG. The Code for Sustainable Homes is seen by many in the industry as an unwelcome burden, being both time consuming and costly. The biggest cost of the Code lies in the administration associated with collection of data, documentation and general bureaucracy.

The Futures Group believes that there is significant duplication within the regulations and the code. This offers the Government the opportunity to remove red tape, create estimated cost savings of £750million in administration. It will also meet the Governments objective to reduce the regulatory burden on the housing industry and SMEs.

The chart below sets out where duplication can be avoided and how important areas of the Code are already incorporated in Regulation:

Categories within the Code are already the subject of other regulation, or could be dealt with elsewhere as shown below. A more detailed approach is shown in the table that follows:

In taking forward this approach, it is effectively making the Building Regulations a set of sustainable regulations, We believe that the Code has served its purpose and it is time to move on.

The Code for Sustainable Homes has served to increase focus on sustainable development within all parts of the industry. In this respect, it has succeeded in accelerating change, but in its current format there are several elements that are more effectively and consistently dealt with elsewhere. Indeed some elements are now based on outmoded ideas and some areas have been superseded by changes in regulation.

Its administration has become an unnecessary resource and cost burden at a time when the industry can least afford it.

In the spirit of reducing regulation and cost to industry and therefore the consumer, the removal of the Code for Sustainable Homes should not be the catalyst for additional planning requirements.

Code for sustainable homes	Current Regulations and standards
Materials	Supply Industry
Floods and Water Management	Floods and Water Management Act
Surface Water Run Off	Floods and Water Management Act
Composting	Not Required
Energy and CO_2 Emissions	Building Regulations
Pollution Heathwell-being - Daylighting	Building Regulations
Sound Insulation	Building Regulations
Management Home User Guide	Building Regulations
Private Space	Planning
Lifetime Homes	Planning
Ecology and Planning	Planning
Waste - Household	Local Authority
Site	WRAP
Construction Site Impact	Considerate Constructors Scheme
Security	NHBC STDs/Secured by Design

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APPENDIX A
Examples of industry initiatives

The home building industry understands the importance of research and development. It constitutes a key part of business activity and ensures new homes ultimately benefit from continuous improvement in materials, components and processes.

It is recognised that this activity must be undertaken in partnership with other stakeholders if practical issues, barriers and costs associated with bringing products to market are to be effectively managed.

In recent years, growth in science-based solutions has made it vital that academia has inputs. However we should also not lose sight of the big benefits that can be won from relatively small-scale changes to working practices or design, often identified by simple observation.
There are many examples of new materials, products and services from every aspect of construction, which have been, or are being developed to assist the designer in the fast-changing regulatory landscape.

The most valuable data for both the Government and industry comes from practical application of innovations. This allows thorough testing during construction stages and normal usage, and importantly stimulates feedback from customers about their experiences living in new homes, an element often neglected in academic analyses.

Presently there is a critical lack of real data other than from showcase developments, which are often unrepresentative of the volume homes being produced. Furthermore, evidence supporting concerns about the performance of new homes is reliant on research projects involving a tiny proportion of the new homes market.

This lack of information underpins the Futures Group's call for an urgent, large-scale study into the performance of new homes. This is needed to properly inform Government policy before a committment is made to a set of regulatory changes that could drive stringent fabric specifications and air tightness that could have long-term consequences for the customer.

The projects listed below illustrate the industry's appetite to voluntarily experiment and innovate across a 30-year period. Going forward this commitment must be harnessed to generate accurate benchmarking data for the Government's energy policy.

Milton Keynes

A larger scale example of extensive stakeholder partnership is offered by Milton Keynes which featured visionary planning from its early concept days and a continuing long term platform for the testing of innovative ideas for low energy and sustainable homes. Early experiments focused on gaining free energy from the sun - including homes designed to actively capture the sun's warmth to heat water and the rooms inside. Some homes also included much higher levels of insulation than were normal in Britain at the time. The timeline below gives an insight into the pioneering work which has been undertaken here.

Late 1960s

Work begins on developing the Master Plan which sought to align closely the decisions on transport and the arrangement of land use. Key structuring principles include the grid system, linear parks and establishment of Redways.

1972

Bradville Solar House is first in the UK to incorporate active solar heating as well as solar heated hot water. It demonstrates that it is difficult to get active solar heating to work, and leads to a stronger focus on passive solar design.

1976

Studies begin on low energy housing design, something relatively new in the UK at the time. The project generates house designs for two estates: Linford and Pennyland.

1979

Solar Court demonstrates extreme passive solar design, incorporating double glazing and much more insulation than that required by the Building Regulations.

1981

Home World is the first housing exhibition in the city showcasing innovation in energy efficient homes. Three homes in particular were seen as being groundbreaking:
The Ideal Home - The entire south facing wall of this house was triple glazed, forming in effect a double height conservatory. The Autarkic House - A timber frame, energy efficient house, designed to be easy to build and extend. The Futurehome 2000 project incorporated a conservatory from which warm air was vented into the house by small fans. It was televised by the BBC's Money Programme.

1983

A total of 177 low energy homes are completed at Pennyland, an entire development designed to showcase a low energy layout using passive solar design, with the aim of producing a cost-effective mass-market low energy house.

1984

36 flats and houses at Gifford Park demonstrate 60% reduction in space heating fuel for no more than £500 additional construction cost. Dwellings incorporate 75% south facing glazing to living spaces, gravity fed solar panels and conservatories.

1985

Insulation standards for Building Regulations are increased, following findings from Pennyland and Gifford Park projects. The Energy Research Group publishes findings of Pennyland and Linford energy use monitoring. Four timber framed houses at Two Mile Ash feature extremely low space heating energy consumption, comparable to standards anticipated for zero carbon homes. Savings in energy costs mean that owners see financial benefits within just two years.

1986

Energy World Exhibition opens. An international showcase of energy efficient housing, where houses must be built to a new energy standard, and perform at least 30% better than required by the 1985 Building Regulations. It is a significant milestone for progress in design and construction of low-energy housing, and in the development of energy efficiency evaluation tools.

APPENDIX A Continued...

1994
Future World Exhibition demonstrates how homes might operate in the 21st century, with an emphasis on energy efficiency and the environment.

1999
The Energy Centre Phase 1 building demonstrates how a 1,000 m^2 low energy office can be heated by a domestic-scale condensing boiler.

2000
Development at Broughton & Atterbury begins. The Homes and Communities Agency (HCA) establish a number of key principles for the area which underpin the creation of an integrated sustainable community which will be applied to town extension.

Salford City Council Low Energy Houses
The Salford Low Energy houses were designed for Salford City Council in a joint project with Salford University in response to escalating energy costs in the late 1970's and concerns about what is now termed Fuel Poverty.

Initially a pair of semi-detached dwellings and a terrace of six homes were constructed. Following monitoring a further 200 or so homes were built for the council. Monitoring of the prototypes was undertaken in 1980-82 by Salford University Industrial Centre Ltd.

Externally the homes are entirely conventional in their appearance but incorporate very high thermal mass. Inside a well insulated envelope designed to minimise cold bridges, combined with simple mechanically assisted ventilation. This delivers low energy requirements for space heating and reliance to overheating in summer.

Other notable features include the use of orientation to minimize glazing on the North West aspect with increased glazing on the South East aspect and the use of mechanical extraction ventilation in the kitchen, bathroom and toilet.

A recent survey of the Salford houses shows that they continue to perform to specification and use about 75% less energy than the average requirement for space heating in the UK and over 40% less than homes built to the latest 2010 Building Regulations.

Findings also support other research concerning the importance of occupant behaviour on energy consumption and running costs and emphasise the need for customer advice and training to help understanding and to obtain optimum performance.

The project also underlines that a simple, first principles, fabric first approach to design arguably provides a more robust route to energy saving.

Ty Gwyrdd (Green House) – House for the Future, St Fagans: National History Museum 1999

Ty Gwyrdd, designed by Jestico and Whiles and built by Redrow Homes was a response to a joint St Fagans/BBC Wales competition to illustrate possible evolution of housing in Wales over the next fifty years, based on traditional building techniques represented on the museum site but, using them in innovative and forward-looking ways. It's success is borne out by the many sustainability features incorporated which have become increasingly familiar in today's construction:-

- Facilities for segregation of household waste for recycling
- Electricity generated by photovoltaic panels
- Solar panels providing hot water.
- Ground source heat pump and underfloor heating
- Insulation, provided by Welsh sheep wool and specially treated newspapers
- Low-energy lighting controlled by voice activation
- Use of local materials wherever possible, reducing energy being used for haulage and supporting the local economy.
- Re-use of earth removed from the foundations to make bricks for the spinal wall, which provides thermal mass for the building.
- Sedum planted "green roof"
- Rainwater harvesting
- Extensive glazing to southern elevation maximising solar energy, controlled by a 'skin' of automatic shutters.
- Flexibility of internal design to allow for changing family structures and providing accessibility to all

Building Regulations Part E Robust Details Scheme

In 2002, the proposed revisions to Part E of the Building Regulations in England and Wales included the introduction of sound insulation performance standards and pre-completion sound testing (PCT) for new build, joined dwellings.

The consultation documents asserted at the time that PCT was necessary because compliance rates for Part E were low. The house-building industry raised concerns that increased technical standards together with the new requirement to test separating walls and floors just before a new home was due to be handed over to a client would introduce uncertainty to the building process and in the event that a test failed, remedial work would be extremely expensive and disruptive. In response the HBF commissioned a project to develop an alternative approach, managed by Professor Sean Smith at Edinburgh Napier University with acousticians and volunteers from the house-building industry.

The outcome was a proposal for a Robust Details Certification Scheme backed up by acoustic data and 13 draft Robust Details (RD). This received ministerial approval and the scheme took effect in July 2004, giving builders the option to use RDs and avoid testing.

RDL's performance measurement has indicated that since the scheme was introduced an overall compliance rate of 97.8% has been achieved with figures for 2010-2011 indicating 99% compliance. NHBC warranty claims figures indicate that noise complaints have fallen significantly over the same period.

Stamford Brook, Dunham Massey, near Manchester

Stamford Brook is a development of around 700 homes constructed on part of the National Trust's Dunham Massey Estate near Altrincham in Cheshire. Construction on the site commenced in 2004, carried out under a partnership agreement between the land owner, the National Trust, and the two developers Redrow and Bryant Homes. The development partners also participated in a "Partners in Innovation" (PII) project with the Centre for the Built Environment at Leeds Metropolitan University (Leeds Met) investigating various aspects of design and construction processes, but particularly those associated with the implementation of an advanced energy standard on a large scale housing development .

The traditionally constructed homes were designed pre 2006 Building Regulation changes, but incorporate enhanced air tightness and the overall development includes other sustainability features including :-

- Housing layout designed to maximise solar gain
- No uPVC products other than rainwater goods
- Water based paints
- Reduced water consumption through flow restrictors and low flush WC's
- SUDS
- Timber, full frame, double glazed, argon filled windows
- Extensive use of recycled materials and local sourcing wherever possible
- FSC Accredited Timber with no chemical impregnation
- Rated appliances
- Waste segregation facilities in the kitchen
- Low energy external lighting
- Provision of compost bins and water butts
- Native species planting only in landscaping
- Secure by design

The project which involved collaborative effort between land owner, housing developers, sub-contractors, supply chain, regulatory bodies, householders and the research team produced valuable data which continues to inform the development of Building Regulations and in particular highlighted the previously incorrect assumptions regarding heat loss through party walls.

BRE Innovation Park

The BRE Innovation Park established in 2005 has provided an opportunity to demonstrate emerging technologies and construction innovations together with community landscape design which aim to achieve a low impact on the environment, lower CO_2 emissions, but a high impact on the quality of life of building and community occupants. It featured eight designs for sustainable houses (built to various levels of the Code for sustainable homes), a health centre of the future, a refurbished Victorian terrace and over 400 different construction innovations.

• Barratt Green House

The Green House, constructed by Barratt Developments PLC and designed by architects Gaunt Francis to meet both level six of the Code for Sustainable Homes and the Government's criteria for zero stamp duty and incorporates high levels of thermal mass in the structure to reduce overheating, optimisation of solar gain, MVHR - a whole-house mechanical ventilation system with heat recovery (MVHR) and flexible internal spaces allow different layouts to suit changing family needs.

• Hanson EcoHouse

Constructed to meet Code Level 4 of the Code for Sustainable Homes, employing thermal mass from prefabricated masonry external walls, heavyweight block internal partitions, and a pre-cast staircase and concrete floors. The home is naturally ventilated and energy demands are met by means of a solar collector and ground source heat pump. Rain water harvesting provides water for flushing toilets and watering plants.

• The Prince's House

The building fabric uses natural materials. The single skin walls are made from strong, lightweight clay blocks that have high levels of thermal insulation but lower embodied energy than conventional bricks. External finish is lime render and internal wood-fibre board provides insulation. The roof tiles are clay and floors and windows made from FSC certified timber.

• Osborne House

The design is based on an adaptable combination of structural insulated panels. Siberian larch has been used to clad the front of the house, recycled plastic slates to the side, Eternit boarding to the rear, and a zinc finish to the roof. The pathways around the house have been made with permeable paving. Inside there is a heat recovery ventilation system, wet under floor heating, electric skirting board heating, low water demand sanitary ware and temperature control taps. Smart technology is used throughout and includes a data delivery system showing energy consumption, live public transport information and the ability to manage an on-site car club.

• Renewable House

Built by the National Non-Food Crops Centre, materials used include Hempcrete used in the timber frame walls and ThermafleeceTM insulation made from British sheep's wool. Careful attention to detail minimises cold bridging, delivers low U values, provides good air tightness and maximises insulation.

• Stewart Milne Sigma Home

The design enables flexibility in accommodation space and aims to achieve a 100% reduction in CO_2 emissions from space and water heating and lighting needs. This is achieved through high levels of thermal performance and air tightness, good solar design, and the integration of a mix of renewable technologies for generating renewable energy. A solar chimney and open stairway arrangement provide passive ventilation.

• Cub House

Designed by property developer Charlie Grieg and manufactured in the UK by FutureForm, this steel frame modular home is constructed to meet Lifetime Homes and Secured by Design standards. Walls are super insulated and pv panels generate sustainable electricity. Heating, hot water and ventilation are provided by an exhaust air heat pump. Rainwater harvesting and water saving devices are also incorporated.

• Organics House

The Organics home system is constructed using factory-made panels and pods with a single mains service core and all components are precision made and fitted. This improves energy performance through increased air tightness and avoiding cold bridging. The water service system employs grey water recycling and low flow devices.

APPENDIX A Continued...

Miller Zero

Miller Homes have been instrumental in highlighting the challenges involved in the move to zero carbon by constructing 5 homes to the energy requirements of levels 1, 3, 4, 5 and 6 of the Code for Sustainable Homes on a typical UK housing site, 'The Pinnacle' at Basingstoke. Various construction methods were employed together with a number of renewable technologies and all homes on the site meet the Government's Lifetime Homes policy .The site was acquired through a design competition by Hampshire County Council, with Miller Homes initially working with architect Fraser Brown McKenna on the design and later adapting it in house. The project has enabled test of design and construction, investigation of marketing and also involved 1 year's post construction performance evaluation. Key innovations were:

- Level 1 house: served largely as a benchmark, but incorporates a smart meter and MVHR.
- Level 3 house: has MVHR, smart meter, water saving sanitary ware, air source heat pump (ASHP), and is built using thin joint masonry.
- Level 4 house: has MVHR, smart meter, water saving sanitary ware, thin joint masonry walls, ground source heat pump (GSHP) 90m deep boreholes, and underfloor heating
- Level 5 house: has MVHR, triple glazed windows, smart meter, water saving sanitary ware and appliances, 14m^2 of photovoltaics, rainwater harvesting via a 2000 litre tank for reuse in toilets and washing machines, biomass boiler and was constructed from Kingspan TEK Structural Insulated Panels (SIPs).
- Level 6 house: MVHR, smart meter, water saving sanitary ware and appliances, underfloor heating, approximately double the quantity of photovoltaic panels of the level 5 house, rainwater harvesting, biomass boiler, full storey height aircrete panels and external insulation of 200mm urethane foam and render.

The project has furnished valuable data for the industry on the issues encountered pre and post construction with design, build methods, technologies, customer perceptions and costs.

ELM TREE MEWS FIELD TRIAL

The Elm Tree Mews Field Trial was carried out by the Centre for the Built Environment at Leeds Metropolitan University on behalf of the Joseph Rowntree Foundation (JRF) and Joseph Rowntree Housing Trust (JRHT). The project objectives were to evaluate predicted performance and the information and models used by the design and construction teams and to monitor the actual as-built performance of the dwellings including a 12 month post occupation period. Performance testing included pressure tests, a coheating test, thermal imaging, temperature and air flow measurements and heat flux measurements.

The scheme sought to achieve a standard equivalent to the Government's carbon target for 2013, adopting high levels of insulation, a panelised I beam wall construction , communal ground source heat pump linked to an under-floor heat distribution system and solar thermal panels supplying some of the hot water demand.

Greenwatt Way, Slough

The Scottish and Southern Energy research project named 'Greenwatt Way' has involved partnering of a number of industry organisations to construct 10 homes designed to Code level 6 of the Code for Sustainable Homes and occupied by SSE employees, Slough Borough Council staff and local families.

The development is a mixture of two and three bedroom family homes and one bedroom flats, constructed in timber frame and masonry and featuring rainwater harvesting, grey water recycling, triple glazed windows, enhanced insulation, and multiple renewable technologies. Renewable heating and hot water is supplied by a mini district heat scheme, located in an adjacent energy centre. This installation includes solar thermal panels, an air source heat pump, a ground source heat pump, a biomass boiler and a spare bay for a future renewable energy technology. Each of these are sized to meet the full heating requirement of the site. The biomass boiler, ground and air source heat pumps run independently to demonstrate that all of these renewable technologies can be installed to generate enough renewable heat to meet zero carbon buildings requirements. In addition to reduced energy bills, the residents also benefit from other sustainable features as part of the scheme:

- Energy efficient appliances
- An electric Ford Focus for the tenants to share
- Fruit trees and space to grow vegetables

Tarmac Homes Project

Tarmac Homes partnered Lovell, Bill Dunster Architects and the University of Nottingham's School of the Built Environment to construct two detached homes (one to Code Level 4 and the other to Code Level 6 of the Code for Sustainable Homes) using conventional, ready-available masonry products and techniques. Construction commenced in January 2009 and was completed in April 2010,

Constructed at the University of Nottingham's University Park, the homes will be accessible for 20 years and are under evaluation by the University as part of the overall Creative Energy Homes research project which has aimed to stimulate sustainable design ideas and promote new ways of providing affordable, environmentally sustainable housing that are innovative in their design.
The homes are occupied by students and university staff, providing real data on home usage over a period of time and ongoing maintenance requirements.

Hanson EcoHouse & QuickBuild

Lawn House, is a code level 6 ecohouse in Burbage, Leicestershire. Its is the first private development in the UK to be built using prefabricated brick and block cavity walls.

At Lawn House each tailor-made panel consists of a high strength wirecut facing brick, insulation and a 100mm aircrete inner leaf, bonded together with an extremely strong modified mortar.

AIMC4

AIMC4 is a partnership of companies, created to research, develop and pioneer the volume production of the low carbon homes for the future, which meet the energy performance demanded by the Code for Sustainable Homes, Level 4. The Consortium is part funded by the Technology Strategy Board.

The consortium members comprise developers Stewart Milne Group, Barratt Developments PLC and Crest Nicholson PLC who together are responsible for the design and build of a minimum of 12 world class energy efficient homes, the Building Research Establishment (BRE) acting in an advisory capacity on innovative solutions and evaluation of technical issues and H+H UK Ltd. BRE Scotland will analyse and evaluate the performance of the homes and the impact on the occupants.
Project objectives are to:

- Develop a better understanding of consumers, their needs and aspirations relating to low energy/carbon homes and their response to a range of possible technology solutions
- Research and develop new design and build processes that will drive innovation in the existing supply chain and the emergence of new suppliers. In parallel this will accelerate the development of new materials, components and systems, creating a supply chain capable of delivering a range of innovative products to support a 'fabric first' approach from within the UK to drive cost efficiencies.
- Design and develop a minimum of 12 homes that meet consumer needs and deliver to Code Level 4 energy standards, with a fabric first solution built in various locations across the UK and sold on the open market.
- Use project outcomes at all stages to broaden the wider industry's knowledge and capability to develop sustainable homes in a more affordable, consumer friendly and efficient manner on a mass scale, to meet Government timescales. The work will also focus on skills requirements, market response and global excellence benchmarks.

About Us

The Futures Group is a unique forum that brings together leading industry experts from manufacturing, home building and regulatory bodies to work in collaboration to drive continuous improvement . A further aim is to help and support smaller home builders who may not have the technical resources to deal with the volume and complexity of regulatory change.

Our primary purpose is to act as a "Think Tank" to advise Government and other decision-makers on how to build better homes for the Customer.

New homes in the UK are built to the very highest quality and environmental standards, offering purchasers a very efficient and desirable new home.

Current members of The Futures Group

Aircrete Products Association

Ancon

Association of Brickwork Contractors

Barratt Homes

Bovis Homes

Brick Development Association

British Precast

Building Control Alliance

Concrete Block Association

Federation of Master Builders

Hanson

Home Builders Federation

H+H UK

Ibstock

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