

ALL PARTY PARLIAMENTARY GROUP FOR EXCELLENCE IN THE BUILT ENVIRONMENT

Inquiry into Sustainable Construction and the Green Deal

Memorandum by the Institute of Historic Building Conservation

The IHBC is pleased to be able to contribute evidence to the Inquiry. While much of the evidence before the Group will relate to new construction, we would hope it would be able to examine the potential contribution to carbon use reduction to come from those aspects of the construction and development industries that are **not new construction**.

Our evidence relates primarily to the Inquiry's questions 1, 2 and 4:

- Best practice in the retention, restoration, reuse and adaptation of existing buildings, which makes up some 50% of all building work.
- The barriers to sustainability in the reuse and refurbishment sector.
- Our concerns about the roll-out of the Green Deal because of the apparent inadequacies of the programme in relation to buildings of traditional construction.

Sustainability in construction

Sustainability in building is characteristically set out in terms of:

- Individual projects, rather than the built environment as a whole;
- New construction, when as much as 75% of building work concerns the repair, maintenance and adaptation of existing buildings¹.
- Energy consumption and harvesting in use, disregarding the environmental costs of manufacture, construction and installation of materials and components.

In our view far too little attention has been paid to:

- The environmental capital of existing buildings and the energy costs of demolition and waste disposal.
- The consequent need for energy use in building to be measured on the basis of a building's whole life-cycle – design, construction, use, removal.
- The need for comparative tools to facilitate refurbishment versus new-build assessment.
- The development of low energy improvements to buildings of traditional construction which take into account the nature of their construction and do not introduce techniques which are likely to reduce the viability of the building's structure and thus increase its environmental impacts in the long-run.

The Green Deal

We applaud the Green Deal in principle because it recognizes the contribution that can be (and must be) made to reduced energy consumption by the enormous stock of existing buildings; but, because its focus is on standard solutions, we fear that it is likely in practice to be damaging to a significant proportion of the 25% or so of our building stock which is of traditional construction, i.e. using techniques generally in use before 1919.

1 HOWARD, N., Sustainable Construction – The Data, Centre for Sustainable Construction 2000, Table 1.
<http://projects.bre.co.uk/sustainable/SusConstructionData.pdf>

Built environment sustainability hierarchy

Taking a lead from the well-known “waste hierarchy”, we think Government policy should introduce a parallel for the building and development industries. Much of this we see as self-evident:

- **Reuse.** The retention of existing buildings in their existing uses or adapting them for new uses is a sustainable way of preserving environmental capital and reducing the need for the environmental impacts associated with replacement development. We think Government policy (including the Green Deal) broadly supports this in principle, but the development industry all too often promotes the alternative with the highest financial return rather than the most sustainable one.

Reuse also applies to building components and materials many of which are costly in energy terms to manufacture and are often not of such good quality as those of the past.

- **Repair.** Repair is likely to be more sustainable than replacement in many instances. We have repeatedly criticized Government policy for promoting rebuilding over repair through the application of VAT on the former and not the latter.

We have serious concerns that the Green Deal, in its application of the single issue of energy conservation, will result in thermal treatments to buildings which are in need of repair first. Any underlying need for repair could seriously weaken the efficacy of a Green Deal treatment and, often, hasten the need for further major works or even building replacement.

- **Renovate.** Renovation of existing fabric for new uses is likely in many cases to be a solution more sustainable in its use of energy and materials than new build. A very significant proportion of the building industry is engaged in this work but it is a very neglected proportion in terms of training for skills and modern methods of working.
- **Recycle.** Near the bottom of the hierarchy is the recycling of materials such as broken bricks for hardcore. Regrettably, much of the building industry tends to give recycling a higher position in the hierarchy than it should have, and awards itself kudos in so doing.
- **Recapture.** As a last resort, energy should be recaptured from discarded building materials where at all possible.
- **Rationale.** Above all, to be truly sustainable, all building work should be the subject of sustainability analysis to ensure that most sustainable option is being properly considered. We favour life-cycle analysis as a methodology and powerful tools are now available to aid this. The use of life-cycle analysis at least exposes misleading assumptions about energy and materials use in construction and at best guides developers to the optimum approach.

Life-cycle analysis

Government building policy has tended to focus on construction, not performance in use, and green energy policy has focussed on the use of alternative means of generation and not its manufacture and installation. It is too often assumed that replacement of existing buildings will be more energy-efficient than retention and adaptation. This model suits the construction industry which is geared up for new building. But, without a proper energy assessment of the alternatives in procurement, construction and use over their design life, this is merely an assumption. We think better regard should be had of this. There is much knowledge on

life-cycle analysis, gathered over many years, powerful tools are available to aid practitioners but these are all too seldom applied².

Research-based consideration of performance

There is currently too much reliance placed on theoretical energy modelling such as SAP and BREEAM. Studies have shown that, all too often in practice, such models do not live up to expectation in relation to new construction or underestimate performance with respect to modifications to existing fabric. We think further study in this area would be merited.

Thermal Performance of Traditional Buildings

It is not true that traditional buildings are incapable of good thermal performance. A 2007 study of Court Service buildings³ found that the older buildings in the portfolio were generally more energy efficient than all but the most recent of more modern buildings. With appropriate further energy improvements retention of these was the optimum outcome. This applies to many public building types and similar buildings in the private sector⁴ and to other buildings such as traditional housing^{5, 6}.

Appropriate materials and techniques in traditional buildings

Conservationists are often criticized for being too pedantic about the use of appropriate materials and building techniques as if this was merely a matter of taste. The fact is that the use of inappropriate materials and techniques on existing traditional buildings can have the effect of shortening their life and accelerating the time at which their replacement at considerable energy cost becomes inevitable. And, in making this point, we do not ignore the potentially significant financial costs as well.

Specific issues, materials and techniques we would draw attention to are as follows are set out in Section A of the Appendix. Amongst other matters this makes detailed references to:

- The often high energy requirements for the resourcing and manufacture of building materials.
- The damaging effects of using cement and other modern materials such as gypsum plasters in the repair of traditionally constructed building fabric.
- The relative thermal efficiency of properly repaired traditional timber windows with secondary glazing over replacement with new windows which often have high energy costs and short design-life.
- The environmental benefits of the use of lime mortars in repairs of traditionally constructed buildings and the wider benefits of its use in new construction as limecrete and hempcrete. Lime, in its curing process, re-fixes carbon dioxide.

2 BORDASS W., Flying Blind: Things you wanted to know about about energy in commercial buildings but were afraid to ask http://www.ukace.org/publications/link_here

3 BRE, Cutting down on carbon, improving the energy efficiency of historic buildings (BRE), 2007 <http://www.helm.org.uk/upload/pdf/BRE-seminar.pdf>

4 MAY N., and RYE C., Responsible Retrofit of Traditional Buildings, Sustainable Traditional Buildings Alliance (SBTA), 2012 <http://www.building.co.uk/Journals/2012/09/27/x/u/l/RESPONSIBLE-RETROfit.pdf>

5 Presentations to 2011 COTAC Conference "Improving Thermal Performance in Traditional Buildings" http://www.cotac.org.uk/conf_2011.php

6 Warmer Bath : A guide to improving the energy efficiency of traditional homes in the city of Bath, Bath Preservation Trust and the Centre for Sustainable Energy, 2011 (BPT, CSE) http://www.cse.org.uk/downloads/file/warmer_bath_june2011.pdf

Industry barriers to achieving sustainability targets in traditional buildings

There are significant industry barriers to a bigger contribution to sustainability targets being made by traditionally constructed buildings. These are generally concerned with the principal emphasis of major players in the construction industry being on new building work, with its consequential focus on this in building industry training at both professional and trade levels. We explore this more widely in Section B of the Appendix.

We recommend a shift of emphasis in construction industry training towards the maintenance and repair sector.

Availability of suitable guidance

The construction industry's failure to provide appropriate training has been significantly compounded by a lack of widely-available guidance on traditional building repairs, this in turn reflecting a failure to collate and build on individual examples of good practice over many years. This lack has been addressed to some extent in the DECC-funded *Responsible Retrofit of Traditional Buildings*⁷.

Warmer Bath is a lone example of detailed place-specific guidance for energy improvements in a historic city⁸.

The Green Deal and ECO

While the Green Deal and ECO have the potential to contribute significantly to the reduction of greenhouse gas production, we have great concerns about the way it is being rolled out in relation to buildings of traditional construction purely because the Green Deal approach has been to ignore potential problems in this sector. Further details are set out in Section C of the Appendix.

Unfortunately at present we see the application of the Green Deal to the 25% or so of the stock that is of traditional construction as likely to cause building failures in sufficient numbers to attract substantial press attention and public criticism. It would be very unfortunate if this were to give the Green Deal programme as a whole a bad name.

Conclusion

Finally, and to end on a hopefully much more positive note, we see the current developments in sustainable construction, the Green Deal, and ECO as a fantastic opportunity, so far overlooked, to promote traditional building skills, and building repairs.

We suggested a shift of focus in the IHBC response⁹ to CITB Construction Skills' 2011 consultation. CITB Construction Skills' follow-up consultation (February 2012) on draft recommendations¹⁰ acknowledged our comments to this effect¹¹:

7 MAY N., and RYE C., Op.cit.

8 Op. cit. (we have reservations about its approach to conservation issues which we hope will be rectified in a new edition due to be published in 2013).

9 IHBC consultation response to Draft Construction Skills Strategy, October 2011
<http://ihbc.org.uk/consultations/docs/PDF/Skills-Strategy-Consultation1-Questions-web%20IHBC%20Final.pdf>

10 Industry views sought on draft recommendations for new Construction Skills Strategy, January 2012
<http://www.cskills.org/aboutus/newsandevents/news/Views-Sought-for-new-skills-strategy.aspx>

11 "Retrofitting will become a major part of the industry, but there is a concern that most current construction courses are primarily aimed at the new build sector and are training new entrants in those skills rather than repair, maintenance and upgrading for the existing housing stock. (note continues next page)

CITB Construction Skills' Draft Recommendation 18 states that **"In particular provision should cater for skills and knowledge needs relevant to different types of building fabric/age, including pre-1919 stock and 'hard-to-treat' buildings.** It is likely that such units will need to be incorporated within qualifications and training provision across a broader range of sector footprints to ensure that the skills and knowledge needs pertinent to the low carbon agenda are addressed holistically."

While this recommendation was welcome, it still showed nothing like the urgency or the scale of change required to resolve the current mismatch between construction industry training and what is needed for retrofitting traditional buildings.

The need for change has been evident, and recognised in words, for a long time¹².

It is now vital that CITB Construction Skills finally grasps this nettle. There is still time. As far as we are aware the new Skills Strategy has not yet been published; we hope that the Group will be able to use its influence to help encourage a change in approach before it is too late.

IHBC
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"Employers consider that lower level skills for Green Deal will be broadly similar to what is already being used by the workforce. Bolt-on up-skilling is likely to be needed rather than brand new skills, this will include transferable skills, new technologies and a future drive in the direction of multi-skilled workers. There is a pressing need for some form of CPD.

"Skills development is required more at the consultation/design stage and including customer service skills, also BIM; whole life cycle costing, whole life cycle carbon analysis; air tightness; cold bridging; breathability, insulation. Heritage/traditional skills in repair and maintenance vital for improving energy efficiency of existing building stock

"A major heritage stakeholder was concerned that existing competent-person schemes typically focus on modern methods of construction at the expense of pre 1919 stock; an issue also highlighted by some employers and training organisations that retrofit could be counter-productive if approached without the right knowledge ("*frequent incorrect use of preparation methods and materials and the resulting problems that are created and consequent deterioration of building stock*")"

12 e.g. Sir Michael Lathan's 2007 speech, Op.cit. 9

APPENDIX: FURTHER JUSTIFICATION OF POINTS RAISED

A. Appropriate materials and techniques in traditional buildings

1. The energy required to make manufactured building materials is considerable. Reuse and recycling in use should be promoted. The requirement for 1 tonne of bricks is equivalent to about 100 litres of petrol. For a tonne of cement the equivalent is 30 litres; cement production also "generates more carbon emissions than any other industrial process"¹³. Plastics manufacture is also high in energy use. This means that the reuse of materials such as bricks (not to be confused with recycling which destroys them at yet more energy cost) should be promoted.
2. Re-use of bricks is easiest where they have been originally set in lime but should always be considered. It has been estimated that 3.5 billion bricks are manufactured in the UK each year and 2.5 billion destroyed so the potential impact of more reuse is great. Even where materials are re-used, there are risks of further needless waste if the fixing or sealing is done with cement.
3. A very significant investment in energy is required for quarried materials. Therefore, repair and re-use (rather than replacement) of existing manufactured and/or quarried materials should, wherever possible, be the first option.
4. Properly repaired traditional timber windows with secondary glazing are usually more thermally efficient than replacement with new windows which often have high energy costs. The self-evident saving in resources which can be achieved by repairing, rather than replacing, timber windows is reinforced by the consideration that the slow-grown wood in old windows is of inherently much more durable quality than modern treated softwood.
5. Plastics used in construction are fossil fuel based and require substantial energy inputs in manufacture. Fibreglass breaks down by vitrification over time, polyurethane insulation may have health disbenefits but both have natural and long-lasting alternatives.
6. Lime mortar, unlike cement, is permeable and flexible. These properties enable it to both "breathe" moisture in and out (so avoiding deterioration of the main building material), and to adjust to fabric movement without cracking. Both of these properties are extremely significant in the context of climate change weather events, and consequent ground movements. In contrast, the impermeability of cement means that trapped water cannot escape, other than through the main building material (leading to saturation and frost damage) or towards the interior of the building (leading to dampness, mould growth and fabric deterioration). The rigidity of cement means that unless movement joints are provided, building movements lead to cracking, with water penetration, spalling of brickwork and other consequent damage.
7. The conservation sector, and building owners, have been learning the lessons and counting the costs of the widespread use of cement in repairs to traditional buildings over the last 50 and more years¹⁴. There is long-standing and all-too-depressing evidence of the ways in which hard cement renders and mortars trap moisture, leading to deterioration of stone, brickwork and timber. There are very serious risks, unless these issues and lessons are understood more widely, of the same problems being repeated on a vastly greater scale, through well-intentioned but misguided solid wall insulation works under the Green Deal.

¹³ <http://www.global-greenhouse-warming.com/cement-CO2-emissions.html>, sourced from *Tracking Industrial Energy Efficiency and CO2 Emissions, the International Energy Agency 2007*

¹⁴ see, e.g., <http://www.spab.org.uk/advice/technical-qas/technical-qa-1-dealing-with-inappropriate-cement-renders/>

8. The use of lime in construction should be promoted even more widely. Lime is increasingly being used in products such as limecrete and (as hempcrete) in highly energy efficient walling for housing. It not only allows the more ready reuse of other materials such as bricks, but fixes carbon dioxide as it cures whereas cement manufacture is one of the world's greatest producers of greenhouse gases.

Encouraging the use of lime mortar, rather than cement, as the default approach in all brickwork and masonry would be an extremely simple, "low-tech", and very effective way of promoting sustainable construction.

9. The use of gypsum plaster is also poor in energy performance. It has high energy costs in mining and production and a relatively short life-expectancy in use. Lime plaster, on the other hand, has all the positive environmental benefits of lime mortars and limecrete.

B. Construction industry barriers to achieving sustainability targets in traditional buildings

1. There are also significant industry barriers to a bigger contribution to sustainability targets being made by traditionally constructed buildings. These are generally, but not exclusively, concerned with the principal focus of the construction industry being on new building work, with its consequential focus on this in building industry training at both professional and trade levels.
2. These are long-standing issues, compounded by the structure of CITB Construction Skills as a levy-paying body primarily representative of the larger construction firms. Traditional construction has been viewed by CITB Construction Skills as a "niche" heritage market, not as a major part of the building industry's bread and butter. In a 2007 speech¹⁵, Sir Michael Latham, Construction Skills Chair said "The current industry culture, trade practice and the historic lack of awareness among many clients and stockholders has contributed to the vicious circle that perpetuates the use of inappropriate methods and materials on pre-1919 buildings – threatening their maintenance and the built environment around us. It is therefore essential that clients and stockholders consider the most appropriate skills and incorporate them into supply chain tendering processes."
3. The formation of the National Heritage Training Group, although welcome, has not addressed the role of general builders working on traditional buildings. The need for general builders to be appropriately trained in traditional construction has simply not been recognised, let alone given industry-wide priority.
4. There are high risks that these historic failings (over many years) could severely impact on efforts to improve the sustainability of traditional buildings. Good understanding of such buildings, and the ability to carry out appropriate repairs, are essential prerequisites for successful upgrading¹⁶, but there is no indication that the required understanding and skills are available on the scale needed. This is highlighted by, for example, the problems experienced by Elevate East Lancashire, even before the financial crash, in finding the skills needed for large scale refurbishment of traditional housing stock.¹⁷
5. We recommend a shift of emphasis in construction industry training towards the maintenance and repair sector.

Continues/...

¹⁵ 11 July 2007, speech as ConstructionSkills Chair to National Heritage Training Group conference

¹⁶ As noted 2008 in "2020 Vision – The Future of UK Construction" report by Experian et al for ConstructionSkills http://www.cskills.org/uploads/2020VisionScenariosforconstructionskills_tcm17-11077.pdf, p2 and para 2.8.2

¹⁷ "Developing Heritage Construction Skills for Regeneration" C Guthrie and A Platten, paper to 2007 Built Environment Education Conference http://cebe.cf.ac.uk/news/events/beecon2007/files/P13_A_Platten.pdf

C. The Green Deal and ECO

While the Green Deal and ECO have the potential to contribute significantly to the reduction of greenhouse gas production, we have great concerns about the way it is being rolled out in relation to buildings of traditional construction.

These include:

1. The failure to see buildings of traditional construction as an opportunity for appropriate upgrading, in parallel with other building types. Because of this failure, information and guidance on such buildings is lagging behind, with no indication of timescale.
2. The failure to recognise that traditional buildings have fabric that needs to be “breathable”, and that this in turn requires a very different approach to that needed for more modern buildings.
3. The failure to recognise that for Green Deal improvements to be successful, the building needs first to be put in good repair by a builder who understands traditional construction. We are concerned to see that the safeguards regarding ancillary works, included in the draft Green Deal Code of Practice, have been dropped from the published version.
4. The strong likelihood (in the absence of suitable guidance and skills) of building failures as a result of misapplied standard Green Deal and ECO assessment processes and techniques to traditional buildings.
5. The assumption that modelling techniques used for modern buildings can reflect the performance of traditional construction. We are concerned that in spite of the fact that the research on traditional solid wall buildings, cited above, has comprehensively undermined the originally claimed potential for “Golden Rule” savings for solid wall insulation (SWI) on traditional buildings, DECC has pressed ahead with promoting such proposals under ECO instead. While this new approach may have circumvented some potential mis-selling concerns, it totally fails to address the fundamental construction issues.
6. SWI is a particularly major concern because of the conjunction of its high risks for traditional buildings, noted above, with an apparent combination of ignorance and complacency within the industry in relation to such risks. It should be noted that even truly breathable insulation could be completely compromised by unwitting application of an impermeable outer coat. The SWI industry also claims that it is possible to replicate the appearance of traditional brickwork; challenges to them to provide evidence to support this claim, and of the costs (hence viability) of the products involved, remain unanswered.
7. The failure to ensure sufficiently adequately skilled Assessors and Installers able to deal with traditional buildings. They need to be able to understand both the way buildings perform as a whole (and so able to choose what may be appropriate measures for the particular building), and the great variety of building details in traditional construction. To take only one, window openings vary significantly in their depth and the position of the window within the fabric. This means a wide range of possible issues for how insulation treatments might be detailed so as to be both energy efficient and weathertight and the likelihood of a need for a great range of bespoke solutions.
8. There appear to be major gaps in the skill requirements¹⁸ for Green Deal roll-out which do not address this fundamental point. The published minimum competencies do not require, or give any assurance of, understanding of how the individual activity being certified interacts with the performance of the building as whole.¹⁹ This applies to both assessors

18 IHBC consultation response on draft PAS 2030, October 2011

http://ihbc.org.uk/consultations/docs/PDF/PAS2030revised_response.pdf

19 see, e.g., The Common Minimum Competences for External Wall Insulation

and installers, and is conspicuously omitted from the Green Deal Competency Framework produced by the Green Deal Skills Alliance.²⁰ There is scant recognition of this on either the DECC or Energy Saving Trust websites.

9. If the Green Deal is inappropriately carried out to traditionally constructed buildings, problems such as dampness and other health disbenefits could come to light fairly soon after implementation. IHBC is aware, and has photographic evidence, of a case where recent council-led application of SWI has created severe damp problems due to trapped moisture²¹.
10. It would be disastrous for the Green Deal if, early in its life, building failures and aggrieved householders were to become the focus of press and public attention. But, given the lack of the required attention to the needs of perhaps 25% of the building stock to which the Green Deal will apply, we see this as almost inevitable.
11. The current uncritical promotion of solid wall insulation by DECC and the Energy Saving Trust, neither of which mention any of the potential drawbacks in relation to traditional solid wall buildings, could at best be described as irresponsible. The DECC and Energy Saving Trust websites need to address these issues. Building owners and tenants need to be made fully aware of the potential risks associated with such measures, and of who bears responsibility for such risks.
12. A further issue is that ECO is now encouraging the replacement of windows, in parallel with solid wall insulation. This will have major implications both in terms of invested energy (see above), and in terms of the appearance of buildings and streets.
13. We note that the benefits have all been expressed in terms of the supposed long-term monetary value of energy saving. Nothing of significance has been said about the impact of the Green Deal on property values, or on the appearance and character of buildings, streets, and places. We suspect that many people choose their house, and their surroundings because of what they look like, and visual appearance has a significant impact on market value. We do not think that improvement of thermal performance will always outweigh reduction of value caused by material alteration to the external appearance of property.
14. A further, and fundamental, consideration is the dual need for:

- **a clearly justified case for radical change to the character of valued buildings, streets and places;**

We are mindful of the historical precedent of the removal of historic iron railings in World War II, to provide material for the war effort – but which turned out to be totally needless and unjustified because the iron was not suitable for the intended purpose. In the present case, radical change needs to be justified on clear evidence that the intended and deliverable aims of the proposed approach will outweigh the losses to valued character.

- **changes to be well designed to complement existing character as far as possible.**

We see no justification for any relaxation of the planning requirements which exist to enable the balances between different aims to be publicly debated. We commend the principles set out in the Building Regulations Part L, that the energy performance of

http://www.cutcarbon.info/media/36406/2012-11-27_ewi_2_version_9.pdf

20 http://www.cutcarbon.info/media/15541/comp_framework_doc_v3_final.pdf

21 exterior photo (internal photo can be provided) on p38 of "Context", May 2012

<http://ihbconline.co.uk/context/124/#/38/zoomed>, page 2 of "The Green Deal is Coming", article by J Preston

historic buildings and buildings of traditional construction should be improved wherever possible, but without harming their character.

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