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**Submission to All Party Parliamentary Group for Excellence in the Built Environment Inquiry into Sustainable Construction and the Green Deal – Call for Evidence**

The Green Gauge Trust is responding to the call for evidence on three of your lines of inquiry:

- evidence of best practice of sustainable construction in the built environment - and how this could be repeated?
- barriers to sustainable construction - what is holding the industry back and how could this be improved?
- the Green Deal - is the policy the right one? What can be done to ensure take up?

***The objectives of Green Gauge Trust***

The Trust was set up in 2010 to mainstream the knowledge and skills for low energy, low carbon buildings. It does this in a number of ways, by:

- honing its core messages around the need for a common language to talk about the energy and carbon performance of buildings, and raising understanding amongst all those in the buildings cycle
- participating in national policy forums
- contributing to the strategy development and implementation of other organisations with national reach and linked objectives
- developing and promoting the Green Stripes training programme and certification scheme which recognises when individuals and companies have the knowledge and skills required to deliver low energy low carbon buildings.

The Trust is a member of the Knowledge & Skills Working Group of the Green Construction Board, and chaired the Working Group's Strategy Sub-group. It is working closely with the National Energy Foundation whose mission is to improve the use of energy in buildings.

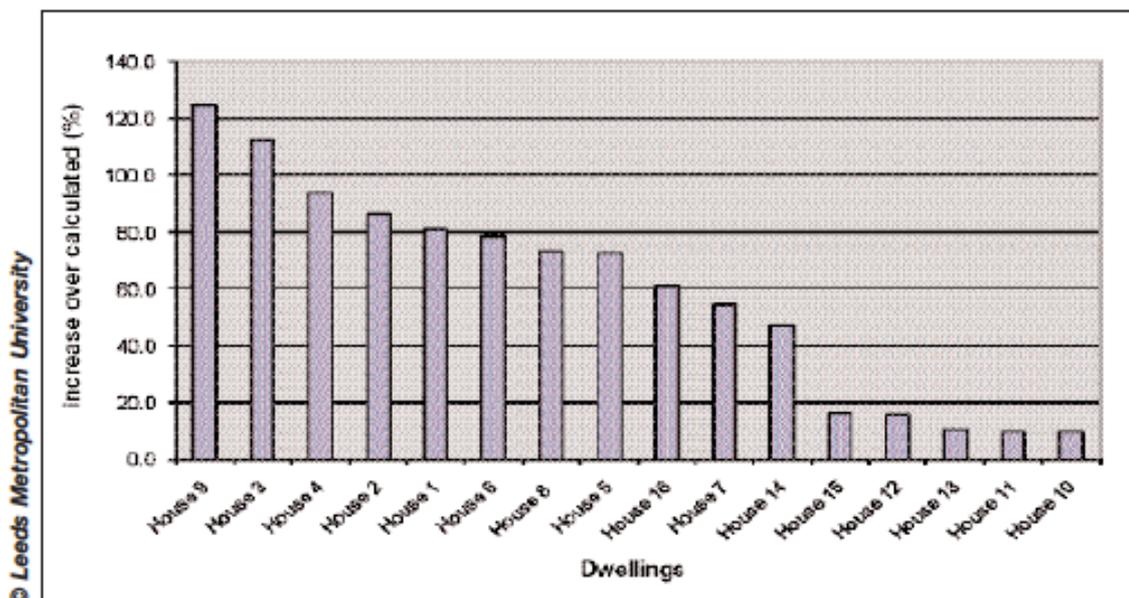
***Evidence of best practice of sustainable construction in the built environment - and how this could be repeated***

Four issues are of important here. Firstly, what is best practice? Secondly, what evidence do we have of best practice (or indeed, of practice at all)? Thirdly, what do we need to do to ensure that we have evidence that is meaningful? Fourthly, is government policy supporting the development of evidence?

### What is best practice?

Genuine best practice can only be identified where outcomes are measured and reported. It has not been the norm in the UK for the performance in-use of buildings to be either measured or reported. The implementation of the Energy Performance of Building Directive has led to two measures that contribute to this end.

In the domestic sector, all new homes are required to have an Energy Performance Certificate (EPC). An EPC must be lodged on the domestic Register and must also be produced whenever a building is sold, constructed or rented out. The EPC shows the energy efficiency of a property and includes recommendations on how it can be improved. The inaccuracies of the SAP and, particularly, RdSAP software used to prepare EPCs have been well-publicised, undermining as they do the effectiveness of the certificate in reporting likely performance. Work undertaken by Leeds Met University during the years 2000-2010 (and ongoing) demonstrated beyond a doubt that buildings with the same EPC rating could have wildly differing energy performance in use.

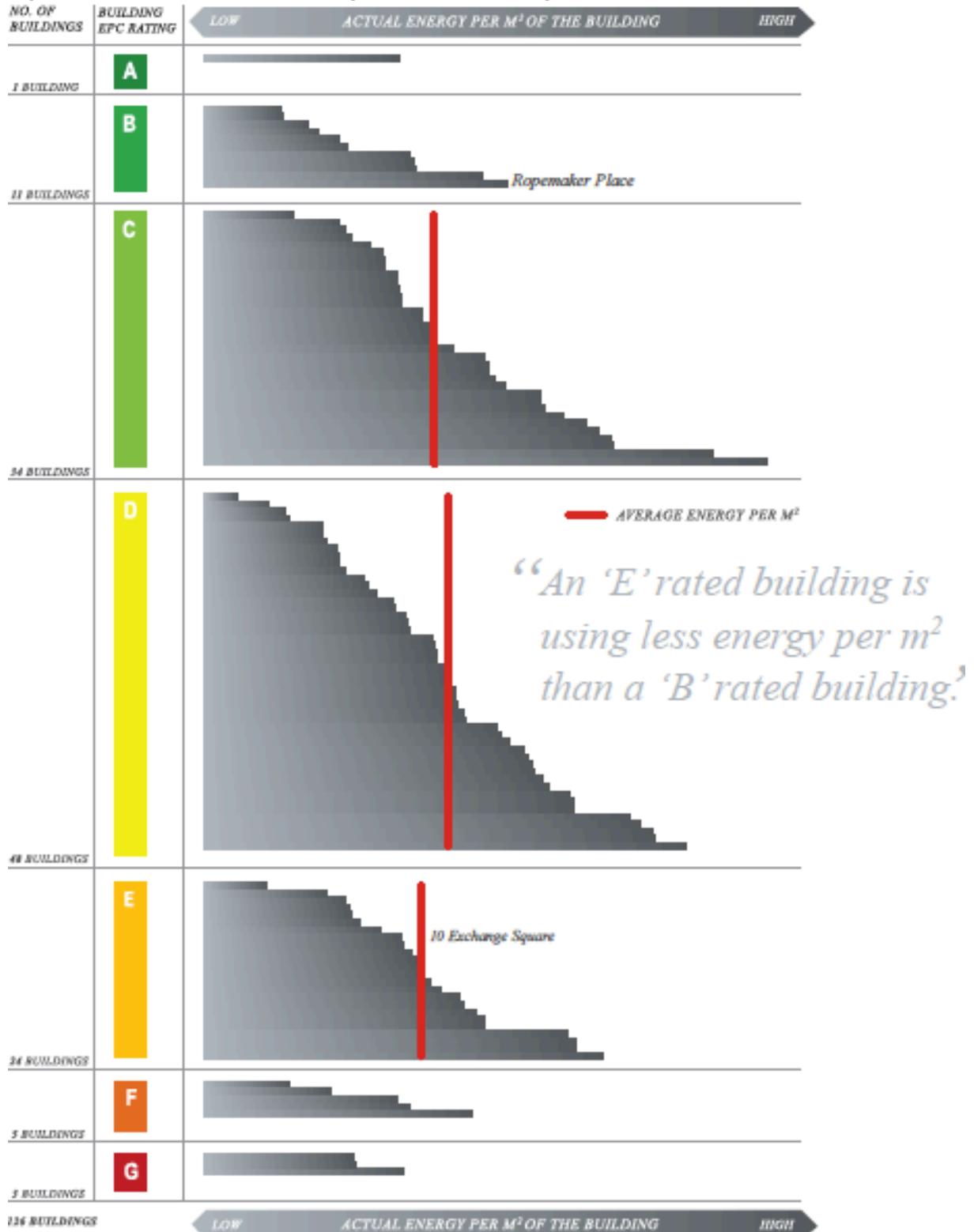


**Figure 1 – Actual energy performance of sixteen new homes built to the same Building Regulations standard exceeded design calculations by up to 120%**

Sources: Zero Carbon Hub report (ZCHD 1030210), Carbon compliance for tomorrow's new homes, topic Work Group 4 ([www.zerocarbonhub.org](http://www.zerocarbonhub.org))

In the non-domestic sector, as Figure 2 shows, the energy in-use figures provided by Display Energy Certificates clearly demonstrate that actual energy use can be significantly different from the asset rating provided by the EPC. Whilst the focus of the APPGEBE inquiry focuses on residential buildings, it may be supposed that if there were similar in-use statistics for a wide range of homes, the discrepancy between asset rating and actual performance would also be similar.

**Figure 2: A Tale of Two Buildings: Better Buildings Partnership (2012)**



To answer the first question, ‘what is best practice?’ we might therefore proffer the answer in two parts. First, it is where the actual performance in use of a building is the same as its design intent – or asset rating. Second, best practice is reflected in very low building energy consumption and carbon emissions.

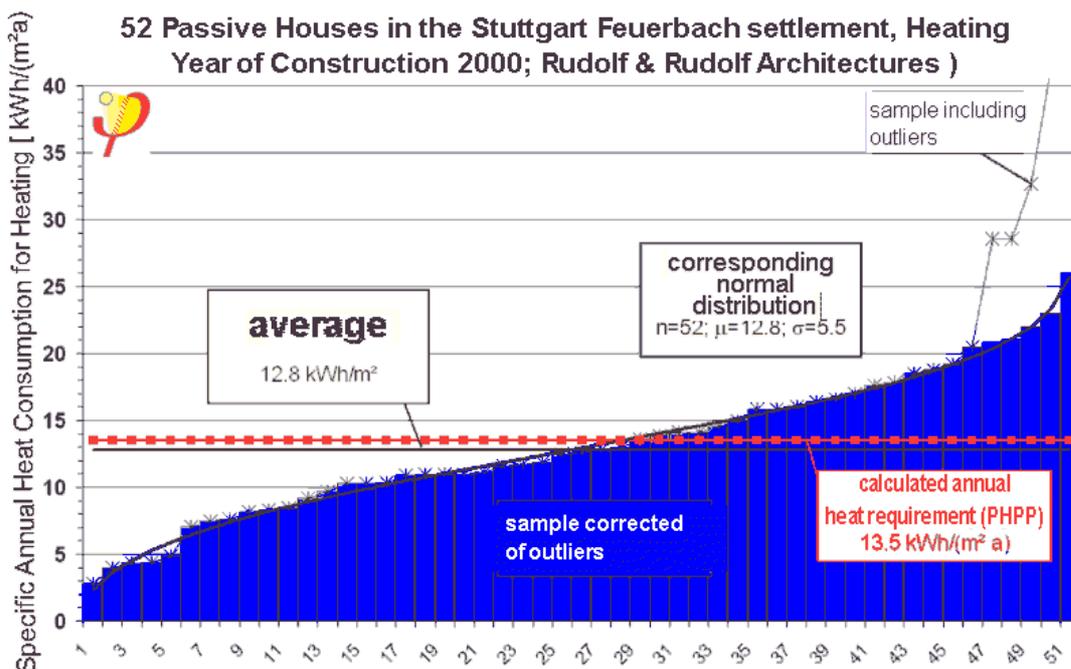
Green Gauge Trust and others who are working at the leading edge in the UK have mainly taken as their inspiration the Passivhaus energy standard. This is because the standard is based on sound building physics principles and has a clear, absolute energy performance target of 15 kWh/m<sup>2</sup>.yr for space heating, and design, construction and certification processes that guarantee that the design and in-use performance are similar.

UK Building Regulations express targets in absolute terms – 44% less than a notional building built to previous regulations. Given that in-use performance has rarely been measured, the target is not meaningful. Part L also targets CO<sub>2</sub>, which is not readily measurable, unlike energy, which is metered in all buildings and what occupants pay for.

The design, construction and certification processes are all designed to ensure quality control and much could be learned from these by the UK as it moves to improve energy in-use performance (see paragraphs below on barriers).

The other key characteristic of the Passivhaus standard is that it is accompanied by a culture of measurement and reporting measurement in use. Hundreds of homes built to the standard have been monitored for their in-use performance. Figure 3, showing monitored results from 52 homes in Germany shows that occupant behaviour can significantly increase in-use performance, but given the standard, the absolute energy use is still well below that of more conventional energy standards.

**Figure 3**



**Conclusion: At the moment, in the UK, best practice is best evidenced by buildings built to the Passivhaus energy standard. The best way to ensure that this best practice can be repeated is for UK Building Regulations to adopt the same principles:**

- **express compliance for Part L of the Building Regulations in absolute terms (kWh/m<sup>2</sup>.yr and kg CO<sub>2</sub> /m<sup>2</sup>.yr)**
- **incorporate elements of the Passivhaus processes into the UK compliance regime for new buildings**
- **encourage the practice of measuring and reporting in-use performance as a matter of routine.**

*What evidence do we have of best practice?*

At the moment, there are few examples of regular reporting of building performance in use, a lack of agreed measurement and reporting protocols, and no securely funded, publicly accessible database of robust low energy buildings.

Three databases do exist. All have been funded by the Technology Strategy Board (TSB).

The Low Energy Buildings database, operated by AECB, was launched alongside the TSB's Retrofit for the Future competition. It mainly contains descriptions of RfF projects, their design energy and carbon performance targets and reported in-use energy when it is available. The database also contains other domestic and non-domestic buildings designed to absolute energy targets. (The RfF competition was framed with absolute primary energy and carbon targets; the homes could be modelled in Passivhaus Planning Package (PHPP) or SAP with an Excel extension to mimic those elements of PHPP that SAP did not include).

TSB is also funding the development of 'Embed' by EST. Embed is an interactive database which will contain all the data from RfF projects and any others that collect energy performance in-use data, as well as other key indicators such as airtightness test results. It will be possible to search for specific data entries filtered by a range of different criteria.

Carbon Buzz, a database for non-domestic buildings, has been a joint venture with a number of not-for-profit and for-profit groups and some assistance from TSB. How it will be managed in the future is currently the subject of discussions between several interested parties willing to work together in joint venture.

TSB funding for pump-priming this crucial activity is clearly very helpful. However, it would seem appropriate – if not essential - for the public sector to support the continued publication of performance data.

These need government support to ensure that they remain transparent and independent of any commercial biases. There is also a need the facility to incorporate data from new builds, Green Deal refurbishments, and any other buildings for which there is good data.

*How can we ensure that evidence that is meaningful?*

For data to be meaningful, it needs to be collected in accordance with agreed protocols and reporting methodologies. The Green Construction Board (GCB) Knowledge & Skills

Working Group (K&S WG) is about to undertake a piece of work which will establish which protocols and reporting methodologies already exist, and will develop proposals for plugging any gaps identified.

The GCB Buildings Working Group has already got a project underway which is exploring the need to establish a Low Carbon Existing Buildings Support Mechanism. Many consultees are arguing that the 'support mechanism' should have at its core the protocols and reporting methodologies and ensuing data in public-funded databases.

**Conclusion: The APPGEBE should call for a good evidence base for building in-use energy and carbon performance and support the work of the GCB to the extent that it delivers on that aim.**

*Is government policy supporting the development of evidence?*

DCLG has announced its proposal for implementation of the EPBD Recast.

For the domestic sector, it is not requiring the production of an EPC at the start of the sale process but only at some point during it. If the EPC is to have an influence on the sale of a property – incentivising the better performing of two otherwise identical properties – then the EPC needs to be available from the outset.

For the non-domestic sector, DCLG is proposing that only EPCs need to put on display rather than DECAs, and renewable only every ten years. This renders the EPBD almost meaningless.

**Conclusion: The APPGEBE should urge DCLG to implement the EPBD Recast in a way that renders most visible the energy and carbon performance of buildings in use.**

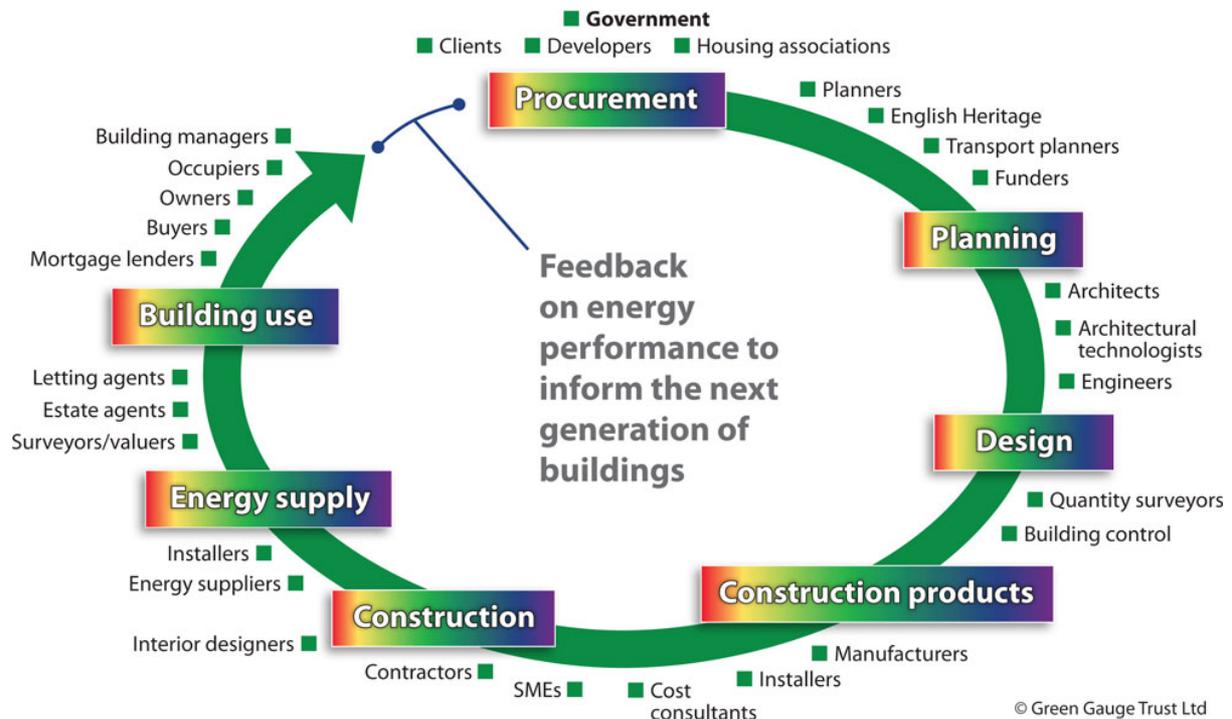
*Barriers to sustainable construction - what is holding the industry back and how could this be improved?*

Talk of upskilling often focuses on the on-site trades as if poor energy and carbon performance is solely related to their work. However, there are many players in the property cycle fulfilling the various functions required to deliver low energy, low carbon buildings. Figure 4 is the Trust's illustration of this factor.

There are many players – sufficient in itself to cause difficulties in producing a good output – but also no common language for talking about a sustainable building. There is the Code for Sustainable Homes, BREEAM, Building Regulations, relative target carbon reductions, ratings A-G, and ratings in points 0-100.

Green Gauge Trust argues for a simple measure based on EPBD so that building owners and occupiers would be able to answer the question: "How many miles per gallon does your building do?" with a simple "50 kWh/m<sup>2</sup> or similar. Working to different descriptor standards also means that the client, design team and occupants may be able to refer to the fact that they have a CSH4 home, but would not have the language to talk about what that means in terms of actual energy bills, for example.

Figure 4



The absence of an evidence base described above means that there is a lack of knowledge in the industry about how buildings do not perform as required and the existence of performance gap is still a surprise to many.

Given that lack of understanding, it is unlikely that members of the supply chain recognise the need to change process and practice. In fact, there are few additional *skills* that need to be taught. It is more a case of improving understanding of the current differences between design and actual energy use and the contribution of different members of the supply chain to this, before we can focus on what they need to change.

To summarise, a cursory review of the education and training landscape for the sector reveals four key issues:

- education and training is conducted in silos, with different players in the buildings supply chain taught only about their role independently of the roles of others;
- a large number of those in the construction industry (amongst the many smaller players) undertake little or no training other than what they learn on the job.
- most of those supplying education and training to the sector are unaware of the performance gap and what different participants need to know – still a case of the unknown unknowns, to coin a phrase;
- the sector does not work to whole building outcomes, but at best only to (scant) compliance with different elements of Building Regulations. If the builder/architect/client used absolute energy targets, it would force them to focus on the whole building, and lead directly into measurable performance.

A second problem arises even when supply chain players do have the requisite knowledge and skills in that there is no formal recognition of their abilities. So, for example, major contractors who deliver their contracts via sub-contractors, have to repeat training many times as on-site staff change regularly. Similarly, those wanting to undertake repair, maintenance or improvements to their home such as a loft extension, have no way of knowing whether the architect or builder they employ will improve or worsen its energy performance.

Making the changes required needs action on several fronts:

- education and training needs to be reorganised so that elements of courses are taught with professions and trades together, and all are required to develop fore multi-disciplinary skills;
- a crash programme of train the trainers needs to be run which imparts the requisite knowledge & skills, calling on best practice to design and deliver the train-the-trainer courses'
- a certification scheme such as Green Stripes needs to adopted so that having the requisite knowledge and skills is formally acknowledged, used on building sites like the CSCS card for health and safety, and recognised as a quality mark for those providing services related to the refurbishment, repair, maintenance and improvement of buildings<sup>1</sup>.

The GCB K&S WG is proposing to undertake work on these issues during the course of the next four months.

**Conclusion: The APPGEBE should monitor the outcome of the GCB project and support its findings as appropriate.**

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We hope that the Trust's responses to you enquiry prove useful. Naturally, we would be happy to come and answers questions from the Group if requested to do so.

Yours sincerely,

John Walker  
Chair

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<sup>1</sup> The Green Deal quality mark and training focuses on specific measures and not on whole building energy and carbon performance so Green Stripes is in addition to Green Deal, although elements of Green Deal training could count towards Green Stripes accreditation.