Rab Bennetts (right) and Bill Bordass

Architect Rab Bennetts and Usable Buildings consultant Bill Bordass put forward a modest proposal for sustainable design

‘Keep it simple and do it well’

Rab Bennetts, the architect behind the iconic Wessex Water Operation Centre in Bath, and consultant Bill Bordass aren’t from the “stick a turbine on the roof” school of green design. Here, they debate the challenges facing the industry.

Do architects know enough about sustainability?

Rab Bennetts Architects who focus on iconic designs often lack the objectivity required for assessing sustainability. Part of the problem is that there is no culture of learning from buildings in use, either by architects, clients or contractors, and the issue is given no emphasis in design schools. Bennetts has tried to learn from the past. Wessex Water, for example, was a well-performing building but was found to be consuming far more electricity than predicted, so we had to work hard to bring it back within predictions.

Bill Bordass The energy consumption of even well-designed buildings is often underestimated. Among the low-energy office buildings we have reviewed recently, only about a third of the electricity consumption had been anticipated in the design. Typically, a third of energy use is overlooked, such as server rooms, kitchens and overnight energy consumption, while a third is down to avoidable waste.

It is hard for designers to be objective about performance assessments and user feedback – it can identify as much bad news as good. Part of the problem is designers are not realistic and fail to manage client expectations, which means clients lack confidence in designers’ ability.

RB Yes, some architects would react very badly to news that their buildings were not performing as expected. Too many iconic buildings that claim to be green aren’t. It is only by assessing them that we will learn how to improve designs.

So designers need a better head for figures?

RB Clients tend to be impressed by objective analysis. But there’s a significant problem in that many designers do not have a quantitative grasp of the targets that they are trying to meet or the impact of key design strategies.

BB Very much so. We tried to look at this at a recent event and many designers were way out in their understanding of what emissions per square metre constituted good energy performance, and the extent to which they could improve it.

RB The lack of understanding in this area can be staggering. Also, the reliance of some architects on other consultants, including services engineers, to come up with the figures means they are abrogating their responsibility for producing genuinely integrated design solutions.

BB The numbers have to be powerful in design terms – they need to be clear and actionable and give an indication of what’s achievable. Designers should be able to understand quickly how a design change will affect energy use and CO_2 emissions and what it is worth in capital cost terms. Their designs should be supported by solid statistics so that good ideas are not stripped out just because there isn’t a robust argument to justify them.

RB When designers develop their designs in a way that assesses the impact and benefit of what they wish to do, science and art really come together. On Brighton Library [a Bennetts project], several design changes were proposed as a result of value engineering exercises that would have had an impact on environmental performance. Some were justifiable but others impaired the design to such an extent that the saving in capital cost was not justified. It was only by having performance and cost figures readily available that we could defend and retain what was valuable.

How can architects make buildings work more effectively?

BB One key reason why buildings don’t work well is their unmanageable complexity, so we advise designers to keep it simple and do it well – and only after that be clever. Today, designers have to cope with so much, as they try to tick all the boxes to meet an increasing range of conflicting aims and objectives. ▶

▶ Too often, they are rewarded for add-ons such as solar panels when much more C02 would be saved in other ways and at much lower cost. If they paid more attention to the design, installation and user interfaces of the control systems, ignoring all the add-ons and focusing on simple solutions that did the basics well, they would often be better off.

RB Some architects delude themselves by focusing too much on imagery and add complexity because it is possible. The engineering challenge is often to make poor solutions work, simply because the tools are there to do it. You see inefficient glass buildings facing south that get burdened with mechanically operable cladding systems, over-sophisticated glazing, complex lighting controls and so on, which promise to make it work but always fail in some way.

When I worked on the Wiggins Teape building with Arup in the 1980s, the building management system (BMS) cost £15,000. Now everyone seems to be convinced you need to spend at least £350,000 on a computer to operate even simple buildings.

BB With a lot of this kind of kit, there is no audit trail on commissioning or programming. BMSs can be surprisingly difficult or expensive to control and change. One building we surveyed had a sophisticated lighting control system but its rooftop conservatory had an occupancy sensor, so if anybody was in the lights were on. It should have been easy to buy a £40 daylight sensor, plug it in to the control wiring and make a small programming change, but the supplier's quote for installation and commissioning was £3,000.

Not surprisingly, occupiers often replace systems – in this case, by putting ordinary light switches in the conservatory – rather then fine-tuning them. Users may not have the necessary skills, so designers should keep things simple.

How can new buildings be sustainable without add-on renewable technologies?

RB High-tech architects often believe that lightweight buildings are the answer, but these are not usually environmentally benign. Their style has become ubiquitous. You find the same glass towers in the US, the Middle East and the Far East, but the designs have more to do with iconography than with respecting the local climate. More thermally massive buildings that don't need lots of alterations to improve environmental performance might be better in the long run.

BB During a trip to Yazd in Iran, I was impressed by traditional courtyard dwellings built in mud brick from excavated material, where the resulting pit was used as a courtyard, sometimes with a central pool for cooling. The courtyard traps cool air and provides areas of shade and sun. Wind towers and underground canals provide further environmental control. At the end of their life, the buildings can crumble into the desert, filling the pit created by the original excavation – a truly sustainable lifecycle.

Today, all the industrial and political muscle is focused on promoting renewable technologies and other add-on features. This may be good for business but I can foresee passive approaches being sidelined in the rush to add renewable technologies.

RB For politicians and some designers and clients, it's important to have low-energy design on show, but I believe they're looking down the wrong end of the telescope. This is particularly true of windmills and photovoltaics, neither of which is effective compared with simple passive design.

We can improve building energy performance by 50% or

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> Rab Bennetts

60% over standard benchmarks by re-engineering the structure/mass and fabric/cladding, even in City offices. There is less to be gained from re-engineering the environmental services elements if the envelope of the building has been properly engineered.

What else should designers consider on new buildings?

BB There is what I call a multiplier effect that can work in favour of simple approaches. Start with passive design to get rid of unnecessary requirements or technologies, install efficient equipment, control the remaining building efficiently and use low-carbon energy supplies. If you halve demand, double efficiency and halve the carbon content of the energy supplies, you're down to an eighth of emissions.

The problem is there is no reliable capacity in our industry to make simple things work well. Why do we build so many problematic cavity walls when there are reliable externally insulated solid wall systems available? We also have difficulty obtaining components at a cost-effective price – Passivhaus windows, for example, are readily available in Germany but not in the UK.

The same goes for linking systems: we tend to use work packages these days, but the interface packages – both technical and managerial – are often weak, leading to problems in use such as poor airtightness..

Finally, there's the problem of how we put things together. QSs and value engineers constantly tell us that the processes and products regarded as essential to robust, sustainable buildings – based on feedback from performance in use – are too expensive. But they wouldn't be if they were industry-standard. I hope that the UK Green Building Council will be able to make a difference if it helps open up markets for high-performance products and processes.

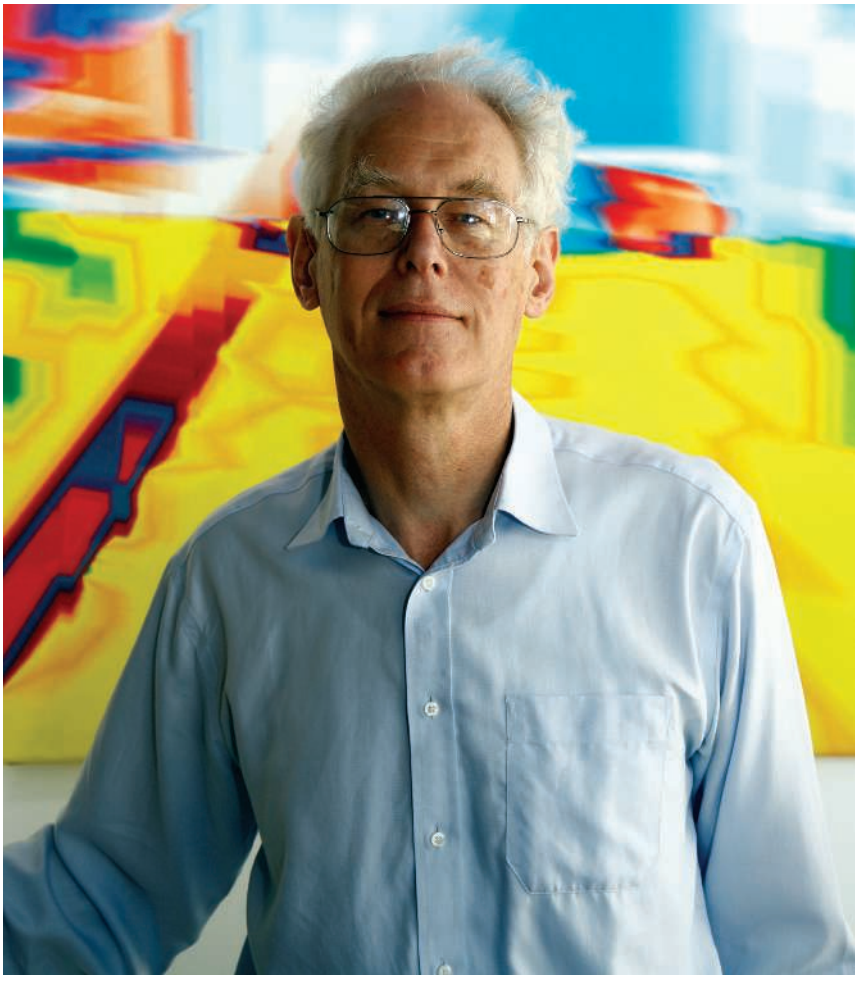
RB A lot of our industry's problems in this area go back to the recession of the early 1990s, when lots of skilled people were lost from the industry. Although the workforce has increased since then, much of it is through casual migrant labour, which has not helped pass on skills and learning.

BB What's needed are the skills and supply chains to get the basics right. Good sustainable design can be simple. We need to follow through from construction into operation, help to understand users, find out what works and what must be improved, and stop spending money on the wrong things. And we need to do it now – there's no time left.

What can designers do about existing stock?

BB The performance of new buildings can be disappointing, but quite a lot of the older stuff is not as bad as you might think. Some of the poorest-performing buildings were built in the 1960s and 1970s, but older buildings often benefit from thermal mass and better passive design for ventilation and daylighting. An awful lot can be achieved through improved control, management and user behaviour, particularly in electrical services, where there is so much avoidable waste.

Before we start knocking down old buildings, we need to be sure the replacements are going to be better. Again, this calls for more reliable design and management and a greater awareness of how buildings perform. Existing buildings that work well socially and economically are already at a huge advantage. The 40% House project [set up by Oxford University's Environmental Change Institute] tried to find ways of improving the performance of existing housing stock. In some areas I don't think it went far enough: there are opportunities to make refurbishments perform better than new-build.



> **We need to find out what really works and stop spending money on the wrong things. And we need to do it now**
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