'Change for good'

Terry WYATT

Partner Hoare Lea Consulting Engineers

1. Introduction

The growth and development of what we currently call 'Building Services Engineering', since its beginnings in early part of last century, has been exponential. In the UK, BSRIA reports, that the size of the industry has overtaken many others, such as farming, once regarded as a significant mainstay of our economy. Even greater growth occurred in Hong Kong and is now under-way throughout China. By any criteria these are big successes.

Though we don't attract the publicity, or have the glamour of the architects, we are the critical industry who makes a building work. We make sure that, using least fuel and energy, a building's temperature over a wide range of climatic conditions is acceptable, that it is adequately and attractively lit, that essential services are provided, that air quality is good minimising harmful pollutants and the spread of infections, that wastes are dealt with and that the building is adaptable and can accommodate newer technologies and changes of use over the building's life

Some would argue that we are now the indispensable industry in the construction process. I don't! Change, very rapid change, is underway within the construction processes and unless we respond quickly, creatively and with focus, we may find that a substantial part of our future earnings and work has disappeared. We are, relatively, a new industry familiar with 'change' and we will continue to thrive if we welcome the approaching changes adapt to them and see them as being 'good', for there is no way back to the past.

The 'Change for good' is for ever and for the better and It will come in both 'What we do ' and in 'How we do it'

2. Traditional work and working practices

Our Role is the Provider of the things that make buildings work.

Originally this was done after buildings were built.

Nowadays there is more involvement with a buildings design.

But the building is, after construction, handed-over as if it were an 'end product', to be operated and maintained by others.

Problems, universally experienced, with this arrangement require change. We must be capable, and in a position, to be able to determine, influence and then control the actual operating performance of buildings in meeting the needs all those involved and effected by it, namely: The Investor. The User. Society & Mankind.

For the Investor; the building needs to be of greater value and able to meet the environmental criteria set by 'Socially Responsible Investors' (S.R.I's).

For the User; the building must be a place of health & Well-being that brings about joy and productivity.

For Society & Mankind; the building must be 'Sustainable' to the Environment and not to be the major source of Climate Changing Carbon Emissions that it is today.

Innovation is central to change and comes from Research and Development. To implement the necessary changes R&D in our industry must be greatly stepped-up from it's present paltry level, and is essential, urgently, in the areas as listed in Table 1.

Table 1 R&D in our industry

Customer	Concern	R&D needed
INVESTOR	Obtaining 'Value' from pursuing sustainability. Costs of 'Better buildings'.	'Whole Life' costing. Criteria for S.R.I's. Improving Construction Productivity & Performance.
USER	Indoor Climate. Adaptable Space. Running Costs. Reliability.	Health, Well-being and Productivity relationships. Operational improvements.
SOCIETY	Climate Change. Resources Depletion.	Building Emissions cuts. Models for decision-making.

3. Changed work and working practices

Terry WYATT : President CIBSE.

Our Role- The Initiator and continuing provider of that which makes a building work, for its Investors, Users and Society, ever better throughout its life.

To fulfil this role we will need to be able to contribute strategically to the preparation of 'The Brief' for the building, ensuring that it will meet the requirements listed, for customer concern, in the forgoing table. This must be followed through design, manufacturing and assembly at site so that the brief is not compromised. After completion comes, arguably, the most important tasks which involves the running of the building through its life, enabling proper changes of use and maintaining it's 'Label and consequent 'Value' at the highest possible level appropriate to its location and usefulness. Finally, we will then be able to complete the cycle by bringing back information to constantly improve our abilities on the original briefing work.

The changes can be visualised, as shown in Fig. 1, in the following way:

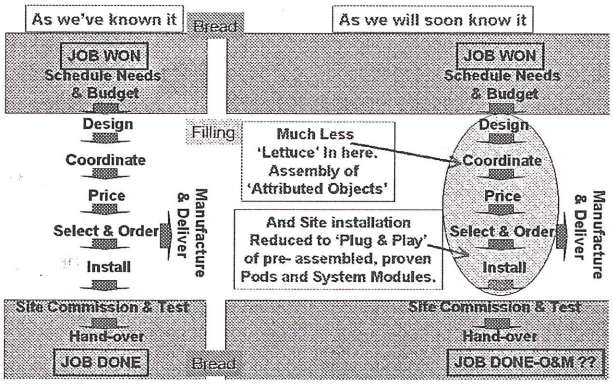


Fig. 1 Our work sandwich

Imagine the construction process and the life of a building as a sandwich. One slice of bread is the briefing, footprint design, concepts and budgets for the building. The filling in the middle consists of the calculations, sizing, positioning and coordination, specification, costing, manufacturing, and the construction and fitting out of the building. The final slice of bread is the O & M work needed to keep the building working well and make future change of use possible.

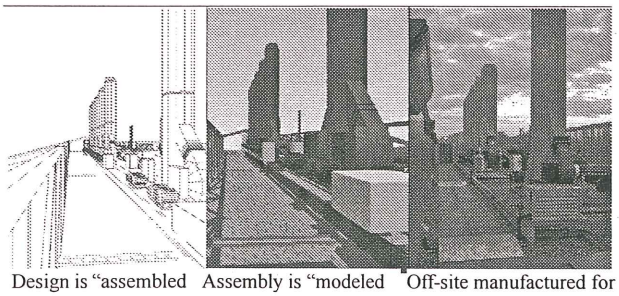
Right now our industry is doing very well in making a decent living with the sandwich filling, while it is much less involved, indeed is often accused of woeful disregard, with the bread surrounding it. My over-riding conviction, backed up by emerging trends within the construction process, is that the filling in the sandwich is going to reduce significantly as computational and modelling design, standardisation and factory construction techniques cut a big swathe through the work currently carried out by the designers and contractors of our industry.

The UK Government frequently quotes the figure of 30% waste, in the construction industry, which they want to see reduced. Much of that exists in the sandwich filling – our current business. Why use a consultant then a contractor to calculate the heating, cooling and lighting needs of a building and then to make installation drawings, and specify the equipment needed, if new software can already do most of this as well as price the job and transfer requirements in detail to manufacturers into the bargain.

Many of you will know this is already happening with the developments of:

1) 'Construction industry standard' software that can automatically calculate the service demands of a building as well as price the job, and the emerging Building Information Modelling (B.I.M.) that will lead to 'Attributed Objects' from which a building design will be assembled, together with

2) The emergence of factory made 'Plug and Play' assemblies of framed-up installations for rooms and Plant & Equipment units that reduce waste and the on-site costs dramatically whilst ensuring control over quality and performance in use. Fig. 2. Shows the employment of these techniques.



Design is "assembled from object" Assembly is "modeled run and tested" "Off-site manufactured for "plug and play" at site

Fig. 2. Employment techniques

If the impact of those two developments is as great as I predict. What will be left for the Building Services Industry? The answer is simple – precious little unless we focus more on those parts of the sandwich filling which will provide a long-term living, plus crucially, the bread on either side of the sandwich. This will mean getting involved far more in the briefing and

concept design of the building, as well as having a longer-term relationship in the O & M of the building, ensuring that it really does work as designed and is thereafter maintained that way through all adaptations.

Re-training will be needed to take on new functions and skills and to tackle new opportunities. The new 'Sandwich' of our work is illustrated in Fig. 3, which also is identified the most important new areas of our work coming from the wider external environment under the title of 'Carbon Management'.

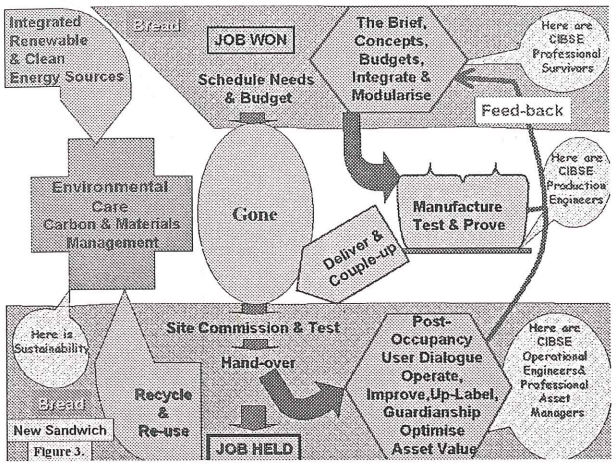


Fig. 3. New sandwich

4. Climate Change and the carbon management market

Climate change is upon us. In the UK we now have a formal Government commitment to adopting the IPCC (Intergovernmental Panel for Climate Change) recommendations for a 60% reduction in carbon emissions before 2050. The commitment is illustrated on Fig. 4.

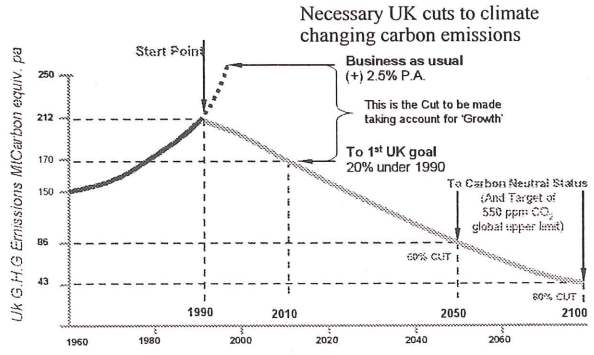


Fig. 4. Climate change mitigation strategy

Targets have been set for energy efficiency and renewable energy over the next 20 years and a strong commitment made to 'Carbon Trading'.

The UK government's gauntlet has been thrown down challenging us to deliver. That challenge comes, especially, to our industry for no others are, singly more able and, in a position to deliver on cutting carbon emissions, than we in 'Building Services'. In looking ahead to 2020, the Government suggests that: "the new generation of buildings could have both minimum energy requirements and produce their own electricity through new and emerging technologies such as micro-CHP, small scale wind turbines, photovoltaic and fuel cells". That's a challenge for us but can we also make it an opportunity?

With buildings the source of a full 50 % of 'Climate changing Carbon Emissions' in the UK, the Building Services Industry has a major opportunity to be at the forefront of 'Carbon Management'. If we achieve the 2 % per Annum improvement to energy efficiency that the government wants, that alone represents a very substantial amount of business for someone to manage. Making buildings, both existing and new, more energy efficient and using more 'green energy' some of it embedded in the fabric of the building, suddenly has big financial benefit. The present danger for our industry is that we wont grasp the opportunity and will allow others to do it instead. We are already behind with advancing along the necessary curve for this.

Embracing and responding with vigour to the call for the mitigation and eventual reversal of 'Climate Change' must be seen as an obligation for all engineers and particularly to us holding so many parts of the solution. The problem is illustrated on Fig. 5 showing the growing 'Global Carbon Imbalance'. It can be seen that, all the activities to make cuts to emissions since 1990 have failed to move below the exponential 'business as usual' curve. Then, if the best we can hope for, is to restrict the upper atmosphere to twice the pre-industrial level at 550 PPM, then we will certainly have to be coping with a very different climate. One that, probably, is beyond our capacity, certainly, as far as the structure of our present society is concerned.

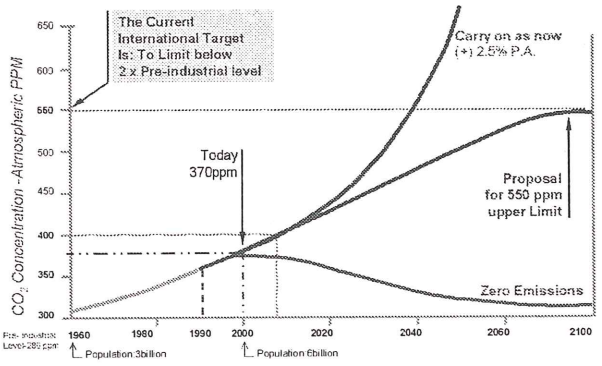


Fig.5. Global carbon imbalance

Carbon Management ' for tightly restricting 'Climate Changing Carbon Emissions' is also and similarly crucial to the burgeoning growth of China. To date China has not been the cause of much 'Climate Changing' emissions but it will be the ultimate tragedy for society and mankind to follow in the footsteps of those that have been the cause instead of leaping to the 'Low Carbon' path that also has enormous business opportunities.

The activities and methods being developed for the UK are totally relevant to China. Better, far more energy efficient yet, more healthy and comfortable buildings are as crucial in China as anywhere else. Use of Combined Heat & Power via distributed generation of electricity; development of renewably sourced electricity and of 'Bio fuels' offers the same benefits and 'Carbon Capture' is of even greater importance since Coal will clearly continue to be the primary fossil fuel in use.

So; the good news is that –'Our Time Has Arrived'. For not only has demand for new lifestyles, better working conditions and new technologies brought ever greater need for building services, but 'Global Climate Change' – Mankind's greatest peril, coupled to a widespread realisation of the need to reform Economics under the banner of 'Sustainability' has, in the context of the built environment, brought both an obligation and a colossal increase to the importance of our work and to our place in society. Prosperity beckons but will only be enjoyed if and when we act and change for good.