

Notes from the MatUK Construction Working Group meeting

Meeting held on 14 Sep 2007 at CPA offices in London

Attendees

Philip Ramsey	Pilkington (chair)
Tony Ashridge	Imerys
John Brumwell	DBERR
Steve Clarke	Costain
John Davenport	TWI
Costas Georgopoulos	The Concrete Centre
Bill Lee	Imperial College
Barrie Moore	PIA
Rupert Scott	TRADA
Mark Singleton	Startlink
John Tebbit	CPA (sec)
Andrew Tyler	Omya
Roy Wakeman	Mumford & Wood
Carolyn White	BSI Global

Apologies: David Adams (Knauf), Graham Couchman (SCI), Tim Marsden (BPF), Cliff Fudge (H+H Celcon), Tim Broyd (Halcrow).

Introduction

The Chairman welcomed new members who have joined us after attending the Community Meeting held in July. He reminded attendees of the remit of the working group, to establish a Strategic Research Agenda for materials in the construction industry, housing to start and then non-residential buildings and infrastructure.

A clear message from the Community Meeting in July was that the industry has been given a Vision by the CLG's Code for Sustainable Homes and other initiatives, but that there are major practical challenges to implementation such as cost, increasing volume demand, the attractiveness of sustainable designs as opposed to the traditional 'country cottage' and the skills and training that will be needed. There are also considerable *material* challenges which are generally not referred to in any of the

various reports and strategies linked to the drive for sustainable homes, which confirms that this working group can plug an important gap.

Discussion on Materials Issues leading to Identifying General Themes

The Chair led a discussion on future developments of glass and windows which then moved to bricks and other materials. It was quickly agreed that as an industry-wide working group, we should be concentrating on identifying **common themes** across material sectors, buildings elements and throughout the supply chain, rather than specific product developments which become competitive between different materials and are best dealt with by individual companies or collaborations.

Common themes identified:

- Reducing the **embodied energy** of common construction materials and the raw materials which input into them:
 - o **Alternative fuels** in manufacturing processes; lower cost and carbon alternatives to oil and gas.
 - o **Heat recovery and re-use** particularly developing practical ways to use lower temperature heat often wasted in common manufacturing processes. Glass and bricks were specifically mentioned at the meeting but this also applies to other construction materials.
 - o **Increased use of recycled materials.** The issue preventing more direct re-use of recycled materials is often quality, so we require better reclamation processes and/or more robust manufacturing processes which can cope with an increased level of contamination from other materials.
 - o **Lower temperature manufacturing processes.** Processes more chemical / biological in nature, rather than high temperature melting. The main issues are likely to be the durability of materials manufactured by lower temperature processes and recycling may be more difficult after permanent reactions.
 - o **Processing of input raw materials** may also reduce manufacturing energy further down the chain, for example reduced particle size may speed-up / reduce temperatures.
 - o An obvious point is that an improvement in the basic properties of a material can result in **less of it being required** which would have a direct effect on embodied energy, for example stronger glass may allow thinner glass / window frames to be used, with lower embodied energy.
- **Coatings** or more generally **Surface Engineering** was identified as an important common theme across material sectors and building elements. For example, heat and light transmission through windows is largely determined by the coatings on the glass, rather than the glass itself.
- There is a lack of **LCAs** for construction materials and systems. These are needed to investigate the relative benefit of potential improvements and to understand the sensitivity of energy / carbon and other environmental aspects to various factors. They should include end-of-life issues and transport (not just to the factory gate) which is important to assess the benefit of off-site construction methods and be easy to use and allow different scenarios to be compared. It was suggested that

BRE could be commissioned to perform this task. It is likely that some material properties and other data may not be known reliably, so a programme of testing may be required. MatUK has the objective of setting-up a Materials Validation Centre, but this appears to be stalling. Roy emphasised the need for **Full Lifetime Costing**.

- As in previous meetings, it was agreed that the interfaces between different materials in hybrid systems will be increasingly important, directly in issues such as air-tightness and thermal bridging, but more generally in joining new elements and materials together. Therefore, **joining technologies** and the more general subject of **designing interfaces** between dissimilar materials was identified as an important common theme. When doing this, recycling needs to be considered carefully.
- We discussed some of the issues around the practicality of mass producing homes requiring much **tighter tolerances** and **new skills / education**. This is linked to **off-site construction methods**, since there is a limit to what can be done on-site, with a number of associated potential advantages such as reducing **waste** on sites and **H&S**. One potential concern of central manufacture of large units such as walls and roofs is **transport** costs and energy. All developments and designs need to be mindful of **'buildability'**, which may be a theme worth considering further.
- **Thermal mass** of materials and systems is a common topic of interest when designing sustainable buildings, including the emergence of **phase change materials**. The whole issue of heavyweight vs. lightweight materials was mentioned, although it is difficult to make generalisations. Again, LCAs are needed to be clearer about comparisons.
- The issue of assessing and predicting a buildings performance against the various criteria used in the Code for Sustainable Homes and other publications, was discussed. It was agreed that the **models** need to be improved to make this more reliable and user-friendly in terms of running different scenarios to determine the effect of changes to design and/or materials. Reliable models will need to be **validated** which may require new practical methods. Use of these models should clarify the main factors for UK, for example should we concentrate on winter heating or summer overheating, or is it critical to tackle both simultaneously.

There may also be potentially step-change pre-competitive research into **novel materials** that should be undertaken centrally because the scale and technical risk are beyond the resources of individual companies, who may also have little incentive to develop disruptive technologies that may nevertheless be vital to the industry as a whole. If the UK does not develop these novel materials, others will.

Summary and Way Forward

So, the potential common themes identified were:

1. LCAs for construction materials.
2. Validated Models of building performance.
3. Coatings and Surface Engineering.

4. Novel, potentially step-change, disruptive materials.
5. Thermal mass materials and their use.
6. Joining technologies and interfaces in general, including tolerances.
7. Embodied Energy: 1) alternative fuels, 2) heat recovery and re-use, 3) increased use of recycled materials, 4) Lower temperature manufacturing processes, 5) modification of incoming raw materials.
8. 'Buildability': issues around the practicality of new developments such as off-site methods, tolerances, H&S, skills, waste, etc.

It was agreed that the Working Group should continue down this approach and that the next step should be to engage wider discussion to firm-up on the list of themes and gather more examples of their relevance to a broad cross-section of the industry.

Cross-industry work, with universities and other bodies to improve our understanding and knowledge in these areas would help the UK Construction Industry to drive product innovation.

The next step would be to consider a number of possible options for taking these common themes forward, ranging from 'Centres of Excellence' to the direct funding of specific tasks.

The themes will be firmed-up with consultation from the members of the steering group and draft action plans proposed. They should also be raised at various forums and with key stakeholders, such as the relevant TSB Innovation Platforms, EPSRC, Knowledge Transfer Networks and key individuals contributing to the Calcutt Review, "Strategy for Sustainable Construction" and other influential initiatives.

A follow-up meeting to review progress and agree a more detailed action plan will be arranged before Xmas. At this point the other areas of non-residential buildings and infrastructure will also be kicked-off and will probably follow a similar route, but more quickly.

P Ramsey
17 Sep 07