Innovating with Low Impact Materials

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Leading the way through research....

• Unfired clay
• Straw bale construction
• Hemp-Lime construction
• Bio-composites
• Multi-functional materials
• Full-scale building research
Unfired clay

• Clay has been used in construction for millennia
• 85% of the embodied energy of bricks is associated with their firing
• Can we use unfired clay in modern construction?
• What are the issues that arise?
Unfired clay

• Bond strength – cement mortars don’t work
• Novel binders developed and tested
Straw Bale Construction

• Straw has also been used in construction for millennia as part of composites (Adobe etc...)
• Straw bale construction started in the US in the C19th
Straw Bale Construction

- Durability
Straw Bale Construction

• Structural
Straw Bale Construction

• Fire Resistance
Straw Bale Construction

• Development of ‘industrialised’ straw bale construction:
  • Quality assurance
  • Acceptable in the mainstream of construction
Hemp-Lime construction

- Novel form of construction
- Developed in the 1980s by Yves Kühn in France
Hemp-Lime construction

- Structural
Hemp-Lime construction

• Durability
Hemp-Lime construction

• Hygrothermal performance
Hemp-Lime construction

- Pre-fabrication
Hemp-Lime construction

• Pre-fabrication
Bio-Composites

- Development of multi-functional bio-based insulating materials
  - Improved temperature & humidity buffering
  - Photocatalytic coatings
  - VOC capture
- Development of holistic modelling framework
- Demonstration of proof of concept and scalability towards industrial needs
- Exploitation and Dissemination (First market replication)
Bio-Composites

- Development of new sustainable composites
  - Enhanced durability and performance
  - New binders, use of sol-gels
- Development of new sustainable construction products
- Demonstration of proof of concept and scalability towards industrial needs
- Exploitation and Dissemination (First market replication)
Multi-functional materials

- Development of technologies to improve characteristics of bio-based materials
  - Advanced coatings (photo-catalysis, improved buffering)
  - Advanced treatments (sol-gel, organic binders)
  - Advanced performance (thermal conductivity, hygrothermal buffering)
The Building Research Park

The Vision

• Resource for students and academics
• International centre of excellence for research into all aspects of construction
• Resource for industry to develop and prototype products
• Vehicle for creating impact in the field of construction
  • Low impact materials
  • Low impact design
  • Influence construction industry
  • Influence policy makers
  • Contribute to UK CO₂ emission targets
The Building Research Park

Key facilities

• The HIVE
• 16 experimental ‘pods’
• Opportunity for long term exposure tests on materials
• Planning all pre-approved
• ‘Plug and play’ facility
  • Utilities
  • Communications
  • Data loggers
  • Supervision
  • Maintenance
Bladder Cell
Double-height Cells
Pods
Investigators

Tim Ibell
President of IStructE

Pete Walker
Director of BRE CICM

Antony Darby
Head of Civil Engineering
Research sandpit
26th & 27th October
Bristol Marriott Royal Hotel
Generate research priorities
Thank you