



An Outline Integrated Project proposal to potential partners.

Full Proposal Submission:
27th March 2006

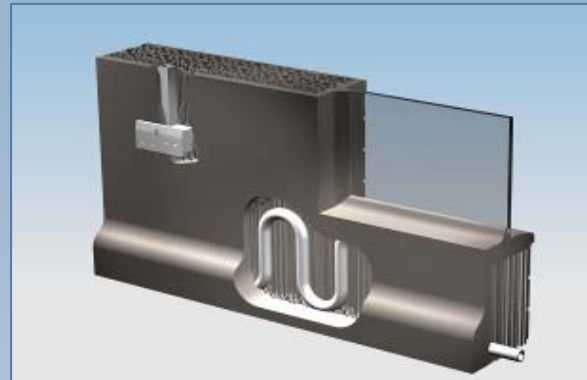
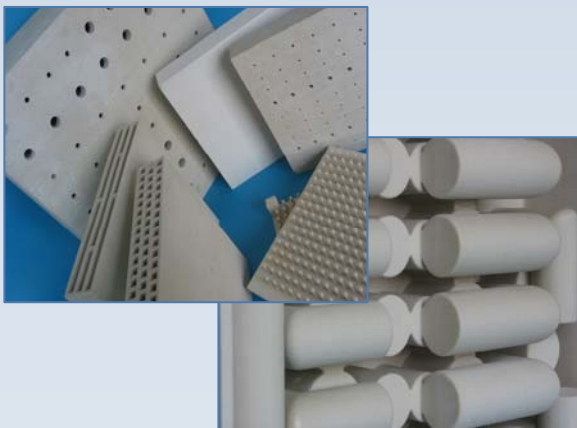
Freeform Construction: Mega-scale rapid manufacturing for construction

The challenge

The construction industry still relies on craft based trades and still suffers from poor performance and quality. Labour shortages, environmental legislation and higher performance demands will compound these issues. Where are the innovations that have been called for? Where are the technologies for a 21st century construction industry? Who is driving the development of new materials and process? It could be us!

The vision

Loughborough University invites you to participate in an adventurous piece of research that will take construction technology way beyond anything the industry has seen. The step change technology will print full-scale building components, layer by layer, freeing the constraints of 'straight line' form, allowing full systems integration. The project will deliver full scale wall and volumetric components, complete with system interfaces 'designed in' and service voids incorporated as the wall is 'printed'. The new technology uses computer based 3D Solid modelling to



drive precise control of construction material deposition... Just click 'Print' for your building.

The benefits

With digitally controlled, automated, constraint free structural material deposition:

- Liberation of form
- Single material construction
- Function integration
- Interface resolution
- Reduction in assembly complexity

Reasons for getting involved are:

- World leading research, this isn't happening anywhere else
- Low risk
- Inside track on new technology ahead of competitors
- Free publicity, the work is high profile
- IP and patent potential
- New market potential

The feasibility of the approach has been already been demonstrated. The UK will take the lead in the development of these new full-scale processes.

Engineering Design Control
 Design Process Machine Construction
 Mechatronics Materials
 Fabrication Design Tools
 Materials Handling Process

The project

This Integrated Project proposal focuses on the generation and development of a new construction technology. It is the realisation of two years and £300K of investment into freeform construction technologies. It builds on a range of high-impact research at Loughborough's Innovative Manufacturing and Construction Research Centre into process and materials development, offsite technologies and rapid manufacturing.

The concept is radical and will deliver construction processes not yet conceivable to the majority of sector players. The four year EPSRC funded £1M project (12 man years effort) with matching industrial contribution will concentrate on the inception of new materials and process, investigating interface and function design interaction, developing control and design generation tools and full scale testing and demonstration.

'Materials for construction projects are usually considered and classified as having traditional functionalities...This poses limitations on the development of new ideas and concepts in building...'

'...New "high value" construction materials, manufacturing technologies and processes for new materials that have new multi-functional properties...should be developed...'

European Construction Technology Platform 2005, Strategic Research Agenda for the European Construction Sector: Achieving a sustainable and competitive construction sector by 2030, European Construction Technology Platform.

Aim and objectives

The concept of freeform construction requires a departure from the traditional roles of construction professions. It can only be realised through a thoroughly integrated, multi-disciplinary approach. The project will deliver:

- Full scale demonstration of a mega-scale additive process
- New construction materials
- A new construction process
- The fundamental issues that will relate to all future technology development
- New concepts in material + process driven design



The project team

Loughborough University

Civil & Building Engineering: Alistair Gibb, Tony Thorpe and Simon Austin • Mechanical and Manufacturing Engineering: Rupert Soar.

Industry

Architects, engineers and designers • Materials, material delivery and transport, additive process and mechatronics experts • Machine builders, CNC fabricators, controls and software developers.

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