

**APPENDIX B**

**Nanotechnology and Construction**

Nanotechnology is predicted to be a main driver of technology and business in this century and holds the promise of higher performance materials, intelligent systems and new production methods with significant impact for all aspects of society. On 7<sup>th</sup> August 2006 Nanoforum and the Institute of Nanotechnology (IoN) commissioned a study of the impact of Nanotechnology on the Construction Industry.

A very important part of the report is gathering the views of a broad range of Industry and Researchers in the field and presenting them in a structured way through the attached survey. We would be grateful for your time in completing this questionnaire.

Please submit your responses by **15<sup>th</sup> September 2006** - the timing of this exercise is crucial since the completion of the report(s) on Nanotechnology in Construction are due by the end of October 2006 and your input will set the direction of the work. It is important therefore that the views of the construction and research community are taken into account.

We anticipate that the survey, comprising a set of 10 questions, should take on average 15 minutes for you to complete. You are strongly encouraged to participate as this modest investment of your time can have an important impact on future industry and research initiatives in Nanotechnology in Construction. The outcome of the survey will be published on Nanoforum's website ([www.nanoforum.org](http://www.nanoforum.org)) and you will be first to be informed.

Please email or fax the completed questionnaire back to the address at the bottom.

**1. Personal Details**

Family name: .....

First name: .....

Email address: .....

Organisation:

Self-employed

Governmental body

University/higher education

Commercial organisation less than 250 employees

Commercial organisation more than 250 employees

Association (e.g. trade association, trade union, employers association, chamber of commerce, NGO)

Other (please specify) .....

Organisation name (if applicable): .....

Role in organisation:

- Management
- Researcher
- Strategy/policy officer
- Specialist/expert
- Consultant/ Engineer
- Other (please specify) .....

Please indicate if you are completing this survey as an individual or on behalf of your company. Individual  Company

Your organisation's country of establishment (indicate your country of residence if answering as an individual person): .....

Your organisation's geographical area of activities (indicate your area of activities if answering as an individual)

- Local
- Regional
- National
- European
- Asia
- Americas
- International

## **2. Industry/ Research Segment Details**

### **2a. Are you involved in Design?**

Yes  No

If so, which area(s)? Specify one or more below,

- Architectural design
- Civil design – please specify below,
  - Roads
  - Bridges
  - Railways
  - Dams
  - Water Supply
  - Other, please specify .....
- Structural design
  - Seismic
  - Non-Seismic
- Building Services design – please specify below,
  - Environmental Control
  - Lighting
  - Electrical
  - Other, please specify .....
- Sustainability/ Life Cycle Cost design
- Other - please specify .....

### **2b. Are you involved in Inspection, Monitoring or Engineering Forensics?**

Yes  No

If so, which area(s)? Specify one or more below,

- Architectural
- Civil – please specify below,
  - Roads
  - Bridges
  - Railways
  - Dams
  - Water Supply
  - Other, please specify .....
- Structural – please specify below,
  - Seismic
  - Wind
  - Impact
  - Other, please specify .....
- Forensic Engineering, please specify area .....
- Building Services – please specify below
  - Environment Control
  - Lighting
  - Electrical

- Other, please specify .....
- Sustainability/ Life Cycle Cost
- Testing
- Other - please specify .....

**2c. Are you involved in Construction?**

Yes  No

If so, which area(s)? Specify one or more below,

- Architectural component construction, please specify,
  - Internal
  - External
- Civil – please specify below,
  - Roads
  - Bridges
  - Railways
  - Dams
  - Water Supply
  - Other, please specify .....
- Structural component erection
- Building Services – please specify below,
  - Environmental control
  - Lighting
  - Electrical
  - Other, please specify .....
- Sustainability/ Life Cycle Cost
- Other - please specify .....

**2d. Are you involved in Research ?**

Yes  No

If so which area(s)? Specify one or more below,

- Architectural component research – please specify .....
- Materials research - please specify below,
  - Steel
  - Alloys, please specify .....
  - Concrete
  - Timber
  - Composites, please specify .....
  - Glass
  - Coatings, please specify .....
  - Bituminous materials
  - Other, please specify .....
- Simulation and Modelling research – please specify below,
  - Structural, specify below

- Seismic Yes  No
- Wind Yes  No
- Hydraulic
- Transport related
- Forensics or data acquisition
- Other, please specify .....
  
- Building Services research - please specify below,
  - Environmental control
  - Electrical
  - Other, please specify .....
  
- Sustainability/ Life Cycle Cost
  
- Techniques/Instruments of Characterization
  
- Other - please specify .....

**2e. In your area(s) of expertise what do you think is the current state-of-the-art, and what are its limitations?**

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**3. Level of Knowledge/ Involvement in Nanotechnology**

	None	Low	Moderate	Quite High	Very High
What would you say is your level of knowledge with regards to nanotechnology in general?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	None	Low	Moderate	Quite High	Very High
What would you say is your level of knowledge with regards to nanotechnology in your sector or field of construction or research?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	None	Low	Moderate	Quite High	Very High
In your opinion, what is the level of knowledge and how advanced are the applications of nanotechnology, within your sector or field of construction or research?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Not at all	A little	Moderately	Quite a Lot	Very much
How involved in nanotechnology are you/ your company?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Europe	Americas	Asia	Don't Know
Which world region is the current leader in Nanoscience in Construction (e.g. in terms of scientific publications or use in industry)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#### **4. Your Current Work**

**Does your current work or sector of expertise make use of advances in nanotechnology?**

Yes  No  (if no, please skip to question 5)

**In which of the following fields or sectors are you most active, with regards to nanotechnology applications in construction today?**

##### **4a. Techniques/ Instruments of Characterization**

- Focused Ion Beam
- Scanning Electron Microscopy
- Synchrotron Radiation Tomography
- Soft X-Ray Transmission Microscopy

- Atomic Force Microscopy
- Indentation Testing
- Other – please specify .....

**4b. Modelling**

**Materials**

- Cement Based
- Metallic Based
- Timber Based
- Glass Based
- Composite Based
- Bitumen Based
- Other – please specify .....

**Systems**

- Engineering Structural Behaviour
- Building Environmental Behaviour
- Building Electrical/Lighting Systems Behaviour
- Civil Engineering Hydraulics
- Coating/ Surfaces Behaviour
- Sustainability/ Life Cycle Cost
- Modelling of Occupant Usage
- Other – please specify .....

**4c. Materials and Products**

- Cement Based
- Metallic Based
- Timber Based
- Glass Based
- Ceramic Based
- Composite Based
- Bitumen Based
- Carbon Fibre/ Nanotube Based Materials or Products
- Other – please specify .....

**4d. Applications**

- Architectural
  - Internal
  - External
- Building Structure
- Building Services
  - Environmental Control
  - Electrical/ Lighting Systems
- Civil
  - Roads
  - Bridges
  - Railways
  - Dams
  - Water Supply
- Coatings
- Monitoring/ Forensics
- Other – please specify .....

**4e. With regards to the above, describe the work you are involved in and how it relates to the use of nanotechnology in the construction industry**

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**4f. With regards to the above what are the conventional strategies to solve these problems and how is the nanotechnology approach superior to these strategies?**

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**4g. With regards to the above, what are the issues that prevent the more widespread use of the nanotechnology strategy rather than the conventional approach?**

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**4h. With regards to the above, what do you estimate to be the global market value of the construction segment that could be impacted by your work?**

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How long do you think before your work in nanotechnology will arrive on the construction market?

	0-3yrs	3-5yrs	5-10yrs	more than 10yrs
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## **5. Your Thoughts about the Future**

**Which of the following fields or sectors are you most excited about with regards to the application of nanotechnology in construction for the future? If none, please skip to question 6**

### **5a. Materials**

- Steel
- Alloys – please specify .....
- Concrete
- Timber
- Composites – please specify .....
- Glass
- Coatings – please specify .....
- Bituminous materials
- Other – please specify .....

### **5b. Systems**

- Architectural components
- Engineering Structures
- Environmental control
- Electrical/ Lighting systems
- Sustainability/ Life Cycle Cost
- Monitoring/ Labelling
- Modelling
- Testing/ Forensics
- Other – please specify .....

### **5c. Sectors**

- Buildings
- Roads
- Bridges
- Dams
- Water Supply
- Other – please specify .....

**5d. With regards to the above, describe the relevant concepts or strategies and how they relate to nanotechnology in the construction industry**

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**5e. With regards to the above what are the conventional strategies to solve these problems and how might the nanotechnology approach be superior to these strategies?**

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**5f. With regards to the above, what are the issues that might prevent the more widespread use of the nanotechnology strategy rather than the conventional approach?**

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**5g. With regards to the above, what do you estimate to be the global market value of the construction segment that could be impacted by these concepts or strategies?**

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	5-10yrs	10-15yrs	15-20yrs	more than 20yrs
How long do you think before these concepts or strategies may arrive on the construction market?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**6. Is there adequate research funding for nanotechnology related to construction?**

Yes  No  Don't Know

**What areas (if any) should receive greater attention?**

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**7. If your work is in industry, does your company currently have an R&D group studying Nanotechnology in Construction ?**

Yes  No  Not yet, but in the near future

**9. If you wish to expand on any of your statements or make any other comments, please use the space below**

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**10. If you feel we should contact someone else in your group or field please pass on the questionnaire to them or indicate the name and contact details below,**

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Thank you for taking the time to complete this questionnaire.

If you would like to be informed when this report is published, please tick this box

Please tick this box if you agree to us using your personal details in any report

If you have any questions about this questionnaire or the Institute of Nanotechnology, please contact:

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Institute of Nanotechnology,

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