BTCM @ IIT Madras

Providing academic leadership in the areas of
Building Science, Construction Management,
and Construction Materials

BTCM
Building Technology and
Construction Management

Department of Civil Engineering
Indian Institute of Technology Madras

BTCM @ IITM - Overview

- First in India to facilitate teaching, learning, and research in…
  - Building Physics
  - Construction Management
  - Construction Materials
- Academic Programs by the Division
  - Dual degree program in BTCM
  - M.Tech. (Building Technology & Construction Management)
  - UoP M.Tech. (Construction Technology & Management)
    - Since 1998
    - L&T sponsors 30 students (Civil, Electrical & Mechanical) each year
- Research Programs
  - MS & PhD
- Faculty Members
  - 10 (full time) + Adjunct and Visiting Faculty

Areas of specialization of faculty members

Faculty	Construction Materials	Construction Management	Building Sciences
Prof. K. Ramamurthy	▲		▲
Prof. Ravindra Gettu	▲		
Prof. Manu Santhanam	▲		
Dr. Radhakrishna G. Pillai	▲		
Dr. Piyush Chaunsali	▲		
Dr Keerthana Kirupakaran	▲		
Prof. Surendra P. Shah	▲		
Prof. Koshy Varghese		▲	
Prof. Benny Raphael		▲	▲
Prof. Ashwin Mahalingam		▲	
Dr. Sivakumar Palaniappan		▲	
Dr. Nikhil Bugalia		▲	
Dr. Aslam Kunhi Mohammed		▲	
Prof. N. Raghavan	▲	▲	
Prof. K. N. Satyanarayana*		▲	

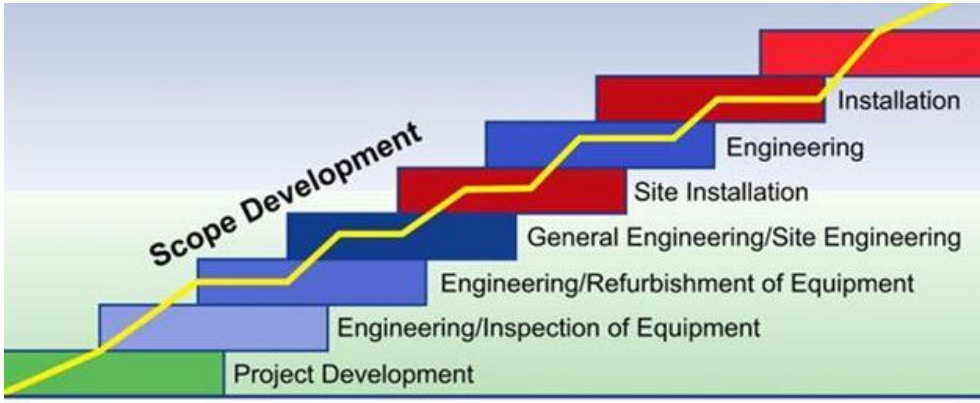
* On deputation to IIT Tirupati as Director

A glimpse on the activities by
Construction Management group

- Construction management
- Infrastructure management
- Construction automation

Studies on construction management

- Questions we answer
  - How do we make construction more ‘LEAN’ and efficient?
  - How do we increase digitalization in the industry? (e.g., BIM, AI, etc.)
  - How do we create more integrated processes for project delivery?



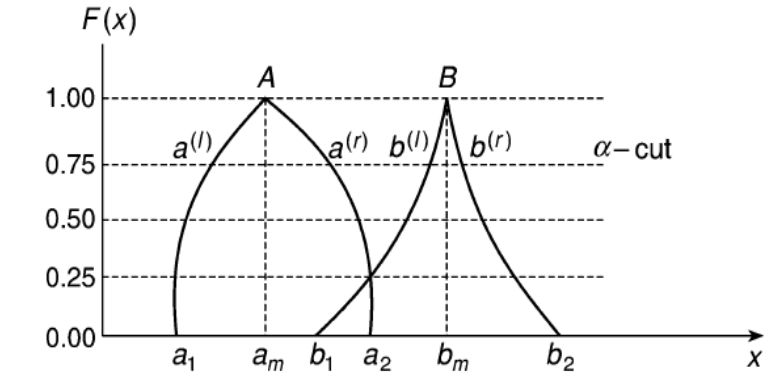
- Impacts

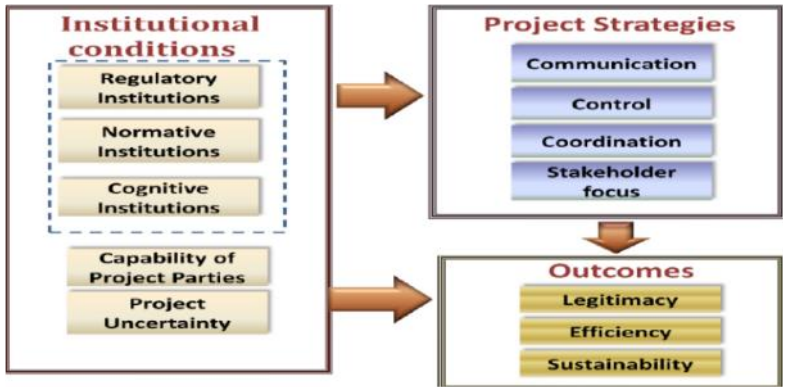
Lean Champions Program

Build India Scholarship

Studies on infrastructure management

- Questions we answer
  - How do we manage Megaprojects better?
  - How do we build Sustainable and Resilient Cities?
  - How do we build Infrastructure Faster, Better and Cheaper?

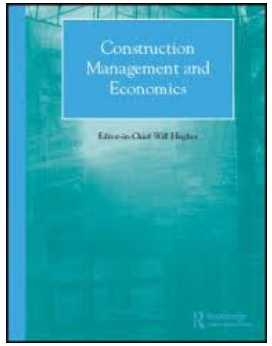




- Impacts

TN Infrastructure Development Act

PPP Policy
Renegotiation Policy



Studies on construction automation

- Questions we answer
  - How do we improve time, cost and quality of construction through automation and robotics?

- Impacts
  - New theoretical concepts, technology solutions
  - Automated construction methods
    - 3D Printing with Concrete

I.A.A.R.C.

SAINT-GOBAIN

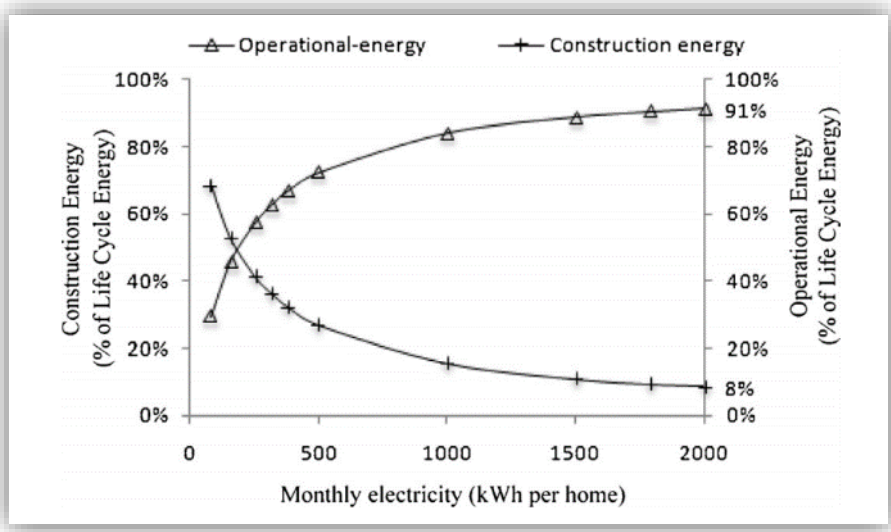
Indian Green Building Council

ASCE Journal of Computing in Civil Engineering

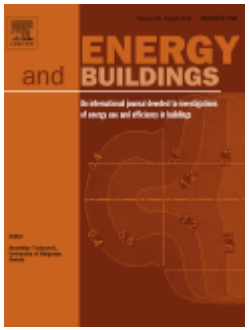
Studies on sustainable construction

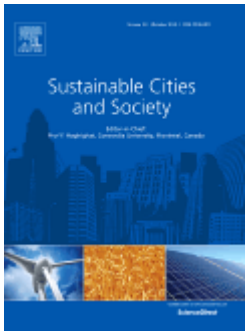
- Questions we answer
  - What is the relative contribution of construction energy with respect to building life cycle energy?
  - How to integrate sustainability metrics into construction planning and control practices?
  - How do we improve the schedule performance of construction projects in India?

Naturally-ventilated buildings | Air-conditioned buildings



- Impacts





Dr. Koshy Varghese

Professor; Ph.D., University of Texas

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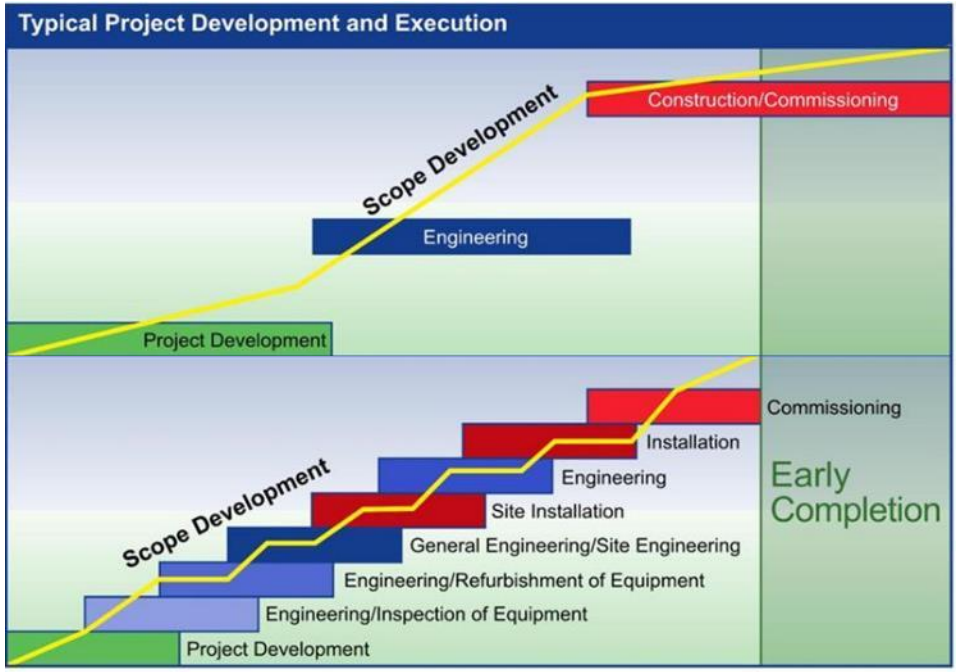
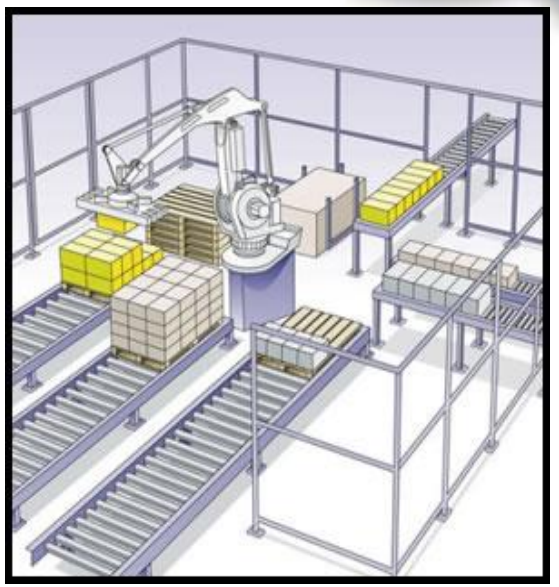
- Automation in Construction
- Fast Track & Concurrent Engineering Projects
- Sustainable Development
- GIS in Civil Engineering Applications





Dr. Benny Raphael

Professor; Ph.D., Univ. of Strathclyde, Glasgow

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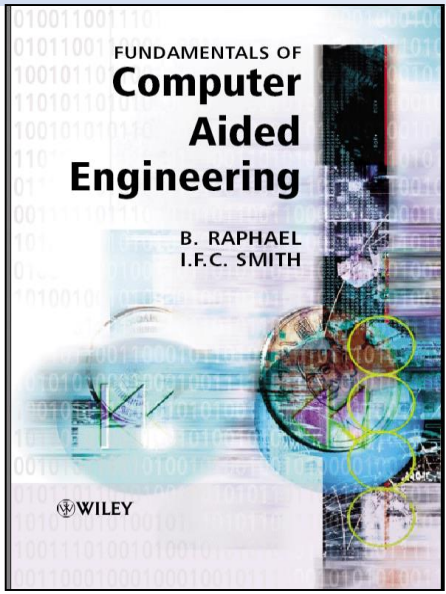
- Construction automation and robotics
- Computer Aided Engineering
  - Modeling, Optimization, Data mining
- Energy efficient buildings
  - Sustainable and smart building systems



Dr. Ashwin Mahalingam

Professor; Ph.D., Stanford University

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- Megaproject Management
- Sustainable and Resilient Cities
- Building Information Modeling and Integrated Project Delivery

Dr. Sivakumar Palaniappan

Associate Professor; Ph.D., Arizona State University

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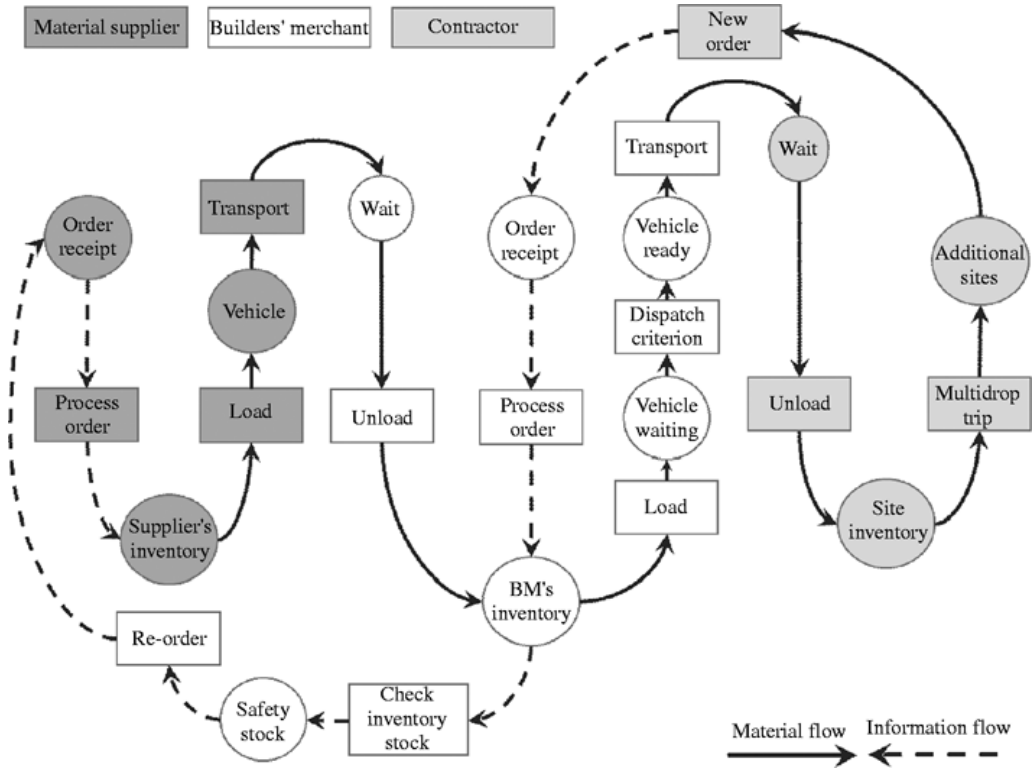
- Modelling and Simulation of Construction Processes
- Information Technology in Construction
- Sustainable Construction



Dr. Nikhil Bugalia

Assistant Professor; PhD, The University of Tokyo, Japan

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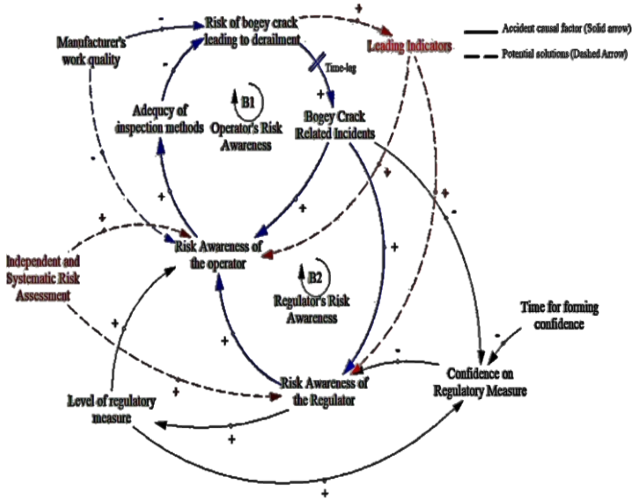
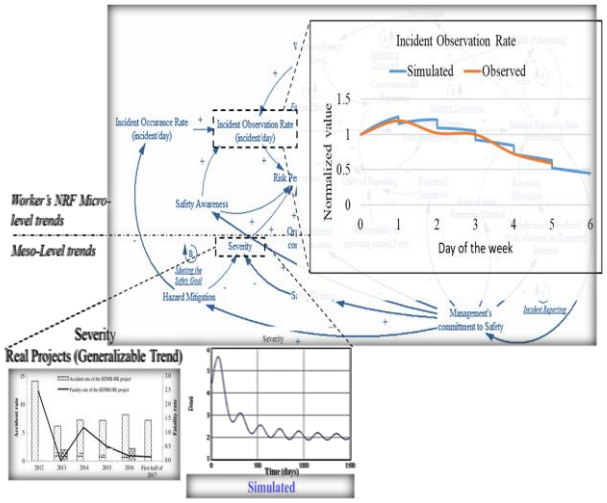
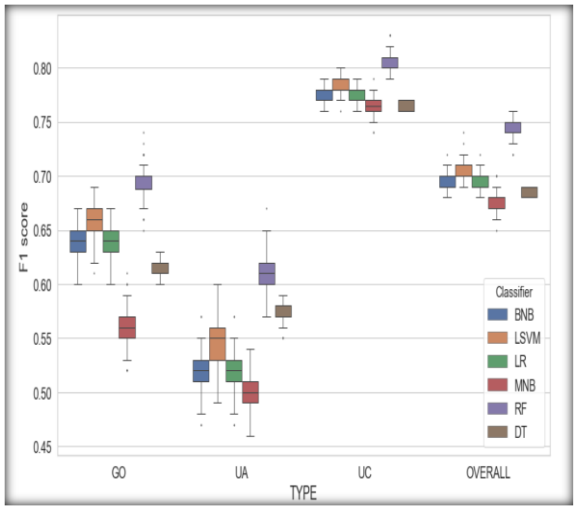
- Safety Management – Railway/Construction
- Organizational Management, Policy for safety management
- Machine-learning for Safety Management



Generalized institutional accident mechanism in Japanese High-Speed Railway



System Dynamics based Numerical simulation for near-miss reporting system



Machine-learning based classification of safety reports

System-Thinking based process map and numerical simulations

Dr. Aslam Kunhi Mohamed

Assistant Professor; Ph.D., EPFL

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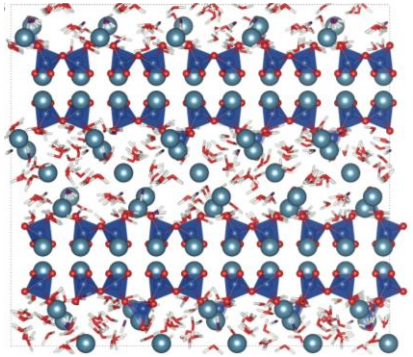
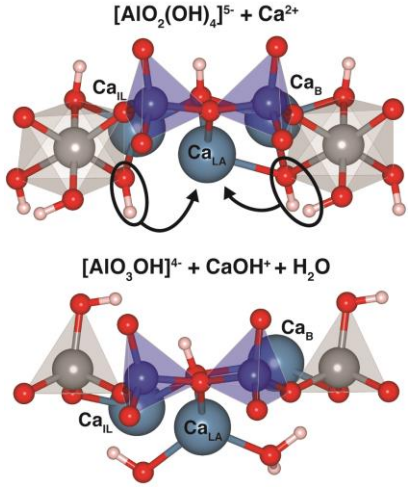
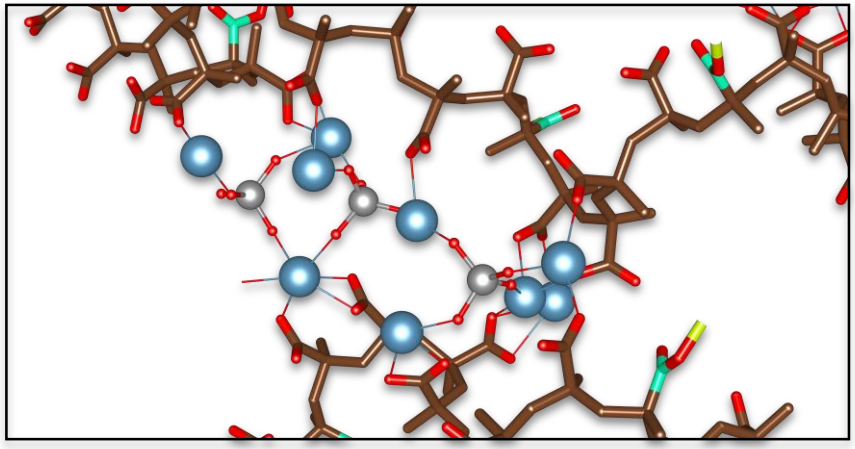
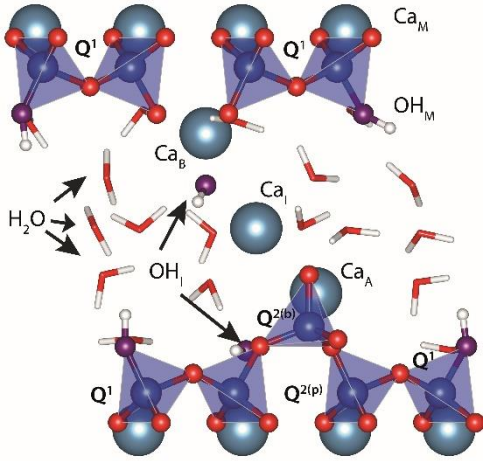
- Molecular modeling of cementitious materials
- Cement hydration at the atomic scale
- Low CO2 cements
- Admixtures



Realistic C-S-H atomic structures-
Cementitious materials and its interfaces







Prof. N. Raghavan

Professor of Practice

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Building Technology and Construction Management

- Construction Management Contracts/ Methods
- Repair & Rehabilitation
- Safety Management
- Structural Consultancy

A glimpse on the activities by
Construction Materials group

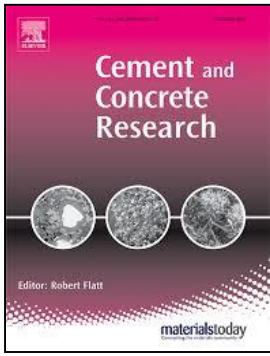
- Cement chemistry and concrete microstructure
- Mechanical properties, dimensional stability, corrosion and durability
- Service life estimation & extension
- Sustainability & life cycle assessment

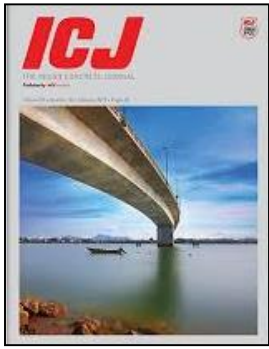
Questions we answer?

- How to design special concretes for various specific needs?
  - SCC, FRC, TRC, LWC, etc.
- How to utilize various by products and alternative materials?
  - Fly ash, slag, limestone, calcined clay, biomass, recycled aggregates, etc.
- What are the material characteristics? How do improve the behaviour of concrete in short and long term?
  - SEM, EDAX, chemical composition, pore structure, etc.
- How to estimate and enhance the corrosion resistance and service life of concrete structures ? How can we arrest corrosion?
  - Chloride ingress, carbonation, corrosion rate, cathodic protection, etc.
- How to estimate and enhance the dimensional stability and mechanical properties of material systems?
  - Toughness, bond strength, fatigue resistance, etc.

Impacts

- Research collaborations
  - DST, Lafarge & Indian industry
  - Polimi, UCT, EPFL, MIT, Imperial, OSU
  - Other IITs, NITs & other engineering colleges
- Improved performance with existing materials, and insights into new materials
- Test methods, codes and technical guidelines
  - BIS, RILEM, ICI, & NACE
- Workshops, seminars, conferences





Studies on mechanical performance

- Test frames (5 kN to 1 MN) and prestressing bed

Fatigue, fracture, bond strength

Flexural toughness

Prestressing bed

Long-term durability performance studies

- Environmental exposure chambers

High-temperature, carbonation, humidity chambers

Natural carbonation studies

Long-term shrinkage and creep studies

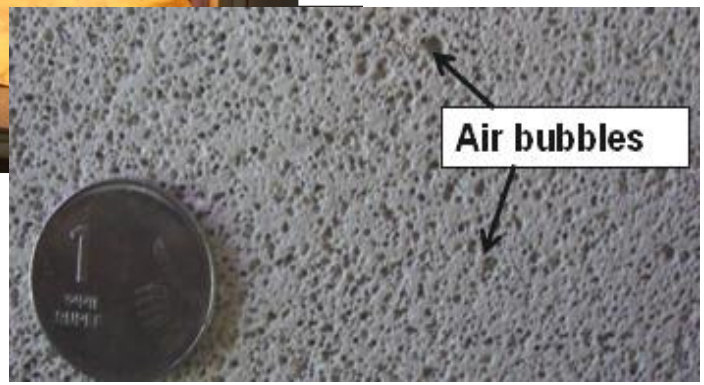
- Large rooms with controlled temperature and humidity environment

Studies on corrosion assessment and service life estimation/extension

- Electrochemical workstation, corrosion cells, prestressing frames

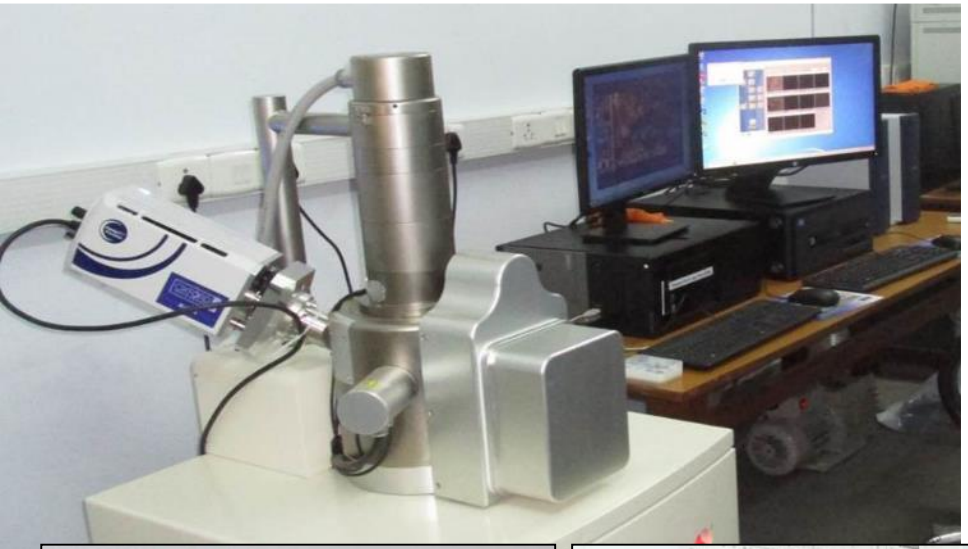
Studies on fresh properties of concrete

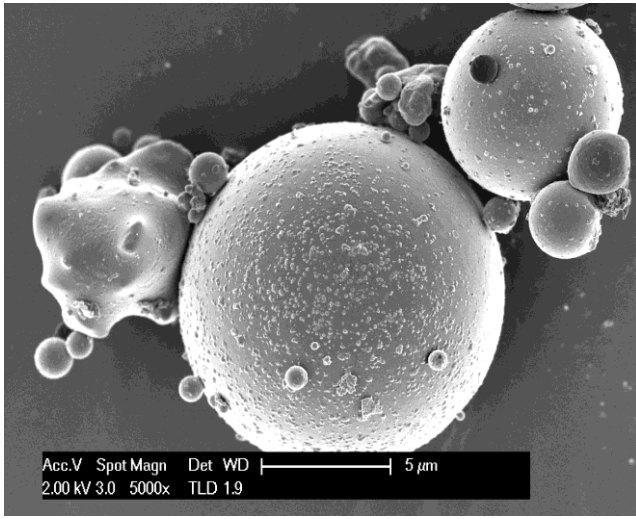
- Walk-in chamber, controlled environment rooms, etc.

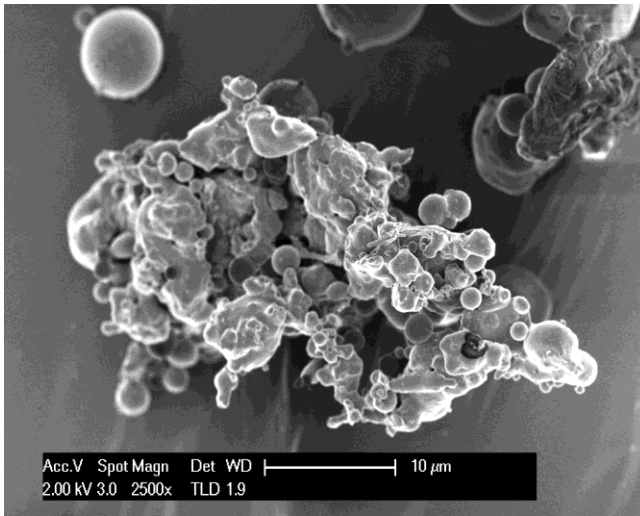


Studies on evolution of microstructure of various cementitious systems

- Optical microscopes, SEM, MIP, etc.

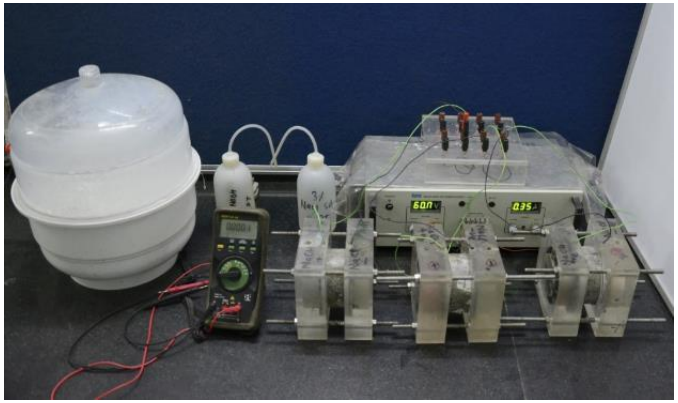


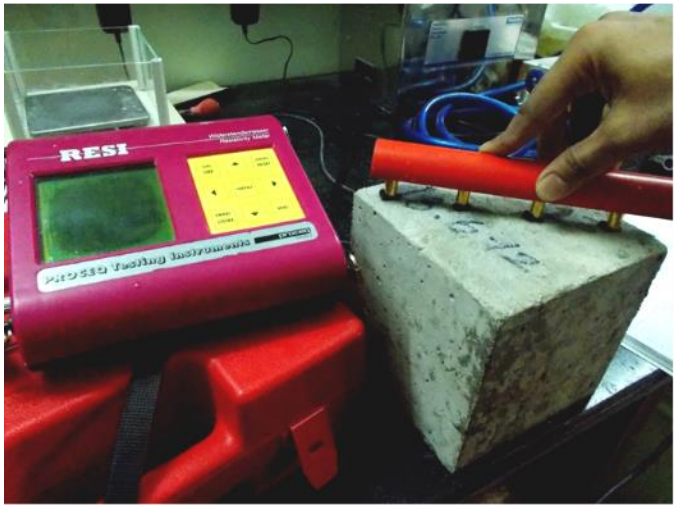




Studies on the transport of water, CO_2, O_2, and chlorides through concrete

- Suite of testing setups





Workshop facilities within the department for fabricating research/testing setups

Dr. K. Ramamurthy

Institute Chair Professor; Ph.D., IIT Madras

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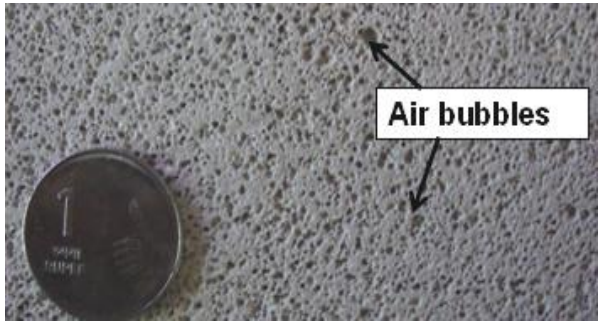
- Light weight and fly ash aggregates
- Aerated & foam concrete blocks/bricks
- Interlocking brick masonry
- Thermal comfort & lighting of buildings



Dr. Ravindra Gettu

Prof. V S Raju Chair Professor; PhD, Northwestern Univ., USA

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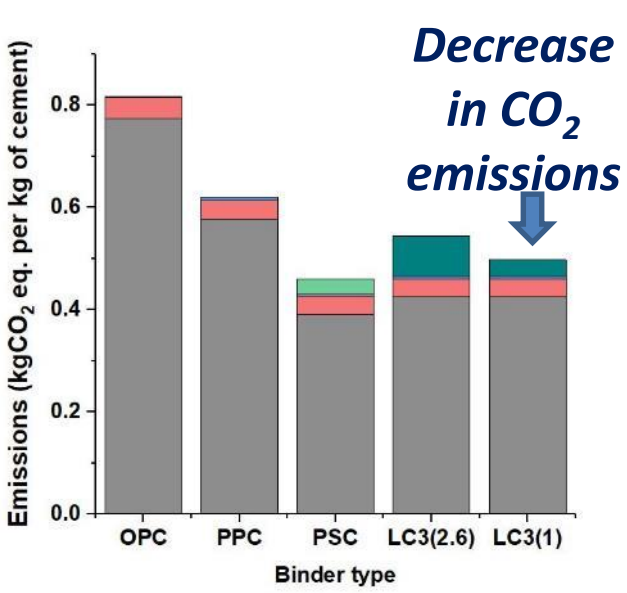
- High performance concrete
- Self compacting concrete
- Fibre and textile reinforced concrete
- Concrete recycling
- Sustainability assessment of concrete systems



Dr. Manu Santhanam

Professor & Head of Department; Ph.D., Purdue University

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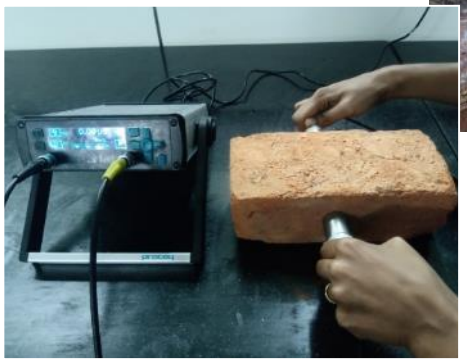
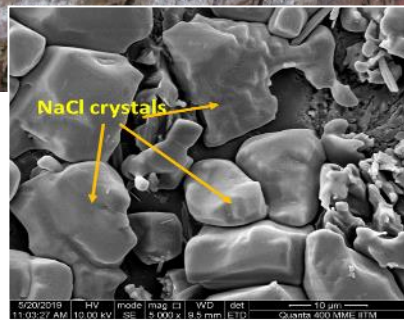
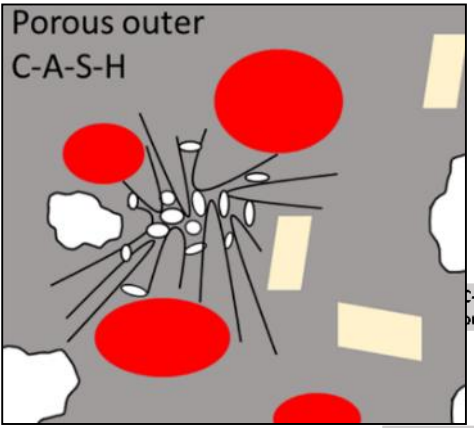
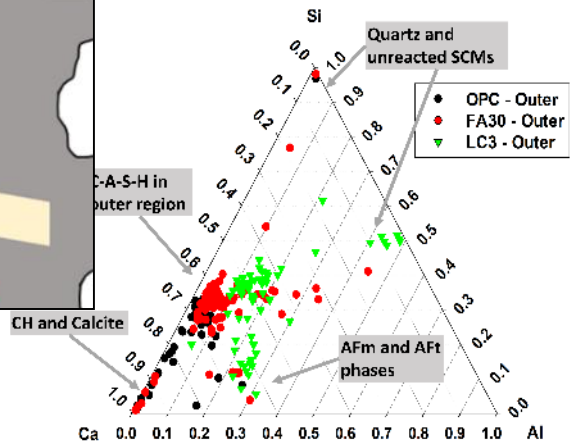
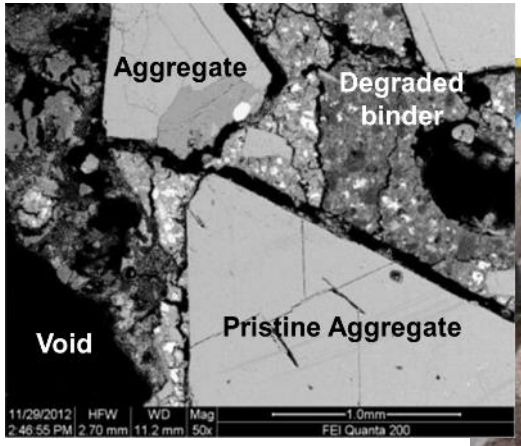
- Cement chemistry & microstructure
- Characterization techniques
- Non-destructive evaluation
- Durability of concrete
- Performance specifications











Dr. Radhakrishna G. Pillai

Associate Professor; Ph.D., Texas A&M University

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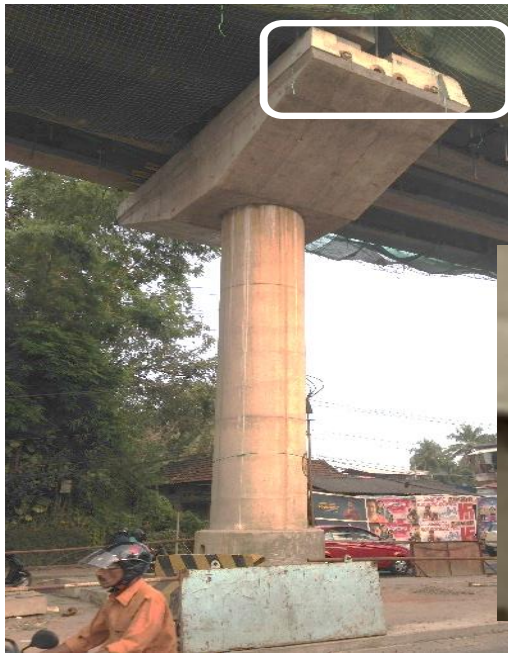
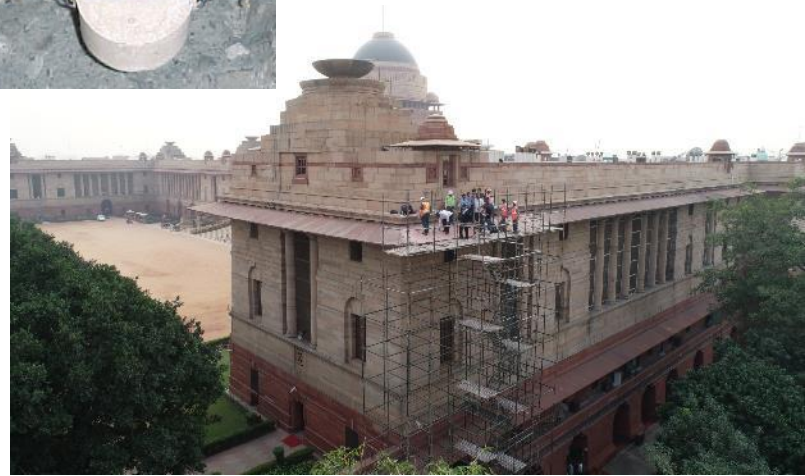
- Corrosion assessment & service life estimation
- Corrosion control & service life extension
- Grout materials & practices for prestressed concrete





Dr. Piyush Chaunsali

Assistant Professor; Ph.D., Univ. of Illinois at Urbana-Champaign

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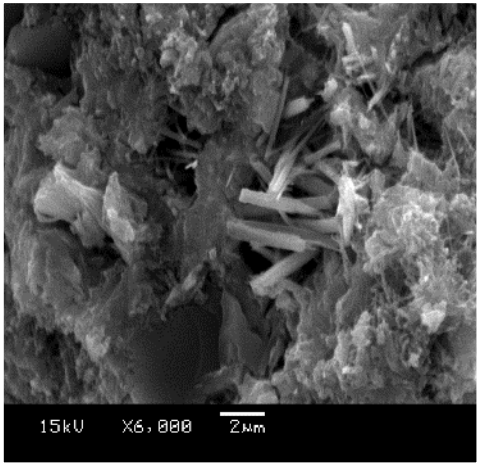
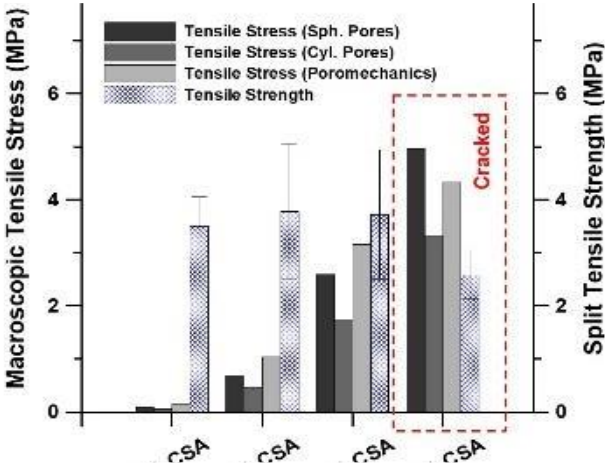
- Cement chemistry and concrete durability
- Processing-microstructure-performance relationships of low CO_2 cements
- Microstructure and thermodynamic modelling of cementitious systems
- Valorization of industrial by-products





Dr. Keerthana Kirupakaran

Assistant Professor; Ph.D., IISc Bangalore

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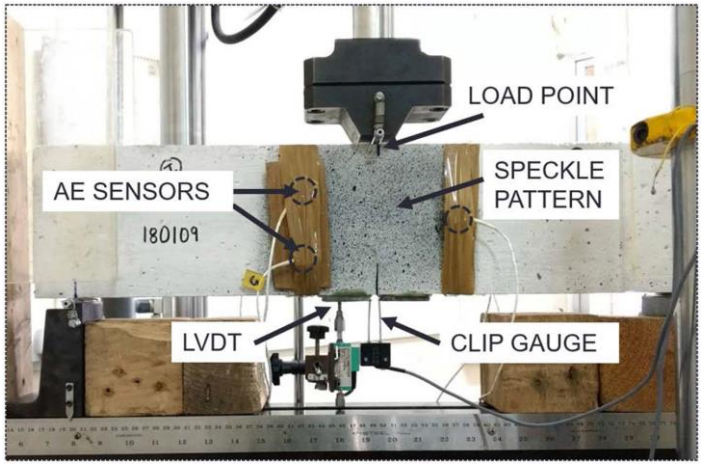
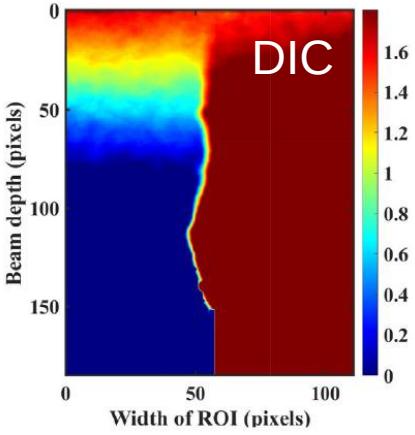
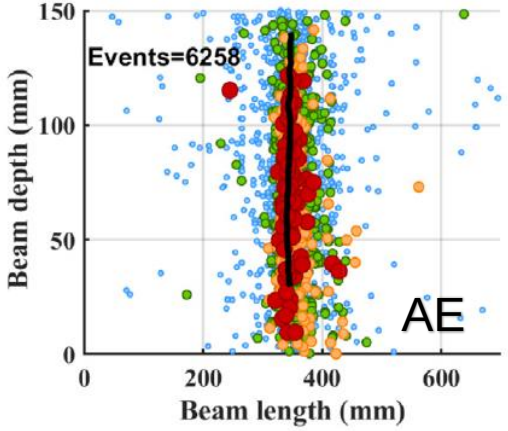
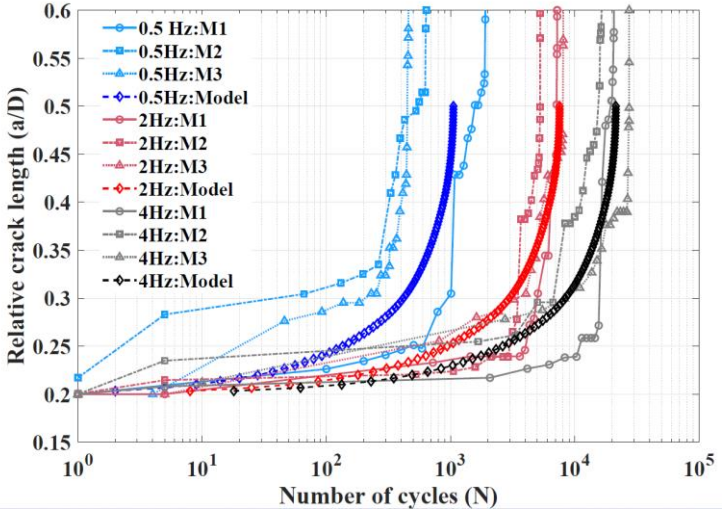
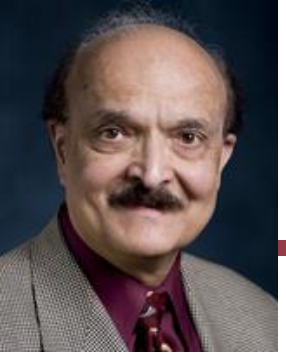
- Fracture and fatigue of concrete
- Fracture Characterization
- Fatigue life predictive models
- Fiber and Textile Reinforced Concrete











Prof. Surendra P. Shah

Distinguished Professor in Civil Engineering

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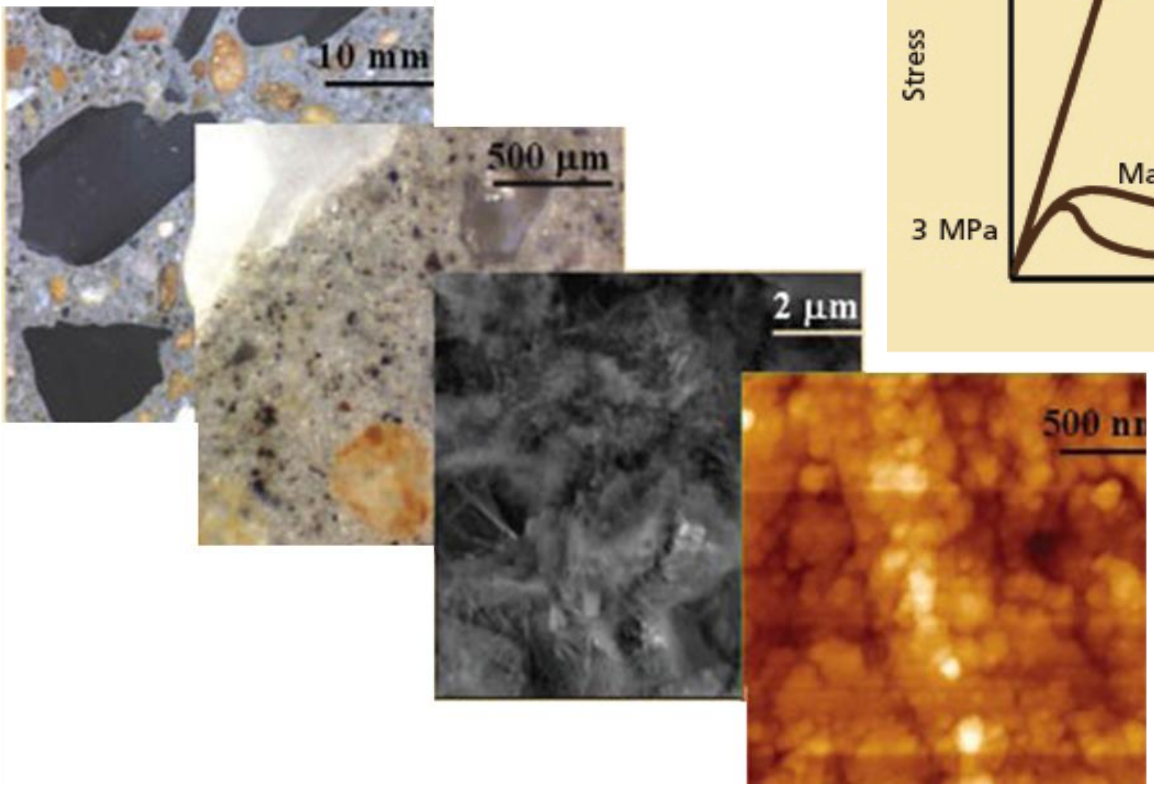
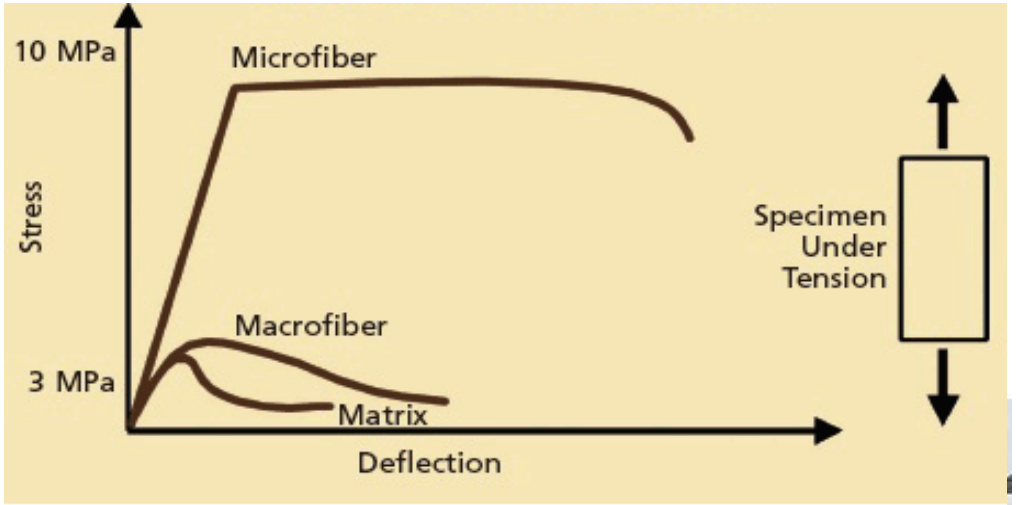
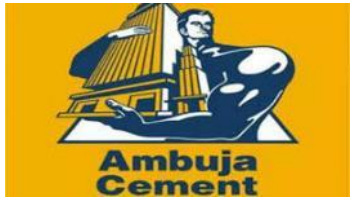
- Connecting micro/nano behaviour to structural response of concrete





Interaction with the industry

BTCM
Building Technology and Construction Management



and many more…

BTCM graduates are now working as…

- Faculty members
  - IISc Bangalore
  - IIT Bombay, Delhi, Guwahati, Palakkad
  - NIT Trichy, Calicut, Warangal
  - Various other public/private engineering colleges
- PhD students and postdocs
  - USA, Switzerland, South Africa, Germany, Belgium, Italy
- Researchers/engineers
  - CSIR-SERC, Kuwait Inst. for Scientific Research
  - Aditya Birla, Ultratech, etc.
  - L&T Construction, SPCL etc.
  - Public sector Units
- Leaders in various other industrial units

BTCM @ IIT Madras

Providing academic leadership in the areas of
Building Science, Construction Management,
and Construction Materials

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Building Technology and
Construction Management

Department of Civil Engineering
Indian Institute of Technology Madras