NEWSLETTER

May, 2024

Indian Institute of Technology Madras

Technologies for Low-Carbon and Lean Construction

Recent Journal Publications

Durability Assessment of Expansive and Nonexpansive Calcium Sulfoaluminate Belite Cement Concrete in Chloride-Rich Environments

Paul Shaji and Piyush Chaunsali, Journal of Materials in Civil Engineering, Volume 36, Issue 7 (2024)

Calcium sulfoaluminate belite (CSAB) cement has gained prominence as a viable environmentally friendly substitute for conventional portland cement (PC). This study investigates the relative performance of expansive and nonexpansive CSAB cement-based concretes, and PC-based concretes when subjected to chloride-rich conditions.

Early-age hydration of ye'elimite (calcium sulfoaluminate phase) in presence of alkalis: role of calcium sulfate

Bipina Thaivalappil, Vaishnav Kumar Shenbagam & Piyush Chaunsali, Materials and Structures, Volume 57, article number 108, (2024)

Ye'elimite is the primary phase in Calcium sulfoaluminate-belite (CSAB) cements which undergoes rapid hydration. Hence, early age performance of CSAB-based bonders are highly dependent on the hydration of ye'elimite. This study investigates the influence of alkali on hydration of laboratory-synthesized ye'elimite, under different sulfate environments. Various aspects of hydration such as dissolution and hydration kinetics, hydrated phase assemblage, microstructure evolution, etc. are discussed in this paper.

In this issue

International Collaboration

Prof. Koshy Varghese visited our alumnus Dr. Manu Mohan and his colleagues at the University of Ghent, Belgium, on 27th May 2024

Dr. Murali Jagannathan with Dr. Gozde Basak OZTURK and our alumni Dr. Varun Kumar Reja and Nandeesh Babanagar

Dr. Murali Jagannathan, gave a talk at DRF Lunchtime Clinic in University of Cambridge on May 31

Find us: https://tlc2.iitm.ac.in/

BSB 205, Department of Civil Engineering, IIT Madras, Chennai - 600036, India

One-day workshop on "Strategies for adoption of Digital Technologies in construction for enhanced skill development and project management", jointly organized by Asian Development Bank Institute (ADBI) and Indian Institute of Technology, Madras (IITM) was held on May 6 at IIT Madras

India is forecasted to be the largest growing construction market globally. However, India's construction sector continues to grapple with challenges such as time and cost overruns. Such issues are underpinned by systemic issues such as the lack of skilled workforce and adoption of digital technologies, despite the proven positive effect of digital technologies in aiding pressing construction industry issues. To promote the rapid growth of digital technologies in the construction sector, this workshop draws lessons from practical cases of applying information technology to design, construct, and maintain civil infrastructure in the Indian context. The workshop was inaugurated with an opening lecture by Dr. K E Seetharam, Senior Consulting Specialist, ADBI, and Dr. Nikhil Bugalia, faculty at IIT Madras.

We wholeheartedly thank our panelists, Mr. Kubaloy Kundu, DGM/Planning, National Capital Region Transport Corporation, Prof. Senthilkumar V. from IIT Palakkad, Mr. Bangalore Sreevatsan Mukund, Head BIM - L&T Construction, Mr. Siddharth S Kumar, Founder and CEO, Eartheon and Mr. Kalyan Vaidyanathan, Director Business Development, Bentley Systems India as they share their expertise on implementing digital technologies for improved project outcomes in Indian Construction sector during the panel discussion on the case study of National Capital Region Transport Corporation (NCRTC) on Digital Technology Adoption. Mr. Rajat Gosain, Group General Manager (Planning) NCRTC, delivered a keynote lecture on Transformational Digital Initiatives at NCRTC.

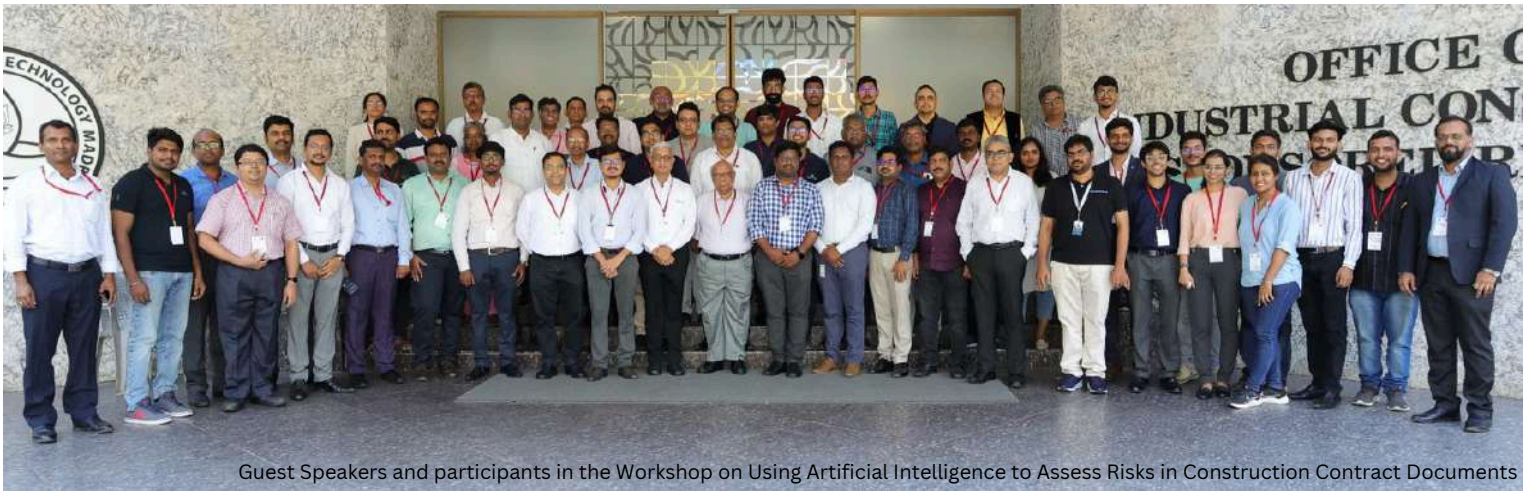
Prof. Ashwin Mahalingam shared his experience from a case study on the journey of Digital Technology Adoption by NCRTC, illustrating best practices that can be readily adopted in construction projects across India. Dr. Nikhil Bugalia organized an online simulation game for the participants where they played the System Dynamics-based Fish Banks game, developed by MIT, to understand the management of resources in a fun learning way. The session also emphasized the relevance of the lessons to the construction industry and how such games can enable enhanced learning.

Dr. Nikhil Bugalia arranged a tour of the Virtual Reality lab at the Civil Engineering Department to experience the intricacies of real construction sites through immersive VR simulations and their application in training and skill development.

Guest Speakers and participants in the ADBI-IIT Madras Workshop

EVENTS

One-day workshop titled "Using Artificial Intelligence to Assess Risks in Construction Contract Documents" was conducted by Dr. Murali Jagannathan and Prof. Mateja Durovic on 11th May 2024, at IIT Madras. The objectives of the workshop were to identify the possible gaps in solutions available, research, and the industry requirements and garner industry support to conduct focused research to develop solutions for problems faced by the construction sector in managing construction contracts. Representatives from three stakeholder groups, academia, industry, and technology providers, were invited to participate in this workshop to ensure fruitful discussions. The Office of Global Engagement, IITM, fully funded the workshop under the Jointly Funded Bilateral Mobility Programme (JFBMP) with King's College London (KCL).



Guest Speakers and participants in the Workshop on Using Artificial Intelligence to Assess Risks in Construction Contract Documents

The workshop featured 7 talks, 6 demonstrations, 3 use cases, and one group discussion. About 60 delegates from different IITs, ICFAI University, Military Engineering Services (MES), Highways Department, Government of Tamil Nadu, Engineering Unit, IITM, L&T Construction, SPCL, AFCONS, NKEI, WABAG, Bentley Systems, Hitech, Scube, Tata Consultancy Services, BotmindsAI, AdIdem, BuddiAI particiapted in the workshop.

In opening remarks, Dr. Murali Jagannathan, faculty at IIT Madras, explained how AI applications in contract management have been gaining traction over the past few years, with academia and the construction industry trying various AI solutions to assess risks in contract documents. This workshop essentially served this purpose as a first step towards utilising the full potential of AI in assessing the risks in construction contract documents. Dr. Satyanarayanan S, faculty at IITM, presented the objectives of the IITM-KCL JFBMP programme, wherein he highlighted the opportunities presented by this international collaborative exercise, the funding extent, highlights of some of the key outcomes of the partnership. Dr. K N Satyanarayana, Director, IIT Tirupati, highlighted the need to thoroughly assess the contracts, identify and analyze the provisions of dispute-prone 'redflag clauses,' and avoid possible conflicts later.

Mr. A Ahamed Khan, from L&T Construction, presented the key challenges of managing construction contracts in India. Compliance with Contractual Obligations, mindset, Multitude of Forms, Non-native language, Layered Documentation, Lack of Empowerment for decision making, and long duration for resolving disputes are some of the challenges he highlighted during his presentation. Mr. Dhakshinamoorthy R, from TCS, talked on Generative AI applications (GenAI) across various sectors and provided the participants with a broad overview of the spectrum of GenAI use cases and possible applications in the construction industry through the project lifecycle. Mr. Ramesh Balaji and Mr. Sivakumar K S, from TCS, presented the evolution of Language Models and the recent developments in the domain.

In Demo Session, Ms. Ishita Khatri, Dual Degree Student in IITM, demonstrated a tool that could compare the text of a standard-form contract with that of a modified/bespoke contract form. Mr. Vikas Anand, from BotmindsAI, highlighted the intricacies of processing construction contracts. Challenges such as confidentiality, complexity, multiplicity, scalability, legal intensiveness, and acceptability were discussed. Dr. Saptarshi Ghosh, from IIT Kharagpur, discussed complex legal texts using AI models and explained the solutions to identify rhetorical labels in case documents, case judgment summarisation, and legal statute identification. In another demo session, Mr. Ramesh Balaji and Mr. Sivakumar K S, from TCS demonstrated the potential of a 'fine-tuned' model, presenting a classification tool to assess the lean-friendliness of a given clause from a construction contract. Mr. Pushkal, B. Tech Student at IITM, presented a tool which can automatically link cross-referenced clauses in a construction contract. Mr. Rohan George and Mr. Adarsh Sosale, from Ad Idem, demonstrated their cost-effective approach to extracting meaningful information from Arbitration awards.

Mr. Gokul and Mr. Vikas Anand, from BotmindsAI, presented a Retrieval Augmented Generation (RAG)-based tool to extract meaningful information from construction tender documents. Dr. Sudarsun Santhiappan, from Buddi AI presented a tool used in the medical domain, which can safely de-identify information from a given document, thereby protecting sensitive information and enhancing user confidence. Dr. Tanmay Agarwal, faculty at ICFAI Law School Hyderabad, explained the key elements of 'Responsible AI' and AI regulatory framework in the EU, the USA, and the UK.

The industry participants seemed positive about the possibility of AI solving their contract management problems and were largely supportive of developing industry-specific databases for AI-based tools. Overall, the workshop witnessed interesting discussions and deliberations, sparking interest in collaboration and exploring AI-based tools to assess risks in construction contracts.

UPCOMING EVENT: CONSEC24, SEPTEMBER 24-27, CHENNAI, INDIA

Pre-CONSEC24 Workshop, 9am to 5 pm, September 24, 2024, Hotel Radisson BLU GRT Chennai (near airport), India

- *7th One-day workshop on Corrosion Control in Concrete Structures (C3S)*

We are witnessing a significant boom in the construction of concrete structures (bridges, ports, buildings, etc.) Some of these concrete structures are designed for a design/service life of 100+ years. However, many are corroding much earlier and not able to meet the design/service life requirements due to chloride-attack and carbonation. These can be avoided by using appropriate concrete mixtures and quality control measures at site. Moreover, most repairs are excessively focused on structural strengthening aspects and neglect corrosion and durability aspects. This leads to short-lived repairs and frequent re-repairs, which in turn lead to a huge economic burden. To create awareness about this, the Department of Civil Engineering at IIT Madras has been organizing the C3S workshop series since 2016. This is the 7th C3S workshop, which is formulated to educate engineers about corrosion mechanisms and how to design for durability or service life and combat corrosion of steel in concrete structures with a blend of both theoretical and practical aspects.

Topics

- Corrosion mechanisms and service life of concrete structures
- Fly ash, slag, calcined clay, limestone, etc. and chloride/carbonation resistance
- Lab and field testing for concrete and steel in concrete
- Case studies of affordable and effective condition assessment strategies
- Corrosion inhibitors, galvanized and stainless steel reinforcement
- Cathodic protection and concrete surface coatings for service life extension

Coordinators:
Dr. Deepak Kamde, INSA, Toulouse, France
Dr. Shweta Goyal, Thapar Institute of Engineering and Technology, Patiala, India
Dr. Radhakrishna G. Pillai, IIT Madras

- *One-day workshop on Construction Technologies for Sustainable Infrastructure (CTSI)*

While the construction industry contributes significantly to economic growth, it faces some of the greatest challenges. Here, academic research can contribute to overcoming those challenges through innovative solutions incorporating modern technology. For this to happen, the industry must be convinced of the practicality and the cost-effectiveness of deploying academic contributions; in other words, translating research outcomes to project site applications. In this workshop, we intend to focus on the practical applications of certain technologies and processes and how they can improve project performance. We have lined up interactive/game sessions on the following three topics.

Topics

- Systems Thinking Approach for Technology Implementation
- Developing Contract Specifications to Implement Technological Innovations in Project Sites
- Implementing Lean Construction in Project Sites – Demonstration through Games

Coordinators:
Dr. Ashwin Mahalingam, IIT Madras
Dr. Nikhil Bugalia, IIT Madras
Dr. Murali Jagannathan, IIT Madras

Register at www.consec24.com or scan this QR code