

# One-day Virtual Workshop on Fundamentals of Fibre-Reinforced Concrete and Textile-Reinforced Concrete (FRC & TRC): Testing & Design

Partially funded by DST & SERB, Govt. of India

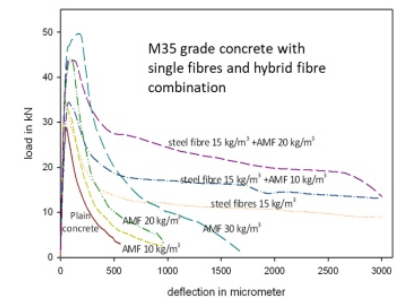
Date: 28 January 2022 | Time: 9:30AM - 5:30PM



About the Workshop: The growing adoption of FRC and TRC technologies for suitable applications by the construction sector in India is a testimony to the multi-faceted advantages these material offers. Flooring, tunnelling, thin-walled structures and pavement applications are currently upcoming applications of FRC, other than limited structural use. In India, about 5-6 % of flooring currently uses FRC technology. Efforts by various stakeholders to promote the use of this material with sufficient quality control has culminated in the publication of the Standard IS 17161: 2020: Flexural Strength and Toughness Parameters of FRC – Method of Test, and prior to this IRC SP 46: 2013.



TRC is an emerging strain-hardening cementitious material with non-corrosive reinforcement, like glass, carbon, or aramid. In comparison to conventional elements with steel reinforcement, thinner sections can be designed for TRC. The possibility of making components with considerably low amounts of materials and the potential to provide long service life contributes to the sustainability aspect of TRC.



This workshop is intended to familiarize the large community of users, applicators, designers, researchers and consumers about the structural behaviour, fabrication techniques, characterization and properties, as well as design and analysis of FRC and TRC. The workshop will be a one-day event. The first session will include talks by academic and industry experts in this field and the second session will be virtual training on the testing and characterization of FRC and TRC. Experts of international and national levels will cover a wide range of topics.



## Topics Covered

- Fundamentals of FRC and TRC
- Characterisation and design
- Modelling and Analysis of FRC and TRC
- Practical aspects of construction

## Training on specimen preparation, testing and characterisation of FRC and TRC

## Who should attend

- Practising Engineers – Govt. and Private sector
- Designers, Consultants, Contractors
- Testing lab. personnel
- Fibre and construction chemical manufacturers
- RMC companies
- Academicians – students, teachers and researchers

## Registration fees in INR (inclusive of GST)

Registration category	ICI Members	Non-ICI Members
Industry participants	₹1300	₹1500
Academic participants	₹1000	₹1200
Students	₹600	₹800

## Registration link:

<https://icsrpis.iitm.ac.in/payment/>

## Details for registration:

Coordinating Department: Civil Engineering

Coordinating Faculty: Prof. Ravindra Gettu

Service type: Registration fees for one-day workshop on FRC

## Speaker list for FRC and TRC workshop

Prof. Ravindra Gettu is the Dean for Industrial Consultancy & Sponsored Research, and the V. S. Raju Chair Professor in the Department of Civil Engineering at IIT Madras. He is the Immediate Past President of RILEM, the International Union of Laboratories and Experts in Construction Materials, Structures and Systems, based in Paris; and Fellow of the Indian National Academy of Engineering. He works closely with industry to promote technology implementation, and has co-authored more than 500 publications in the areas of concrete technology and characterization, and sustainability.



**Prof. Ravindra Gettu**



**Prof. V S Gopalaratnam**

Vellore S. Gopalaratnam is a Professor in the Department of Civil and Environmental Engineering at the University of Missouri. He has extensive experience in experimental stress analysis and in developing test procedures and instrumentation techniques, with particular emphasis on laboratory and field-testing of materials and structures. He has also worked on developing automated data acquisition systems for remote monitoring of structural systems. A Fellow of the American Concrete Institute, He has served as the principal investigator on many research projects sponsored by the federal and state government and by the industry on advanced cementitious composites, bridges, dams and pavements. He is a registered professional engineer in Missouri.

Dr. Sunitha K Nayar is currently a visiting faculty at the Indian Institute of Technology, Palakkad. She had over a decade of teaching experience at Amrita University, Coimbatore prior to starting her research career. She has over 20 publications mainly in the area of Fibre reinforced concrete and the characterization technique for FRC specified in IRC SP 46 and IS 17161 is largely based on her research work on toughness characterisation of FRC. She has also co-authored two book chapters in FRC design. A recipient of the INAE award for Innovative Project in the year 2016, she was also awarded the ICI – Ultratech Outstanding Thesis award of the ICI Tamil Nadu chapter. Her areas of interest include special concretes and applications, use of soft computing techniques in modelling material characteristics, sustainability analysis of building materials, fatigue-based design of pavements.



**Dr. Sunitha K Nayar**



**Dr. Stefie J. Stephen**

Dr. Stefie J. Stephen is currently working as a post-doctoral researcher at IIT Madras. She holds a PhD degree from IIT Madras and M. E in structural engineering from Government College of Technology, Coimbatore. She has developed expertise in handling servo-hydraulic closed-loop controlled machines, advanced instrumentation, and data acquisition systems and is also capable of utilizing numerical tools to predict the performance of concrete systems. She is an inventor of the software, 'sigw-Concrete©', which was developed to characterize the tensile properties of concrete. She has published seven papers in reputed journals and has co-authored two book chapters in the analytical modeling and design of FRC structural elements. She recently received the most prestigious Indian National Academy of Engineers (INAE) Innovative Student Projects Award 2020 under Doctoral level - for the extensive and innovative experimental, analytical and numerical investigations accomplished during the doctoral research (PhD) at IIT Madras. Her areas of interest include design of tunnel lining segments, fracture mechanics of high-performance and sustainable concrete systems, fatigue characterization of concrete, creep and shrinkage behavior of high-performance concrete systems, numerical and analytical modelling of concrete structures.

Mr. Ganesh Chaudhari is the Vice President (W) of Indian Concrete Institute and the Co-Chairman of Indian Concrete Institute Technical Committee ICI/TC 09 on Industrial Flooring. He was instrumental in preparing and releasing the 'Guidelines on Ground Supported Concrete Slabs for Industrial Flooring Applications'. He is an Executive Member of Indian Concrete Institute Fiber Reinforced Committee and has steered the preparation and release of Fiber reinforced concrete guidelines. With a 12 million sqm of fiber reinforced concrete completed under his belt across the globe, he is one of the most experienced person in fiber reinforced concrete in Indian construction industry. In addition to his passion and drive for promotion for FRC, he collaborated with industry players and successfully implemented high performance flooring applications like Jointless, Seamless floors in South Asia, Middle East and North America. He actively promoted the performance based SFRC approach for Tunnel support systems in Himalayan Geology. He started FMG® a Consulting and EPC concrete flooring organization based out of Mumbai in Jan 2019. IIT Madras, IITM and FMG® signed an MOU on 15th July 2019 to do collaborative research on finding durable concrete solutions for industrial floors and conduct FMG® certification. He holds a Bachelor's in Civil Engineering and a PG in Operation Research from Mumbai University. He also holds Masters in Systems & Marketing from Mumbai and AME from INSEAD @ Fontainebleau, France.



**Mr. Ganesh P. Chaudhari**



**Dr. Mohit Raina**

Dr. Mohit Raina has obtained his PhD as well as started his career at the RWTH Aachen University, Germany in the Department of Spinning Technologies. He headed the Department of Spinning Technologies and started working as an EU Research Consultant for the ITA RWTH Aachen and later led the division of Production Technologies & Textile Machinery at the ITA and was responsible for the Project Management, Strategy, Human Resources and Finances. Dr. Raina also headed the EU Research Coordination at the institute and had personally been involved in a number of EU as well as German projects. He has been providing inputs to policy decisions for the technical textile platform Euratex and European Union FTP. After successfully completing his executive MBA from RWTH Aachen, Germany and St. Gallen, Switzerland he established the growth of the field of Textile Production Technologies and was entrusted with the field of composites in 2014. He worked as a senior expert on advanced composite building materials. After moving back to India in 2014, he launched Raina Industries Pvt. Ltd. which manufactures pre-cast glass fibre reinforced concrete and textile reinforced concrete for the building, construction and infrastructure sectors. Recently, recognising the need for sustainable solutions in the Marine Infrastructure sector, Raina Industries plunged into the domain of Marine applications with fibre and textile based solutions. Parallely Dr. Raina works as a consultant for RWTH Aachen and is their Indian representative. He is on the research advisory board of the ITA, RWTH Aachen and also pursues educating students on International Business at the SP Jain Institute of Management Research, Mumbai, India as a Visiting Professor and also in the engineering domain at VJTI Mumbai. In the recent past, Raina Industries went on to win the National Award 2021 from the Government of India, for successful commercialization of the technology Textile Reinforced Concrete in India. Being a technocrat Dr. Raina is also involved in various committees focusing on technical textiles at NITI Aayog, Government of India and the Ministry of Textile, Government of India.



**Mr. Mukesh Chandra Kothiyal**

Mukesh Chandra Kothiyal is a civil Engineer and is the Quality Head of the Transportation division of Megha Engineering & Infrastructures Ltd. He has been trained in Shotcrete technology, Tunnelling (NATM&NMT), Railway Station, Extreme weather conditions, repairing of construction defects & Grouting in underground projects. He has extensive experience in underground projects. Presently working as Quality Head of Zoji la project, Asia's longest 14.2 km tunnel between Sonamarg & Kargil. Contributed so far- Nuclear Power Project Kota Rajasthan unit 5&6, Pirpanjal tunnel 11.22 km India's Longest Rail Tunnel, Z-Morh, and adits P5, P7B & P8 of RVNL RKSH-KNPG Railway Project. He was appreciated for successfully handling QAQC function and accomplishing the contract goals for Z-Morh Project.



**Mr. Sachin Paul**

Mr. Sachin Paul is a PhD research scholar at IIT Madras and Assistant Professor at Mar Athanasius College of Engineering, Kothamangalam, Kerala. His area of research is on characterisation and durability of Textile reinforced concrete (TRC). He has worked in several national and international research projects on TRC. He has been a part of development of fabrication and testing techniques for TRC at IIT Madras and have expertise in design and modelling of TRC elements.



**Ms. Federica Bini**

Federica Bini is a registered professional civil engineer with over 10 years' experience as senior Product Manager for CONTROLS, a global business established since 1968 and a leader in the design, manufacture and supply of high calibre equipment for the mechanical testing of construction and civil engineering materials.

Thanks to her knowledge of testing equipment relating to Concrete, Cement and Steel, she is a member of UNI/CT 009 "Cement, mortar, concrete and reinforced concrete" Italian normative working group.



# Tentative Schedule for FRC/TRC WORKSHOP

Sr	Topic	Speaker	Time slot
1	Overall introduction to the materials	Prof. Ravindra Gettu	09.00 AM - 09.30 AM
2	Design and Characterisation of FRC	Dr Sunitha Nayar	09.30 AM - 10.00 AM
3	<b>Demo Unnotched Beam test, Field sampling</b>		10.00 AM - 10.20 AM
4	FRC Applications	Mr. Ganesh Chaudhari	10.20 AM - 10.45 AM
	<b>Break -Sponsor 1</b>		<b>10.45 AM - 10.55 AM</b>
5	Use of Steel Fibre Reinforced Light Weight Concrete for Wearing Surface systems on Steel Deck Orthotropic Bridges	Prof. VS Gopalaratnam, U. Missouri-Columbia, USA	10.55 AM - 11.30 AM
6	<b>Demo Notched Beam Test, lab fabrication</b>		11.30 AM - 12.00 PM
7	Shotcrete/Spray Concrete: Construction aspects	Mr. M C Kothiyal	12.00 PM - 12.30 PM
8	Product Manager for CONTROLS <b>Talk and Demo of Square panel testing</b>	Ms. Federica Bini	12.30 PM - 01.15 PM
	<b>Lunch Break Sponsor 2 &amp; 3</b>		<b>01.15 PM - 02.00 PM</b>
9	TRC Introduction	Mr. Sachin Paul	02.00 PM - 02.30 PM
10	TRC Industry Talk	Dr. Mohit Raina	02.30 PM - 03.00 PM
11	TRC Design	Dr. Stefie Stephen	03.00 PM - 03.45 PM
	<b>Break Sponsor 4</b>		<b>03.45 PM - 04.00 PM</b>
12	<b>Demo- TRC Characterisation and Fabrication</b>		<b>04.00 PM - 04.30 PM</b>
	Open Forum / Q & A		04.30 PM - 05.00 PM

## Contact information

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All registered participants will receive a hard copy of the ICI TC reports on FRC, ICI TC01/01