# Sustainable Methods in Foundation Engineering: A Focus on Soil Mixing Techniques

Soil mixing techniques, such as Mixed-In-Place (MIP) and Cutter Soil Mixing (CSM), are gaining prominence in sustainable foundation engineering. These methods involve mixing in-situ soils with cement-based slurries to create strong, durable foundation elements like cutoff and retaining walls, without extensive excavation. MIP uses a triple auger system, while CSM employs rotating cutting heads to achieve uniform soil-cement mixtures. Both techniques offer significant environmental benefits by reducing carbon emissions, material transportation, and construction time. Their versatility in handling various soil conditions makes them ideal for a range of applications, from urban construction projects to deep excavations. Overall, MIP and CSM represent important advancements in the effort to reduce the environmental impact of the construction industry. **Page no. 3.**

Volume 10 Book 3, July 2024

# DFI of INDIA News



Quarterly Newsletter from
Deep Foundations Institute of India
www.dfi-india.org

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DFI of INDIA News
Volume 10 Book 3, July 2024
3

Cover Story

# Sustainable Methods in Foundation Engineering: A Focus on Soil Mixing Techniques

**Fadi Haddad**, Head BD Dams, Dikes, Mining, Ports, Bauer Spezialtiefbau GmbH, **Vidyaranya Bandi**, Technical and Tendering, Bauer Engineering India Pvt. Ltd.

The construction industry has long been recognized as a major contributor to global carbon emissions, necessitating a shift towards more sustainable practices. One area where significant progress is being made is in special foundation engineering, particularly through the use of soil mixing techniques. These techniques, including Mixed-In-Place (MIP) and Cutter Soil Mixing (CSM), are being increasingly adopted for their ability to reduce environmental impact while maintaining the structural integrity of foundational elements.

**The Challenge of Special Foundation Engineering**

Special foundation elements are essential in a variety of construction projects, from the construction of dams and dikes to the foundations of high-rise buildings and the stabilization of soils for ports and LNG tanks. Traditionally, these elements have been constructed using methods that involve significant excavation and the use of concrete, both of which contribute to a high carbon footprint. The need for deeper and more robust foundation elements in response to the increasing demands of modern infrastructure has further exacerbated the environmental impact of these construction projects.

One of the major challenges in special foundation engineering is the need to rehabilitate aging dams and dikes. These structures often require the installation of cutoff walls to limit seepage and erosion, a task traditionally accomplished using diaphragm wall techniques. However, these methods involve trenching, concrete pouring, and the use of bentonite slurry, all of which increase the carbon footprint due to the transportation of materials and the energy-intensive nature of the processes involved.

**Sustainable Alternatives: Soil Mixing Techniques**

Soil mixing techniques have emerged as a sustainable alternative to traditional excavation and concrete construction methods. These techniques involve the in-situ mixing of existing soil with cement slurry, creating a strong, durable wall without the need for extensive excavation or concrete. By using the soil already present on-site, these methods significantly reduce the amount of material that needs to be transported, thereby lowering the carbon footprint of the construction process.

**Mixed-In-Place (MIP) Technique**

The MIP technique, developed by Bauer, is particularly effective for the construction of cutoff and retaining walls. This technique involves the use of three augers that mix the soil while injecting a suspension containing water, bentonite, and cement. The result is a strong and durable wall that eliminates the need for excavation, significantly reducing the environmental impact of the construction process.

Fig. 1: MIP

One of the key advantages of the MIP technique is its ability to create a homogenous wall by vertically mixing in-situ soils, even those with layers of organic or high fine content. The use of reversible augers and a back-step sequencing method ensures the overall homogeneity and

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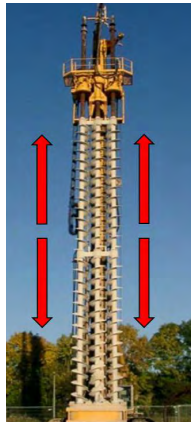


Fig. 2: MIP – Mixing principle

Fig.3: MIP by executing a retainng wall for an excavation pit in Germany

continuity of the wall, which can be reinforced with H-beams and anchors for added structural strength.

**Cutter Soil Mixing (CSM) Technique**

The CSM technique, also developed by Bauer, utilizes special cutting and mixing heads derived from diaphragm wall cutter technology. This method is highly versatile, capable of creating deep walls up to 40 meters in depth. The CSM technique is particularly effective in non-cohesive and cohesive soils containing sand and a small percentage of fines. The mixing wheels of the CSM machine break up and mix the soil with an injected suspension, creating a homogenous mix that is both strong and durable.

Fig. 4: CSM

One of the significant advantages of the CSM technique is its ability to create vertical rectangular panels, resulting in fewer vertical joints compared to multiple shaft systems. This makes it ideal for linear in-situ structures such as cutoff barriers, retaining walls, and liquefaction mitigation cells. The CSM system also allows for complete instrumentation inside the cutter gearbox support frame, providing real-time control of the cutting head's coordinates, ensuring complete overlap between panels.

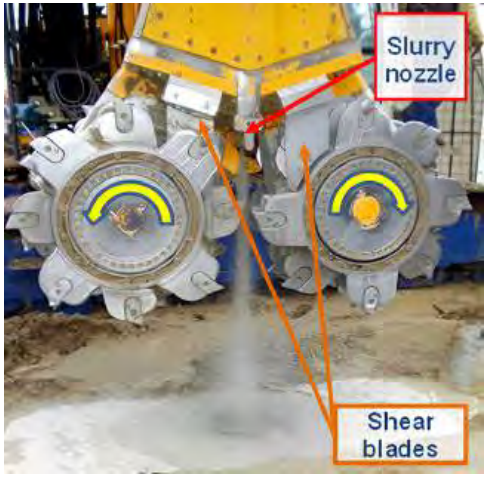


Fig.5: CSM-Mixing in horizontal direction

Fig. 6: CSM by executing a Cutoff wall in Canada (Diavik)

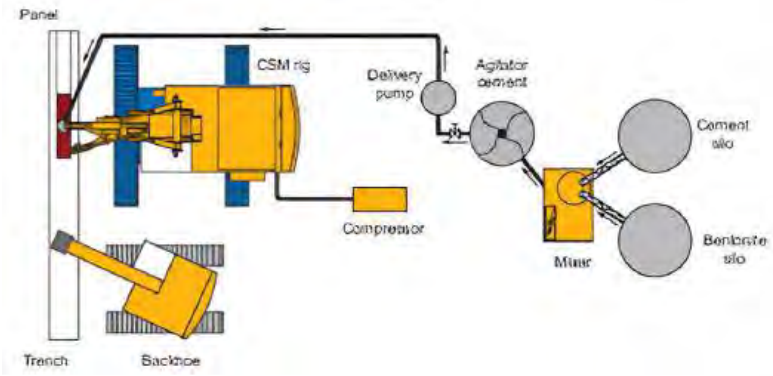


Fig. 7: Installation of Cutter Soil Mixing

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## Sustainability - Economic and Ecological Benefits

Both the MIP and CSM techniques offer substantial economic and ecological benefits compared to traditional methods. By using the existing soil on-site, these techniques reduce the need for material transportation, which in turn lowers carbon emissions. Studies have shown that these methods can reduce CO2 emissions by up to 30% compared to traditional diaphragm wall construction.

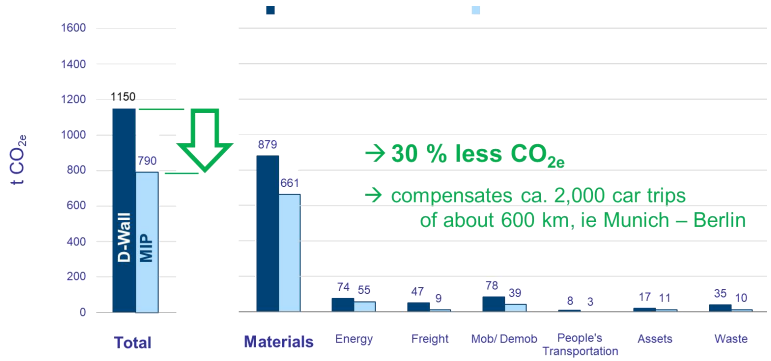


Fig. 8: Comparison of CO2eq balances for the geotechnical works at QH Track, using the conforming solution (D Wall and Jet Grout Plug) in contrast to the variation (MIP retaining wall and LWS silicate gel grout plug)

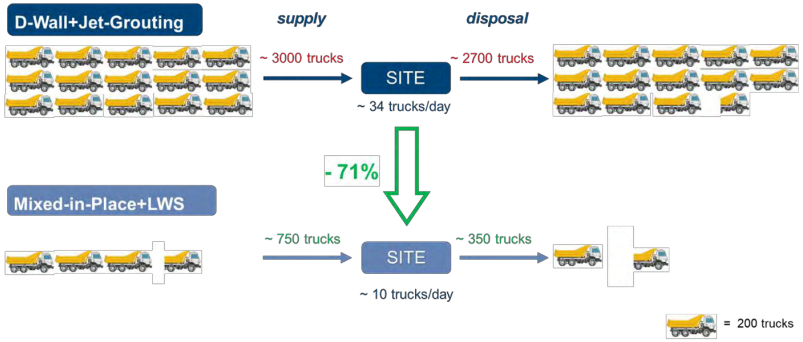


Fig. 9: Comparison of traffic volume for the geotechnical works at QH Track using the conforming solution (D Wall and Jet Grout Plug) in contrast to the variation (MIP retaining wall and BAUER LWS silicate gel grout plugs)

In addition to their environmental benefits, these soil mixing techniques also offer significant cost savings. The reduced need for excavation and concrete results in lower material costs, while the speed of construction is increased, leading to lower labor costs. Furthermore, the ability to reinforce MIP and CSM walls with steel sections and anchors allows these techniques to be used in a wide range of applications, from simple cutoff walls to complex retaining structures.

The sustainability of these techniques is further enhanced by their ability to minimize the environmental impact of construction activities. The in-situ nature of these methods means that there is no need for extensive excavation, reducing the disruption to the surrounding environment. Additionally, the reduced transportation of materials results in lower noise emissions and less traffic congestion, contributing to a more livable environment.

## Quality Control

Quality assurance is critical to the success of both the MIP and CSM techniques. Prior to execution, preliminary tests are conducted to determine the optimal binding agent suspension mix and the appropriate quantity based on soil and groundwater samples taken from the site. During the construction process, samples of the soil mix are collected and tested to ensure the desired strength and durability are achieved.

## Conclusion

The adoption of soil mixing techniques such as MIP and CSM represents a significant step forward in the pursuit of sustainable construction practices in special foundation engineering. By reducing the carbon footprint of construction projects while maintaining the structural integrity of foundational elements, these techniques offer a viable alternative to traditional methods. As the construction industry continues to evolve, the use of sustainable techniques like MIP and CSM will play an increasingly important role in shaping the future of infrastructure development.

# DFI of India Executive Committee Member Message

*- Mr. Sanjay Gupta*

Dear Members and Stakeholders,

As an Executive Committee member of DFI of India, I am honored to share insights on how our organization is making a profound impact on the deep foundations industry. DFI is pivotal in fostering innovation, ensuring quality, and enhancing safety within our sector.

**Mr. Sanjay Gupta**
Managing Director,
Cengrs Geotechnica Pvt Ltd

DFI provides an invaluable forum to bridge the gap between research theory and practice. I have witnessed this firsthand in various forums and conferences where cutting-edge research is shared and discussed. These interactions have enabled practitioners like myself to apply theoretical advancements to real-world projects, significantly improving outcomes.

Our commitment to innovation is showcased in our technical seminars, workshops, and conferences. These events serve as platforms for professionals to learn about the latest advancements and implement them in their projects. One notable example is our emphasis on sustainable foundation techniques, which has led to the adoption of eco-friendly and cost-effective construction practices across the industry.

Quality and safety are at the forefront of DFI's mission. By establishing rigorous standards and guidelines, DFI ensures that projects are executed with the highest levels of precision and safety. Our focus on quality is exemplified by the Continuous Flight Auger (CFA) pile technology, which DFI introduced to the Indian market. This technology has significantly improved the efficiency and reliability of foundation construction, thereby setting new benchmarks for the industry.

DFI has also been instrumental in promoting continuing education for practicing engineers. This aspect is critical to keeping pace with developments in innovation, new technologies, and equipment. By offering ongoing educational opportunities, DFI ensures that engineers remain at the forefront of the industry, equipped with the knowledge and skills necessary to tackle emerging challenges.

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Another significant contribution of DFI is providing platforms to address various shortcomings in construction practices, particularly in deep foundations. By learning from failures and discussing these experiences openly, we can improve upon our construction methods. This culture of continuous improvement is essential for advancing the industry and ensuring that we deliver safer, more reliable foundation solutions.

Collaboration and knowledge-sharing are central to DFI's mission. Our organization brings together a diverse group of professionals, including engineers, researchers, and industry leaders, to facilitate the exchange of ideas and experiences. This collaborative environment fosters professional growth and leads to innovative solutions to industry challenges. DFI's conferences and workshops are prime examples of our commitment to knowledge-sharing. These events provide a platform for professionals to present their research, share case studies, and discuss the latest trends and technologies. The DFI India 2023 conference, for instance, featured presentations on groundbreaking topics such as the use of artificial intelligence in geotechnical engineering and the application of advanced materials in foundation construction. These sessions sparked insightful discussions and inspired attendees to explore new approaches in their work.

Being part of the DFI community has been an enriching experience for me. The networking opportunities and access to a wealth of knowledge have been invaluable. One particularly memorable experience was participating in a collaborative project that developed a novel foundation system now implemented in several major projects nationwide. This project involved close collaboration with international experts and provided an opportunity to learn from their vast experience and expertise.

I have also had the privilege of attending numerous DFI conferences and workshops. These events have not only expanded my technical knowledge but also allowed me to build lasting relationships with industry peers. The sense of camaraderie and mutual support within the DFI community is truly remarkable and underscores the value of being part of such a dynamic and forward-thinking organization.

In conclusion, DFI's dedication to promoting excellence in deep-foundation engineering is inspiring. Through our collective efforts, we are setting new standards for innovation, quality, and safety in the industry. I encourage all members to actively participate in DFI's initiatives and take advantage of the numerous opportunities for professional development and collaboration that our organization offers. Together, we can continue to advance the deep foundations industry and contribute to the sustainable development of our nation.

# DFI-India 2024: 13th Annual Conference


The Deep Foundations Institute of India (DFI of India) is hosting its 13th annual DFI-India 2024 Conference in Goa from 19th to 21st September 2024. The event promises to be a pivotal event for professionals in the deep foundations and geotechnical engineering fields. With a focus on sharing the latest advancements, practices, and challenges in subsoil characterization and foundation engineering, the conference offers a unique platform for industry leaders, researchers, and practitioners to collaborate and exchange knowledge.

**What to Expect at the Conference**

At the DFI-India 2024 Conference, attendees can expect a comprehensive program designed to address the latest developments and challenges in deep foundations and geotechnical engineering. The conference will feature:

***Keynote Lectures:*** The DFI-India 2024 Conference will feature a distinguished lineup of keynote speakers, each bringing a wealth of expertise to critical topics in foundation engineering. **Prof. Alessandro Mandolini** will introduce "A Novel, Simple but Effective Method for Assessing Pile Base Resistance in Sandy Soils," offering new approaches for evaluating pile resistance. This lecture is designated as DFII-ISSMGE TC212 lecture. **Dr. Venu Raju** will address "Sustainability in Geotechnical Construction – A Global and Indian View," focusing on sustainable practices in the field. **Prof. M. R. Madhav** will explore "Evaluation of Ground – Pile Interactions from Pile Load Tests," shedding light on the role of load testing in understanding pile behavior. **Thomas Domanski** will discuss "Advancement in Ground Improvement Techniques for the Construction of Load Supporting Columns in Soft Soils," presenting innovative methods for stabilizing soft soils. Finally, **Dr. CR Parthasarathy** will share insights on "Failure Analysis, Design & Installation of Offshore Conductor Piles – Case Studies," providing practical lessons from offshore pile installations. This diverse array of topics promises to offer valuable insights and advancements in geotechnical engineering. Two more Keynotelectures will be delivered by delivered by leading professionals from India and abroad.





***Special Session:*** A special half-day session on 'Foundations for Tall Buildings' will be conducted during the second half of the first day of the Conference. This session is poised to be a highlight of the event, offering valuable insights into the complexities and innovations in foundation engineering for high-rise structures.

Tall buildings present unique challenges in terms of foundation design, requiring a deep understanding of geotechnical engineering principles and advanced construction techniques. This session will bring

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together some of the leading experts in the field, including Prof. Alessandro Mandolini from the University of Campania (Italy) and Chair of ISSMGE TC212, Prof. Deepankar Choudhury, Mr. Satyajit Vaidya, Dipl.-Ing. Robert Dunaevskiy, and Dr. Marwan Alzaylaie. Each speaker will share their expertise on the design, analysis, and construction of foundations that support the world's tallest buildings, addressing both theoretical and practical aspects.

***Technical Presentations:*** Presentations by industry experts, academics, and practitioners on cutting-edge research, innovative technologies, and case studies in subsoil characterization, foundation design, and construction practices.




***Networking Opportunities:*** Ample time for attendees to connect with peers, exchange ideas, and build professional relationships, fostering collaboration and knowledge-sharing across the industry.


***Exhibitions:*** A showcase of the latest products, equipment, and services from leading companies in the geotechnical and foundation engineering sectors.

***Awards and Recognitions:*** Acknowledgment of outstanding contributions to the field through various awards like LifeTime Contribution Award, Student Awards, and Best Paper Awards, etc., highlighting excellence and innovation.




***Women in Deep Foundations (WIDF) Session:*** WiDF Session on had been a special leaf of DFI-India conferences and this year also a special slot is dedicated to honour the contributions of Women in Deep Foundation Industry. Ms. Angelica Leana Odetta Sarita Da Silva, will speak during the session. She is the first women chief engineer of PWD, Goa.



***A Call to Participate***

The DFI-India 2024 Conference is more than just a gathering of professionals; it's a chance to shape the future of geotechnical engineering in India. Attendees are encouraged to come ready to learn, share, and collaborate. This is an opportunity to be part of a community that is

*Photos are from DFI-India 2023 Conference at Vadodara*

Continued

Technical photo feature of relevance are invited from the readers. The feature shall preferably illustrate a modern technology or testing procedure. Please prepare the feature with six to eight good quality pictures with brief and crisp description.

dedicated to making a positive impact through innovation and sustainable practices.

As we approach this important event, let's remember that the future of geotechnical engineering—and by extension, the future of our infrastructure—depends on our collective efforts. The DFI-India 2024 Conference is the perfect platform to make those efforts count. Let's work together to build a better, more sustainable future for India and the world.

Set in the vibrant and culturally rich setting of Goa, the conference will not only be an intellectual hub but also an opportunity to experience the local heritage and hospitality.

**Official Venue Partner:** Kala Academy
Dayanand Bandodkar Marg, Campal,
Panaji, Goa 403001

**To register, visit Conference website:** https://dfi-events.org/india24/
For Group Registration/sponsorship/exhibition opportunities, contact DFI of India Office team at activities@dfi-india.org/dfiindiaoffice@gmail.com


KALA ACADEMY GOA


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DFI members can post their professional achievements, corporate achievements, awards, other news related to geotechnical profession here. Please send the details 15 days before every quarter, April, July, October and December to technical@dfi-india.org

# DFI-India 2024 Conference Chair Message

*- Prof. Purnanand Savoikar*

Dear Readers,

**Prof. Purnanand Savoikar**
*Professor, Goa College of Engineering*
*Chair, IGS Goa Chapter*

Following the grand success of 12th DFI-India conference last year in Vadodara, with great ecstasy and bliss, I welcome you all to the 13th Annual Conference on Deep Foundation Technologies for Infrastructure Development to be held in Miramar, Panaji - Goa, India from 19th to 21st September, 2024. The conference is co-hosted by DFI India and IGS Goa Chapter. Goa is situated on Konkan Coast of India with coastline of 105 kms. Panaji is the vibrant capital city of Goa, well connected by rail, road and flight connectivity and popular for the brilliant blue coastline of Miramar beach at the backside of the Conference venue, the Kala Academy. The beautiful city of Panaji is the permanent venue for International Film Festival of India IFFI. This annual conference is the flagship event of DFI and it brings together the deep foundation professionals for discussions, debates, and presentations on the latest technologies relevant to deep foundation construction for major infrastructure projects. In addition, the conference will also showcase exhibitions where various stakeholders present their latest equipment, services and technologies. The conference also provides for the valuable networking opportunities and contributes to the continuous improvement of deep foundation practices in India. This conference is eagerly looked upon by the construction companies, consultants, equipment manufacturers, testing companies and the academicians for the quality keynotes, lectures, papers and discussions by the eminent experts from India and abroad.

The Goa conference is receiving an over-whelming response from sponsors and exhibitors as almost all the exhibition stalls and sponsorships are booked in June itself.

The Organising committee, Technical committee and the management team has left no stone unturned for grand success of this conference. The conference consists of a special session on Day 1 on the theme 'Foundations for Tall Buildings' in which Special Lecture will be delivered by Prof. Alessandro Mandolini from University of Campania (Italy) who also chairs the TC212 – Deep Foundations, of ISSMGE, in addition to a keynote on the second day. The special session also consists of

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several other invited presentations by the eminent resources persons from India and abroad. Keynotes will be delivered by the renowned experts worldwide on the various themes that will be highlighted during this conference on Sustainability and Safety for Efficient Geo-Construction, Reuse of Existing Deep Foundations, Deep foundation and Deep Excavation Techniques, Deep Marine, Near-shore and Coastal Structures - Design & Construction of Deep Foundations, Ground Improvement Techniques, Advancements in Subsurface Characterization & Testing for Foundations Performance and Monitoring including Automation, Artificial Intelligence and Machine Learning, Research, Experimental and Numerical Methods in Deep Foundations, Deep Excavations, and Ground Improvement Technologies, Special Foundations like Large Diameter Piles, Helical Piles, Monopiles, and Driven Piles - Innovative Methods & Foundation Equipment and Legal & Contractual Aspects, Project Management of Deep Foundation Construction Projects, and any other interesting papers on topics in the deep foundation industry. Besides the keynote presentations, quality contributory paper presentations in parallel sessions and the corporate presentations, the flagship event of DFI, the Women in Deep Foundations (WiDF) India Session will be the highlight of the conference. The conference will conclude with awards and a valedictory session on day three. The presented and selected papers will be published in the Springer proceedings "Lecture Notes in Civil Engineering" series.

The entire event is planned in the historic Kala Academy of Goa, embracing the beach line of Miramar beach. The cultural evening with present the traditional Goan folk art, culture and singing. The delegates can savour the special Goan Cuisine and the famous Goan fish-curry-rice and many more delicacies, on all three days. The lush greenery in mid-September along with scanty rains makes the climate more pleasant and enjoyable. In addition to the conference, the beautiful and picturesque State of Goa, which is the destination of national and international tourists, has a lot to offer for the global and the local delegates. There is a planned spouse tour which will ensure that the family or spouse has a good time in Goa when the delegates are busy with the conference and networking. The beaches of Goa are a priceless attraction. The conference participants can indulge in Scuba Diving, Banana Boat Ride at Grande Island, Mandovi River Sunset Cruise, Hot Air Balloon Flight, or visit to Dudhsagar Falls, Anjuna Flea Market, beautiful temples spread across the State of Goa, Basilica of Bom Jesus, Aguada Fort, Dolphin Ride and many more such tourist attractions.

We, at Goa eagerly await you esteemed presence for the conference as delegate, resource person, exhibitor and sponsor. Once again I welcome you for this 13th Annual DFI Conference and with your esteemed presence, I am sure, we can make this conference a grand success.


The Deep Foundations Institute of India (DFII) is committed to advancing the science and technology of deep foundations, ground improvement, and related construction techniques. In line with its mission to disseminate knowledge and enhance professional development, DFII is conducting a webinar series titled "Practices for Efficient Subsurface Characterization" under the DFII Committee for Geotechnical Characterization for Foundation (DCGCF). This series is designed to address the critical aspects of subsoil investigation and characterization, which are fundamental to the success of any construction project involving deep foundations. To Know more about the Committee Goals & Programs visit : *https://dfi.org/communities/geotechnical-characterization/*

**Webinar 1 Schedule:** **30 August 2024, Friday at 5:30pm - 6:30 pm IST**

**Technical Session:** **Case studies on Problems, Challenges and Solutions to Site Characterisation**

**Speaker:** **Dr. CR Parthasarathy,** *Founder, Chairman and Managing Director, Sarathy Geotech & Engineering Services Pvt Ltd.*

**Free registration is open for the webinar series, Register Here:** *https://www.xcdsystem.com/dfi/attendee/index.cfm?ID=Nioknvq*

*For any enquiry, contact DFI of India Office at* dfiindiaoffice@gmail.com/ technical@dfi-india.org

## DFII & DFI Upcoming Events

| Event | DFI-India 2024 | DFI49 | SuperPile '25 | DFI50 |
|---|---|---|---|---|
| Date | Sept 19-21, 2024 | Oct 07-10, 2024 | June 18 - 20, 2025 | Oct 20-23, 2025 |
| Venue | Goa, India | Aurora, Colorado | Cleveland, OH | Nashville, TN |

Not a Member?
Join DFI here www.india.dfi.org/members/

## DFII Technical Committee News & Reports

### DFII Committee for Geotechnical Characterisation for Foundations

DCGCF committee conducted first 5-days workshop of 2024 (sixth overall) for Geotechnical Investigation laboratory Testing, at L&T Construction Research and Testing Centre, Chennai during 08 - 12 Jan'24. The program received excellent feedback from all the participants who joined the program from all across India. More workshops are planned in different regions of India.

The committee is all set to start a webinar series titled "Practices for Efficient Subsurface Characterization" to address the critical aspects of subsoil investigation and characterization, which are fundamental to the success of any construction project involving deep foundations. The first webinar in the series is scheduled on 30 Aug'24.

### DFII Training Committee on Foundation Technologies

After huge success of two training programs on Support Fluids for Foundation Construction and Tremie Concrete for Deep Foundations in 2023, DFII Training Committee conducted its fifth training program on 'Ground Improvement for Foundation construction' on 18 May 2024. It was a full day hybrid workshop conducted in-person at Raj Park Hotel, Chennai and online via zoom webinar. Leading experts from industry and academia participated and presented during the event. The workshop was sponsored by Bauer Engineering India Pvt. Ltd.

The program was attended by 46 in-person attendees and 40 online attendees. The technical coverage and insights provided by the experts got highly encouraging feedback.

The Committee is also planning to have more training programs on different topics like D-Walls, Working Platforms, Tool Management for Construction Equipment, etc.

### DFII Student Outreach Committee-Groundwork

DFII Student Outreach Committee conducted three Groundwork online webinar series for 2024 in Jan, March, and July 2024.

DFII invited abstracts of the project work by graduate students and the thesis by the research students for the DFII Student Awards 2024 for 'Best Project Award for Masters Students' and the 'Best Research Award for the PhD scholars' in the deep foundation and ground improvement field. The winners will receive the awards during the annual conference DFI India 2024.

### CFA Pile Technology Implementation Committee

The committee successfully conducted a workshop on CFA Pile construction in collaboration with IGS Kolkata Chapter on 30 March 2024. Several national and international experts namely, Er. Shyamal Kumar Mitra, Geotechnical Consultant, Dr. Martin Larisch, Director, Larisch Consulting Ltd., Mr. Prathmesh Wani, Geotech Engineer, Menard & Mr. Ian White, Business Unit Manager, Menard Middle East, Mr. Anirudhan IV, Geotechnical Consultant, and, Dr. Sunil S. Basarkar, Vice President, AFCONS presented during the program. It received excellent feedback from the participants. The program was attended by more than 250 online delegates.

The P20 sub-committee under CED 43 is ready with the draft of the BIS code for CFA Guidelines and reviewing the same. The guidelines document is expected to be out by this year end.

### Women in Deep Foundations India

WiDF India Committee is actively working on the program in the DFI-India 2024 Conference. Ms. Angelica Leana Odetta Sarita Da Silva, will speak during the session. She is the first women chief engineer of PWD, Goa. More details on the program will be rolled out soon.

***Follow DFI of India on social media for updates & announcements***

## WHAT CAN DFI DO FOR YOU?

### Overview

DFI is an international association of contractors, engineers, suppliers, academics and owners in the deep foundations industry. For more than 40 years, we have brought together professionals for networking, education, communication and collaboration. As a member, you help create a consensus voice and a common vision for continual advancement in the planning, design and construction of deep foundations and excavations.

### Find Common Ground. Become a Member of DFI

- Network with thousands of members and industry professionals worldwide
- Get involved locally through DFI's active presence in Europe, India and the Middle East
- Strengthen your knowledge base and obtain practical information at seminars, short courses, workshops and conferences
- Collaborate with colleagues by joining one of 25 plus active Technical Committees, Regional Chapters or a DFI group
- Gain visibility with a corporate member listing on the DFI website, which has 20,000 views each month
- Connect and communicate with industry peers through social media such as DFI's LinkedIn Groups
- Access OneMine.org and download up to 145,000 articles, technical papers & books from DFI & organizations all over the world - at no cost


## 49th Annual Conference on Deep Foundations

Oct 07th - Oct 10th, 2024

Join us for DFI's 49th Annual Conference on Deep Foundations in Aurora, Colorado, and network with the largest gathering of international practitioners specializing in cutting-edge technologies and risk management for deep foundations, ground improvement, earth retention and excavation support. The goal of the conference is to create a forum for discussion and knowledge exchange amongst industry professionals, government agencies, and academia on the challenges and solutions for water, resiliency and infrastructure.

For more information, and registration visit:
https://dfi-events.org/dfi49/

This e-newsletter of DFI of India is available at DFI of India website: https://dfi.org/india/

Editorial team: Anirudhan I. V. , Pranav Jha & P. Sai Sindhu