

## DFI of India

Since the full-time office was established last year, DFI of India (DFII) has been working on several initiatives. The interaction with DFI headquarters, the Indian construction industry and the stakeholders of the foundation industry has become very intense. Ongoing initiatives and programs for DFII are presented below. Progress updates will be reported in future issues of this magazine and in DFII's quarterly e-newsletter.

### Subsoil Characterisation Committee

The Subsoil Characterisation Committee was formed recently and is chaired by Professor V.S. Raju, a well-known geotechnical consultant, professor of geotechnical engineering at IIT Madras and former director of the prestigious IIT Delhi. He has been tirelessly advocating the urgent need to improve quality and professionalism in the subsoil investigation business in India. The committee was formed to address various issues plaguing the geotechnical investigation and reporting practice in India, to formulate a syllabus for

training and to kick start training programs. The main issues include poor quality of work and the low skill levels of the technicians involved in the field and laboratory investigations. Regular meetings are being held with National Academy of Construction (NAC), Hyderabad, to develop a training program. This committee will liaise with DFI's overall Subsurface Characterization for Deep Foundations Committee to exchange related information.

### Drill Rig Operator Training

Drill rig operator training and certification is another major initiative of DFII to improve the quality, productivity and safety in deep foundation construction. DFII is working with several related organisations, such as NAC, Indian Construction Equipment Manufacturers Association, Infrastructure Equipment Skill Council, National Skill Development Council, various foundation equipment manufacturers, etc., to create a robust model to test and certify existing operators and to create a large pool of trained operators. DFII is confident that we can achieve



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success with determined and dedicated efforts despite the complexities involved.

### DFII CFA Pile Initiative

We are pleased to report that six continuous flight auger (CFA) test piles were successfully installed in May as part of the CFA field demonstration project. This demonstration project was developed as a part of DFII's larger mission of implementing new technologies of high potential application in India, skill development programs and other knowledge dissemination programs.

Recognizing the value of this initiative for the Indian deep foundation industry, Nuclear Power Corporation of India (NPCIL), a major Indian government agency, encouraged DFII to execute the test pile project at their greenfield project site in



Participants at CFA Pile Initiative

Gorakhpur, in the state of Haryana, about 165 km (103 mi) from Delhi.

Mobilization of equipment and materials began the first week of May. To observe the commissioning of the equipment, fabrication of the reinforcement cage and installation of the test piles, about 30 representatives from more than 10 organizations were present, including NPCIL, Power Grid Corporation of India, L&T Construction, ITD Cementation, Soilmec, AECOM, Bauer, Radise International (USA), Radise India Pvt Ltd., Ultratech Cement, Schwing Stetter, Keller and IIT Delhi. Two trial piles and six test piles with a diameter of 600 mm (23.6 in) and a length of 11 m (36 ft) were installed at the site, which took less than 15 min/each to auger, concrete and insert the reinforcement cage. DFII plans to complete the testing of the trial piles, including pile integrity testing, and vertical compression, pull out and lateral load testing. The field testing will be followed up with the development of a design manual and guidelines for CFA pile implementation for the deployment of this technology across India for infrastructure works. DFII also plans to host seminars and workshops to disseminate the information and guidelines.

Dr. Sunil S. Basarkar, head of engineering at Afcons and coordinator of the DFII CFA pile committee, and Dr. B. Sivarama Sarma, head of R&D at L&T Construction, were some of the senior professionals from the industry who spent considerable time onsite to oversee and ensure the success of the program. Two experts from Soilmec, Italy were flown in specifically for this project, and one expert from the U.S. was on hand to handle the instrumentation during installation. The project implementation and fund mobilization were achieved under the leadership of G. Venkata Prasad, DFII director of operations, with the assistance of Mohd Athif and Chandrasekhar, both DFII staff. In addition to whole heartedly thanking the above participants and all those involved in this project, I would like to state that credit for success of this technology demonstration project goes to the entire Indian construction industry. The continuous follow up, coordination and involvement of DFI and DFII teams is greatly appreciated.

## **DFI – CMRL Initiative**

Chennai Metro Rail Ltd. (CMRL), a joint venture between the Government of India and the Government of Tamilnadu, was created to build and operate a rapid transit system in the city of Chennai. Toward the end of Phase I of two metro corridors (Corridors 1 and 2) covering about 45 km (28 mi) with both underground and elevated stations, CMRL began Phase II with three metro corridors covering an additional 120 km (75 mi), where 52 km (32 mi) of the first stage will be covered with funds from Japan International Cooperation Agency. The first stage will extend the metro rail connectivity between Madhavaram and Sholinganallur (Corridor 3 at 35.7 km [22.2 mi]) and from Madhavaram to Chennai Mofussil Bus Terminus (Corridor 5 at 16.4 km [10.2 mi]), which is 60 percent underground. Considering the complex geotechnical stratum of Chennai and in view of highly buzzing activities of a very populous city, execution of the underground structures and foundation scope will likely pose significant challenges during project planning and execution.

With the goal to improve the Indian deep foundation industry, DFII approached the CMRL project leadership during early 2018 to explore possible areas of collaboration where DFII along with subject matter experts from the DFI membership could offer value-based solutions to CMRL that could be implemented in Phase II. After multiple rounds of discussions during the past 1.5 years, the efforts culminated in a signing of a 5-year MOU between DFII and CMRL and the formation of the DFI-CMRL International Geoengineering, Contractual, Construction Working Group.

On June 3-4, DFII met with CMRL to discuss the role of DFI/DFII in the CMRL project and to explore the possibility of conducting a two- or a three-day workshop for CMRL in September 2019. The workshop will include presentations from representatives of the owner, detailed design consultant and general consultant on different aspects of the project, such as detailed design, contract, construction, plant and equipment. Subject matter experts from the DFI working group will present a few case studies of infrastructure projects executed in the U.S.

In addition, DFII is exploring the possibility of developing an appropriate platform for CMRL for providing skills training programs for various foundation equipment operators and engineers, which would be used to identify potential risks associated with the geotechnical, foundation and underground construction portions of the scope of the project and to find measures to mitigate such risks for a smooth and successful implementation of this megaproject.

We are especially thankful to David Paul, P.E., DFI trustee and managing director of Paul GeoTek Engineering, Jack Mulvoy, P.E., chief engineer of DSI Tunnelling, and Satyajit Vaidya, P.E., Langan, who specifically travelled from the U.S. to Chennai for the two-day meeting with CMRL. While in Chennai, Dave Paul delivered a lecture to the Indian Geotechnical Society - Chennai Chapter at the IIT Madras campus titled "Repairs to Wolf Creek (U.S.) and Mosul Dams (Iraq) to Mitigate Dam Safety Issues."

## **Other Activities and Events**

The latest edition of the DFI of India News Quarterly was released in April (vol. 5, no. 2). A technical article by Antonio Marinucci, Ph.D., MBA, P.E., V2C Strategists, titled, "Single Bore Multiple Anchor Systems (SBMAS)" along with reports from Mary Ellen Large, P.E., D.GE, technical director of DFI, and G. Venkata Prasad, director operations of DFII are included.

A DFI-NAC workshop on the Challenges in Foundation Construction – Way Forward was held on July 20 at the NAC Auditorium in Hyderabad. The primary aim of this seminar was to disseminate knowledge of latest foundation technologies among the engineers of various government organisations in the state of Telangana.

The 9<sup>th</sup> International Conference on Deep Foundation Technologies for Infrastructure Development in India is being held at the NAC Auditorium in Hyderabad from November 15-16 (see p. 41). There will be a one-day preconference workshop on November 14. Conference preparations are currently in an advanced stage, with full papers being received from authors. Registration details and more information can be found at [www.dfi.org/India2019](http://www.dfi.org/India2019).