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# IGS News

*A Bulletin of Indian Geotechnical Society, Chennai Chapter*

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Editors : Prof. S.V. RAMASWAMY & Er. I.V. ANIRUDHAN

## Geotechnical Calendar

### National

- **Symposium on Engineering of Ground & Environmental Geotechniques**, Hyderabad, 29 Feb – 1 Mar 2008, Er. E. C. Nirmala Peter, Email: seghyd@gmail.com
- **National Seminar on Recent Advances and Future Trends in Design and Construction of Bridges**, Hyderabad, April 25-27, 2008, Er. N.S. Moorthy, nbrdc@rediffmail.com; www.nbedc.org
- Two days symposium on **“Geoenvironment, Geohazards, Geosynthetics and Ground Improvement - Experiences and Practices” (4G)** – May 1 & 2, 2008, CS MRS, New Delhi, Mr. Manish Gupta, geosymposium2008@gmail.com
- **6<sup>th</sup> Asian Young Geotechnical Engineers Conference**, IISC Bangalore, December 15-16, 2008, Prof. T.G. Sitharam, Email: sitharam@civil.iisc.ernet.in
- **Indian Geotechnical Conference, IGC – 2008**, 17-19 December 2008, Bangalore, Prof. T G Sitharam, IISc, email: igc2008@civil.iisc.ernet.in, http://civil.iisc.ernet.in/~igc2008

### International

- **3rd International Conference on Site Characterization 1** - 4 Apr. 2008, Taipei, Taiwan, Contact: An-Bin Huang, abhuang@mail.nctu.edu.tw
- **Development of Urban Areas and Geotechnical Engineering**, Saint Petersburg, Russia, 16-19 June 2008, www.geotec.spb.ru/eng/conf/080616/
- **International Conference on Landslides, Slope Stability & Safety of Infra-Structure (LS08)**, Kuala Lumpur, Malaysia, July 24-26, 2008, Email: cipremie@singnet.com.sg; www.cipremier.com
- **6th International Conference on Case Histories in Geotechnical Engineering**, Washington DC, United States, 4 - 9 August 2008, Prof. Shamsher Prakash, prakash@umr.edu, www.6icghe2008.org
- **12th Conference on International Association for Computer Methods and Advances in Geomechanics**, 1-6 Oct. 2008, Goa, Prof. D.N. Singh dns@civil.iitb.ac.in
- **XVII International Conference on Soil Mechanics and Geotechnical Engineering**, Bibliotheca Alexandrina, Alexandria, Egypt, 5 - 9 October 2009, Link: www.2009icmsge-egypt.org

## From the Editor's Desk ... IS 2911, 2<sup>nd</sup> Revision

The second revision of IS 2911 is under progress for more than two decades. Indian Geotechnical Society (Chennai Chapter) was an active participant in this activity.

In 1992 IGS (Chennai Chapter), at the request of Bureau of Indian Standards, conducted a test program, “Installation, Testing and Exhumation of Under Reamed Bored Piles in Sand” at Thiruvannamiyur, Chennai. A number of recommendations were made as a result of the program and a few were circulated for implementation.

Sections 2 and 4 of IS 2911 relating to the design and construction of bored cast-in-situ piles and precast piles in pre-bored holes were revised and redrafted by IGS (Mumbai Chapter). After a sitting of CED 43 of BIS held at Chennai during 1999, IGS (Chennai Chapter) undertook the responsibility of preparing a revised draft document for sections 1 and 3 of IS 2911. A committee was formed by IGS (Chennai Chapter) and after considerable deliberations the draft proposal was finalized. It was submitted to BIS for its perusal in 2000. It was later understood that the draft was widely circulated for comments.

Sections 1 to 4 of Part 1, Part 3 and 4 of IS 2911 were finalized and they have been circulated for comments and suggestions in 2005. Unfortunately the revised draft code under circulation is much different from the draft submitted by Chennai chapter. Some of the crucial sections are kept pending to be included in the future revisions.

It is to be pointed out that the revised draft was not sent to IGS (Chennai Chapter) for its comments and views. Actually there was no interaction between BIS and IGS (Chennai Chapter) after the revised draft was sent to BIS in 2000.

Geotechnical community and Bureau of Indian Standards have spent nearly fifteen years to produce an incomplete document. The comments of those who directly involved in the drafting were not obtained. It is hoped that the revisions in future will be done in reasonable time giving an opportunity for the concerned persons to send their comments.

## The Big Temple Tanjaur

Prof. A. Sargunan

The Brhadiswara Temple, Tanjaur – popularly known as The Big Temple – was built by the Chola King, Rajarajan I to commemorate twenty five years of a successful reign (985 – 1010 A.D.). Built completely in stone, the Big Temple is known for its majestic Vimana, architectural perfection and balance, its structural relief, murals etc. and is a world heritage site. This article briefly examines certain aspects of construction of interest to engineers.



It may surprise many that modular coordination was used in this temple (one thousand years ago!). The height of the pyramidal tower, 59.82m – an unprecedented height for a temple those days- is the basic module for all principal dimensions. Three identical squares placed side by side, the side of each square being twice the basic module, ie., 119.64m, define the temple complex. The Lingam is at the centre of the first square, the Nandi at the centre of second and the gateway in the third. The width of the base of the tower is one- half its height (30m), the height of the Lingam one- fifteenth (4m) and the height of the inner gateway two-fifths (24m) etc. Similarly, architectural works on the tower facades are governed by another basic module, the width of the urn pilaster, 0.33m.

The Sanctum is a square (7.9m x 7.9m) surrounded by massive inner and outer walls (average thickness = 3.5m) separated by a corridor 1.8m wide. At a height of about 20m the two walls are coalesced together by corbelling and a pyramid rises from here to a height of 32.5m. It may be noted that the temple architects had to develop a special polygonal bond for the sanctum walls.

With two lower floors (around the sanctum) and thirteen upper storeys of varying heights (4.4m to 1.9m) the tower transmits a load of 42000 MT; but the three temple architects (sthapathi) – Kunjaramalla Rajaraja Peruntaccan, Nittavinoda Peruntaccan and Kandarathitha Peruntaccan – do not appear to have been unduly perturbed by the massive load. It is this writer's opinion that after ascertaining the continuity

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## Minutes of AGM held on October 6, 2007

The annual General Body Meeting of Indian Geotechnical Society, Chennai Chapter, was held at Viswesvaraya Hall, Geotechnical Division, IIT Madras at 6:30 PM on October 6, 2007. Forty two members attended the meeting.

Prof. K. Ilamparuthi chaired the AGM and welcomed the members. He gave a brief account of the activities of the chapter during 2006-2007.

Mr. Anirudhan read out the report of activities of the chapter. The report was circulated among the members present. Mr. Anirudhan thanked the Chairman and other executive committee members for their full support during his 3 year tenure in the office. He, in his report, congratulated Prof. S.R. Gandhi, Prof. K. Ilamparuthi, the staff and students of Geotechnical Division, IIT Madras and the staff and students of Division of Soil Mechanics and Foundation Engineering, Anna University, for conducting the IGC 2006 held at IIT Madras.

The accounts of the chapter for the year 2006-2007 was presented by Mr. Anirudhan. The chapter has roughly 13.5 lakh in the fixed deposits in SBI, Anna University Branch. Rs 1.03 lakh is contributed to the parent body as contribution for IGC 2006 and another one lakh was given to the parent body for constituting an award for best paper in deep foundation category. The account was approved by the AGM. Mr. Anirudhan concluded the report by thanking the executive committee members and other members of the chapter for helping him in the activities of the chapter.

Mr. K Bhaskaran, the election officer for the 2007-2009 elections to the executive committee, declared the election results as follows.

The Chairman	Prof. S.R. Gandhi
Ex officio	Prof. K. Ilamparuthi
The Secretary	No nomination
Members	Dr. V.K. Stalin Mr. I.V. Anirudhan Mr. V. Balakumar Dr. K. Premalatha Prof. K. Rajagopal Mr. Senathipathi

Six more members including the secretary were to be elected / nominated by the general body. Mr. Bhaskaran congratulated Prof S.R. Gandhi and his team and wished them success in conducting the activities of the chapter.

The nomination for the vacant positions was then done. Prof. K. Ilamparuthi proposed the name of Mr. Anirudhan I.V. as the secretary for the term and was seconded by several members present. Mr. Anirudhan accepted the nomination as the secretary for the term 2007-2009.

The following members were nominated to the new executive committee from the floor.

Mr. R Radhakrishnan - proposed by Prof K. Rajagopal
Mr. Subhash Chandra Bose – proposed by Dr. D. Thirunakkarasu
Mr. K. Bhaskaran - proposed by Mr. I.V. Anirudhan
Mr. L. Sivanarayana - Proposed by Prof. A. Boominathan
Dr. K.L. Pujar - proposed by Mr. V. Balakumar
Prof. S.V . Ramaswamy – proposed by Prof. S.R. Gandhi

Mr. Anirudhan, then proposed an amendment that, Prof. S.V. Ramaswamy being a senior member and national executive committee members may be made as a special invitee. Mr. P.T. Ravichandran was proposed as one of the members.

All the nominations were seconded and approved by the AGM. The elections to the executive committee concluded and the chair read out the names of the new members.

Prof. S.R. Gandhi briefly presented the proceedings of the EC meeting of the national body held in Bangalore on 29 September 2007 as per the advice of the chair.

Prof. K. Ilamparuthi invited Prof. S.R. Gandhi to conduct further proceedings. Prof. Gandhi thanked all the members of the chapter for the confidence shown and for his election. He complimented the activities carried out by the chapter in the past and thanked particularly Prof. K. Ilamparuthi, Shri. I.V. Anirudhan and all members of the IGC 2006 committee for the excellent support. He

## Personal Column

1. **Dr. M. Ram Rao** awarded doctoral degree for his theseis 'Arresting heave of swelling soils using stabilized fly ash cushion.'
2. **Dr. M. Ram Rao**, presented a paper 'Some solutions to problems in expansive soils, at ARC-2007, Dec 10-14,2007, Kolkata.
3. **Mr. S. Murugesan** attended the 13th ARC held at Kolkata and presented his paper 'Model tests on Stone columns subjected to lateral soil movement.'
4. **Dr. R.G. Robinson**, IIT Madras, had a six month sabbatical at the University of Wollongong, Australia.

Members are requested to write to the society about their activities and other personal achievements. Members may please send their email ID to anirudhen@eth.net for better communication.

## Papers Published

**Mr. S Murugesan** and **Prof. K. Rajagopal** published their paper Model tests on geosynthetic-encased stone columns in Geosynthetic international, Volume-14, Issue-6, pp. 346-354

**Dr. M. Ram Rao, et.al.** published their paper "Leaching studies on lime-stabilised fly ash cushion" in Asian Journal of Microbiology & Environmental Science Vol,9, No.3, 2007, pp: 573-580



During one of the ARC advisory committee meeting; Dr. V.V.S. Rao, Prof. K. Rajagopal and Prof S.R. Gandhi attended

## Executive Committee of the Chapter for 2007-2009

Chairman	Prof. S.R. Gandhi - srgandhi@iitm.ac.in
Ex officio	Prof. K. Ilamparuthi
Secretary	Mr. I.V. Anirudhan - anirudhen@eth.net
Members	Dr. V.K. Stalin Mr. V. Balakumar Mr. K. Bhaskaran Dr. K. Premalatha Dr. K.L. Pujar Mr. R. Radhakrishnan Prof. K. Rajagopal Prof. S.V. Ramaswamy Mr. P.T. Ravichandran Mr. Senathipathi Mr. L. Sivanarayana Mr. Subhasah Chandrabose

briefly spoke about his plans for the future activities of the chapter and sought the support from all the members.

I.V. Anirudhan, Secretary

## Activities - July- December 2007

### Terzaghi Day Programme on 6 October 2007

Terzaghi Day celebrations of the year 2007 was held on 6 October 2007 at IIT Madras. **Er. Murali Iyengar**, Advisor (Geotechnical Engineering), (Formerly Dept. Head, Geotechnical Engg. & Executive Director, Engineers India Limited, delivered the Terzaghi Lecture. He spoke about the **"Experiences with Ground Improvement through Pre- Consolidation"**.

**Shri Rambabu Tadepelli**, Utraco-Ryobi Ground Engineering Pvt. Ltd. gave a lecture on **"Slope Stabilisation using Soil Nails and Ground Anchors for Deep Basement Excavations"** after the Terzaghi lecture.



**Shri Murali Iyengar** on " Experiences with Ground Improvement through Pre- Consolidation"



**Shri Rambabu Tadepelli** on "Slope Stabilisation using Soil Nails and Ground Anchors for Deep Basement Excavations"



A view of distinguished audience - Terzaghi Day function

### The Big Temple Tanjaur contd from page 1

and thickness of the underlying strata, the sthaphathis conducted simple load tests at select locations and satisfied themselves about the unyielding nature of the underlying strata, latexitic rock. The base of the tower being 30m x 30m, it is most likely that foundation raft was around 40m x 40m.

The foundations are known to be shallow, not more than 1.5m deep to keep the number of joints to a minimum. Stone beams 12m long, 1.2m wide brought from quarries 40 to 50km away over land and water were used. Adjacent beams were interlocked by provision of 'Kumizh' (projecting buttons) and 'kuzhi' (corresponding holes) to prevent lateral movement. No distress to the tower has so far been reported.

No records are available about techniques used in tower construction, so only functional possibilities could be discussed. It is certain though that one or more ramps (of mud and stone) were used. The first one from a village on the east, 6km away, ran straight to the platform (24m x 24m, height 20m) in the tower created by merging the sanctum walls. The massive outer wall served as an abutment. Both major and minor slips could have occurred in the ramp but these were amenable to repairs.

A more solid spiral ramp with a structure ran on all the four sides of the tower. The tower storeys have median opening and could now be accessed by short wooden ramps. A scaffolding system, which had its anchor in the spiral ramp completed the support system.

The tower is terminated at a height where the opening at the top is of the same size as that of the sanctum (8m x 8m) directly below. Because of the longer span the sanctum had to be roofed over using wooden beams and joists. Since it was not advisable to use wood at the top (a question of accessibility and replacement) the architects ingeniously solved the problem by gradually reducing the inner volume of the tower from the fifth storey onwards. The tower rising on a square became progressively round on the inside through an octagonal transition (The interior of the tower can be viewed from an upper floor). The capping stone was thus reduced to a manageable size. The Lingam being 1.66m in dia, the keystone directly above was probably not more than 2.5m in dia at the most. The common saying that a single stone slab weighing 80T adorns the tower top is, of course, a misconception.

The mandapam (the long pillared hall in front) and its upper floors appear to have been taken up only later even though the base of the mandapam was contiguous with that of the sanctum and had been laid in phase I itself. Shortly after construction there appears to have been a partial collapse of the mandapam walls, particularly the western wing nearest to the sanctum. The socle and the base were also damaged.

Some myths abound about this failure also. From an engineering point of view there is some evidence that the quality of the substrata begins to decline as one moves away from the tower. In support of this there is an officially recorded settlement of 200mm by ASI of the median shrine in the north corridor. Further during the six years it took to complete the tower the mandapam had no roof (the ramp?) and this permitted infiltration of rainwater. Perhaps the intention to raise the mandapam and its upper floors along with the sanctuary tower could not be implemented for some unknown reason. The mandapam is connected to the tower at several levels. The tower probably settled a few millimeters and stabilized. The mandapam is a heavy - walled structure and its tendency to settle and drag the tower along with it probably resulted in the collapse of its walls. The mandapam has since been restored for ground floor use. The tower and the shrine are intact and continue to inspire with a dignity and serenity of their own.

The Big Temple will be completing one thousand years in the year 2010 and it is hoped that all lovers of art would join together and pay a fitting tribute to 'Team Rajarajan' for having bequeathed to posterity a truly outstanding masterpiece in Imperial Chola Art.

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We are on the web - [www.igschennai.in](http://www.igschennai.in)

THE BIG TEMPLE

## Growth of Geotechnical Wisdom

Geotechnical Investigation provides important input for any Civil Engineering project. More complex constructions, deep excavations, large land reclamation, etc. resulted in considerable improvement in the investigation methodology and the equipment used in the investigations. However, the geotechnical investigation in India still revolves around old conventional methods and a major change is elusive because of lack of awareness on the importance of such investigations for important projects and also because of very limited funds allotted for investigation.

The topic had been discussed at several forums. However, the topic has its own charm and more importance because of several unexpected and unpleasant issues related to foundation construction we experience every day. This seminar is aimed at refreshing the knowledge on new developments in the selected topics of geotechnical investigation.

**Seminar on  
Geotechnical Investigation  
23 February 2008  
9:30 AM to 5:30 PM  
Venue  
IIT Madras**

Check for more details at  
[www.igschennai.in](http://www.igschennai.in)

Registration form enclosed

### Topics of discussion

- Awareness by the end user.
- Field tests - Importance of field tests and new methods in field tests
- Geotechnical Investigation scope, definition
- Sampling procedures and the field realities
- Report & Moral obligation of the geotechnical investigation agency

The first four topics will be presented by selected speakers, while the last topic will be presented in the form of a panel discussion.

A nominal registration fee of Rs 250/- will be charged from the delegates. The fee includes lunch and tea. As such no printed course material will be made available to the delegates. Minimum stationery will be made available to the delegates.

The students also need to register as delegates. Contact Anirudhan at Email [chapter@igschennai.in](mailto:chapter@igschennai.in)

**Technical lecture by Dr. (Mrs.) Suzanne Lacasse,** Managing Director, Norwegian Geotechnical Institute, Oslo, Norway, - "Tsunami Risk Mitigation Strategy after December 2004 Earthquake in Indian Ocean" on 29 October 2007



Prof. K. Ilamparuthi welcoming the gathering at during Terzaghi day celebrations

Dr. V.V.S. Rao, Dr. Suzanne Lacasse and Prof.S.R. Gandhi during a technical lecture