

ACS College of Engineering Bangalore -560074

Department of Civil Engineering



Report on
One day workshop

*“Structural Dynamic Studies Using
Shake Table and Scaled Building Models”*

In association with
M/s Milenium Technologies Pvt. Ltd., Bengaluru
Indian Concrete Institute, KBC

Sponsored by



1.0 INTRODUCTION

The study of structural dynamics in civil engineering curriculum is commonly perceived to be a difficult exercise, more so in India, especially at the undergraduate level, and, even at the graduate level, because of the mathematical nature of the subject. This difficulty is felt, not only by the students, but also, by the teachers, who may not have had formal advanced level training in the subjects of earthquake engineering and structural dynamics. Thus, there exists a need to develop suitable teaching and learning aids to augment the classroom teaching of these subjects. One of the most effective ways to achieve this would be to develop a suite of simple experimental setups which would enable the study of basic issues related to vibration behaviour.

Shake table is one such setup which would provide valuable physical insights into the basic vibration behaviour of structures in general, and, structural dynamic responses under base motions, in particular. It is a basic testing facility for development of earthquake resistant techniques. This is a platform excited with hydraulic actuators to simulate different types of periodic and random motions, such as artificial earthquakes and other dynamic testing. This is the only experimental technique available for direct simulation of inertia forces, which can be used to simulate different types of motion such as recorded earthquake ground motions, sine sweeps, etc. Shake table tests results enhance further the understanding of the behaviour of structures and calibration of various numerical tools used for analysis.

In this regard the department of civil engineering has organised a one day workshop on "*Structural dynamic studies using shake table and scaled building models*" in collaboration with M/s Milenium Technologies Pvt. Ltd., Bengaluru on 19th July, 2017.

2.0 INAUGURATION FUNCTION

The inauguration took place on 19th July at Seminar hall - 2. The function started with naadageethe, followed by lighting of lamp. Welcome address was delivered by Prof. Venkatesh Babu D L, HOD, civil engg. Dpt. Then our principal Prof. M. S. Murali gave precedential address and inspired everyone with his motivational speech. After the presidential address by the principal, the chief guest of the event Prof. Ranganath Talanki, Faculty in Civil Engineering, Higher Colllege of Technology, Muscst. Sultanate of Oman spoke about the importance of suitable experimental aids for teaching and learning to augment the classroom teaching of subjects like structural dynamics and earthquake engineering.



3.0 TECHNICAL SESSIONS

Three guest lectures were planned as a part of technical sessions during morning immediately after the tea break. All the participants were then assembled in structural engineering lab during afternoon session to see the demonstration of shake table set up and experimental procedures. The details of technical sessions are described in the following sub sections.

3.1 Introduction to Structural Dynamics and Earthquake Engineering

The very first technical speech after the tea break was "*Introduction to Structural Dynamics and Earthquake Engineering*" delivered by Dr. Naveenkumar D T, ACSCE/CIVIL, Bengaluru Dr. Naveenkumar D T, PG coordinator, Dpt. of civil engineering, ACSCE, Bengaluru. During the course of the presentation the speaker gave a clear picture of basic concepts in structural dynamics such as free vibration, difference between oscillation and vibration, damping, mathematical modelling, lumping of mass, degrees of freedom, formulation of equations of motion etc.. The speaker also gave a brief insight about the causes of earthquake, structural response, earthquake hazards, design of earthquake resistant structures etc.

3.2 Linear Harmonic Shake Table Test on Hybrid Spherical Rollers

The second session was addressed by Prof. Aravinthan K., EASACE, Coimbatore, Tamilnadu. The speaker spoke on the topic "*Linear Harmonic Shake Table Test on Hybrid Spherical Rollers.*" The speaker initially gave a brief classification of present base isolation systems along with their merits and demerits. Further the speaker emphasized the need of efficient hybrid isolation systems to overcome the demerits of present existing base isolation

systems. The speaker also discussed about research findings on linear harmonic shake table test on hybrid spherical rollers to highlight the efficiency of hybrid spherical rollers.

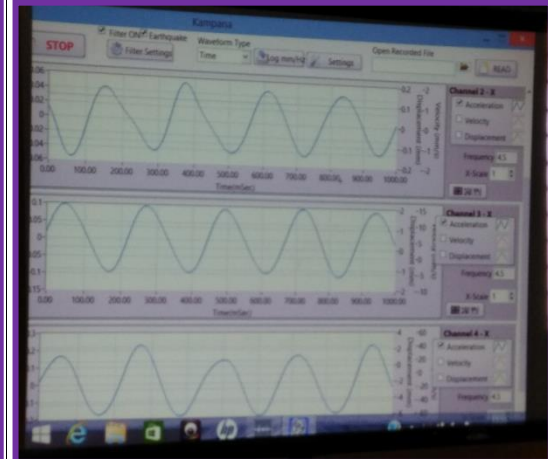
3.3 Introduction to Shake Table Setup and Measurement Aspects

The last session of the morning was presented by Er. Shrikant. S. Shinde, M/s Milenium Technologies (I) Pvt. Ltd., Bengaluru who was also the industrial partner of the workshop. The speaker gave the brief history of development of shake table manufacturing technology. The different types of shake tables available in the market and their range of application along with their pros and cons were also presented. The speaker gave the working principal of servo shake table which is currently being used in structural lab, ACSCE. The different types of tests which can be conducted using servo shake table were also explained during the presentation.

3.4 Experimental demonstration on shake table with scaled building models

All the delegates were assembled in the structural engineering lab, ACSCE for the afternoon session. Mr. Mahadev and colleagues from M/s Milenium Technologies (I) Pvt. Ltd., Bengaluru, gave the Experimental demonstration on shake table with various scaled building models. The brief description about initial set up of the instrumentation, usage of softwares such as Kampana and shake table were given. It was found that more than 80% of the were seeing the shake table for the first time. The experimental demonstration gave the brief idea about the types of tests which can be conducted using shake table.

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4.0 Feedback and Distribution of Certificates

Mrs. Kavitha S. took the feedback from all the delegates. Finally participation certificates were distributed to all the participants by our vice-principal Prof. Prof. R.R. Elongovan.



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