

SPARC SEMINAR SERIES ON

SEISMIC RESILIENT STRUCTURES

Achieving Resilience through Innovative Seismic Devices



Organized by: Indian Institute of Technology Bombay, India and University College London, UK

Title of the talk: Performance of Supplemental Inertial Devices for Base-Isolated Structures

Speaker:

Professor R. S. Jangid
Professor of Structural Engineering
Indian Institute of Technology Bombay, India



Date: 19th November 2021

Time: 5:00 pm (IST) ; 11:30 am (GMT)

Online Meeting Link:

<https://kaksha.webex.com/kaksha/j.php?MTID=m14b29a3edf20ba0f4aa773ae4869d455>

Abstract of the Talk:

The seismic response of base-isolated structures with supplemental inertial devices subjected to stationary and real earthquake excitation is presented. Three types of devices, namely inertial mass damper (IMD), tuned mass damper-inerter (TMDI), and clutching inerter damper (CID), are considered. The seismic response of the base-isolated structure with and without inertial devices is compared to assess their effectiveness. Under stationary white-noise excitation, the optimum parameters of these devices were obtained. The criterion selected for optimality is the minimization of the mean-square relative displacement and absolute acceleration of the isolated structure. An equivalent linearization method was used for base-isolated structures with CID under stochastic excitation. It was observed that the IMD is not very effective in controlling the response of base-isolated structures. Optimally designed TMDI, on the other hand, was found to be effective in controlling the displacement and acceleration response of the isolated structure, with the effectiveness increasing as the inertance mass ratio increased. The CID involved in the base-isolated structure reduces the structural natural frequency and increases structural damping, thereby reducing isolator displacement and structural acceleration. The high-frequency components were present in the absolute acceleration of base-isolated structure with inertial devices (more pre-dominating for IMD and CID), which may have detrimental effects on installed high-frequency sensitive equipment.

About the Speaker:

Dr. Jangid is a Professor in the Department of Civil Engineering at the Indian Institute of Technology Bombay (IITB). He received B.E. (Hons) in Civil Engineering from the University of Jodhpur in 1989. Subsequently, he did his M.Tech. and Ph.D. in Structural Engineering from the Indian Institute of Technology Delhi, in the years 1991 and 1993, respectively. His research interest includes the aseismic design of structures by active and passive control devices and the dynamic analysis of a non-classically damped system. His recent research contribution includes the base isolation for near-fault motion and its application to bridges and tanks, multiple tuned mass dampers for vibration control,

and active control of torsionally coupled structures. He received the Young Engineer Award of the Indian National Academy of Engineering in 1998 for significant contribution towards research in earthquake engineering. In 1999, he spent six months at the University of California, Berkeley, conducting research at the Pacific Earthquake Engineering Research Center as part of the Department of Science and Technology's BOYSCAST fellowship scheme. He also received the IIT Bombay Research Paper Award for the year 2014. He worked as a Seismic Consultant for the Government of Maharashtra in the repair and retrofitting of houses affected after Latur, 1993 earthquake. He also conducted research for BARC on the use of passive control devices to design earthquake-resistant nuclear structures and components. He had published several papers in international journals (about 172) and conferences and co-authored a book on Structural Analysis. He guided several doctoral (28) and master's (69) theses in Structural Engineering.

At IITB, he also served as Associate Dean (IPS). Served as Independent Director for ETC Network Ltd Company of the Essel Group. Currently, he is a Member of the High-Rise Committee for the structural safety of the tall buildings in Mumbai.

He has served as a consultant in many prestigious buildings, infrastructure projects, and historical structures including Grand Pagado at Essel World Gorai.