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Multiple tuned mass dampers for vibration control of high-rise buildings

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Vibration control of long-period high-rise buildings against wind and seismic loadings has been a hot topic in the field of structural engineering to assure structure safety and human confort. Single tuned mass damper (TMD) is one kind of passive-type devices and has been successfully installed in many high-rise buildings, observatory towers, and long-span bridges since 1971. It can be incorporated into an existing structure with less interference than other devices. Multiple Tuned Mass Dampers (MTMD) consist of multiple units of tuned mass dampers arranged in parallel to suppress vibrations of single or multiple modes of a structure. A brand-new optimal MTMD system was developed by the authors to provide broader frequency bandwidth than single TMD, and thus, to be able to endure large variation of controlled structural frequency (called frequency detuning effect). In this study, a friction typed MTMD system with three units of TMD was designed and fabricated. A series of shaking table tests for a scaled-down long-period building model equipped with the MTMD system and a stop/lock device were conducted to prove the control effectiveness of the MTMD system and the workability of the stop/lock device. The results demonstrate that analytical results agree well with the experimental results showing accurate analytical friction model. The proposed MTMD system is effective in reducing the dynamic responses of the target high-rise building. In addition, the stop/lock device works well when the stroke of each TMD unit exceeds its limit.

Biography

Chi-Chang Lin received his PhD degree in Civil Engineering at the State University of New York at Buffalo in February 1989 and joined the Department of Civil Engineering at National Chung Hsing University (NCHU) in Taiwan in August 1989. He has been a Distinguished Professor since 2007. He was the Department Chair of Civil Engineering, Dean of College of Engineering, Founding Director of Center for Environmental Restoration and Disaster Reduction, and Vice President of NCHU. His research interests include structural health monitoring and damage assessment, passive and active control of structures, earthquake engineering, and train- or man-induced vibration control. He has received numeral awards and honors including Distinguished Research Award from Taiwan National Science Council three times and the Outstanding Engineering Professor Award from Taiwan Chinese Institute of Engineers. He has published one book chapter and over 150 peer-reviewed technical papers in international scientific journals and conferences. He is currently President of the Chinese Society of Structural Engineers and a life-time Fellow of both the Chinese Institute of Civil and Hydraulic Engineering and the Chinese Society of Structural Engineers in Taiwan.

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