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Using real-time hybrid testing to verify the performance of full-scale tuned mass damper against wind forces in high-rise building

* Chan-Jung Kang[1)] Qi-Yang Liao[2)] Jer-Fu Wang[3)] Shih-Yu Chu[4)]
Chung Fang[5)] Chi-Chang Lin[6)]

[1),2),4),5)] *Department of Civil Engineering, National Cheng Kung University, Taiwan*
[1)] *kang830927@gmail.com*
[3)] *Department of Civil Engineering, National United University, Taiwan*
[6)] *Department of Civil Engineering, National Chung Hsing University, Taiwan*

ABSTRACT

In recent years, high-rise buildings have become increasingly built in metropolitan areas. One of the major challenges faced by high-rise constructions is excitation from wind force. Tuned Mass Dampers (TMDs) are commonly used in tall buildings to reduce the vibration of high-rise structures caused by wind force. However, conducting actual TMD vibration reduction performance testing in a laboratory setting is impractical, as it is impossible to construct a target building in the wind tunnel and install the full-scale TMDs. Therefore, this research aims to utilize the technology of Real-Time Hybrid Testing with a shake table (RTHT-ST), whose core concept involves replacing the high-rise building with a numerical model while keeping the full-scale TMD on the shaking table. Through advanced control techniques of the shaking table, the iteration effects of the full-scale TMD and the high-rise building subjected wind force can be simulated and verified. This paper will provide a detailed overview of the RTHT-ST process and explore the test results of RTHT-ST for verifying the wind resistance capability of the full-scale TMD.

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[1)] PhD Candidate
[2)] PhD Candidate
[3)] Associate Professor and Chairman
[4)] Professor
[5)] Professor
[6)] Adjunct Professor

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