The Evolving Metropolis
2019 IABSE Congress
New York City

IABSE 90 YEARS

# Application of Modular Air-Tuned Damper System in High-Rise Buildings

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## 1 Abstract

High-rise buildings are progressively being designed and constructed in increasingly slender and complex shapes. Consequently, excessive wind-induced vibrations of these structures are a growing serviceability concern due to their flexibility. Tuned mass dampers (TMDs) are regularly incorporated into high-rise buildings for mitigating excessive wind-induced vibrations. However, traditional TMDs are only effective over a narrow domain of frequencies, require an immense mass and occupy a significant volume of interior space. A novel modular air-tuned damper system was developed which is more cost-effective and flexible in distributing its mass throughout a building to make efficient use of unused space. Importantly, the air-tuned damper system is capable of being tuned across a broad domain of frequencies to more effectively alleviate wind-induced vibrations. This paper presents a case study demonstrating the performance of a high-rise building under 1-year and 10-year wind events whilst equipped with the air-tuned damper system. Dynamic analyses were performed for evaluating the reductions of the building's lateral accelerations considering different air-tuned damper configurations. The performance of the building under the different damper configurations is discussed.

**Keywords:** wind-induced vibrations; vibration mitigation; tuned mass damper; air-tuned damper

https://doi.org/10.2749/newyork.2019.1198
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