

## Abstract

This research presents section model test of Akashi kaikyo Bridge suspension bridge and Industrial Ring Road Bridge in wind tunnel to find vortex shedding phenomena and critical wind speed for flutter instability. These aeroelastic phenomena are the most important problems that usually happen in suspension bridge and cable stayed bridge. The section model of the bridges are made of woods of length scale 1/50 for Akashi Kaikyo Bridge and 1/90 for Industrial Ring Road Bridge respectively and installed in wind tunnel by eight springs support for stiffness of the bridge. In addition, the Tuned Mass Dampers (TMDs) are installed on the bridge to suppress the aerodynamic response of the bridges. The TMDs are designed of 1% and 3% by mass ratio for Akashi Kaikyo Bridge and 1%, 2% and 4% for Industrial Ring Road Bridge respectively. TMDs are installed in 2 patterns. The first, the TMDs are installed in each mode shape of vibration; in vertical and in torsional. The second, the TMDs are installed to control both vertical and torsional in the same time. In addition, 3 different damping ratios occupied for TMD 1% mass ratio for Industrial Ring Road Bridge. Moreover, the aerodynamic response of the original section and improved section by providing the 10 cm. width of strip opening in middle lane of Akashi Kaikyo Bridge were tested.

The results shown that the efficiency of TMDs 1-4% by mass ratio for both Akashi Kaikyo Bridge and Industrial Ring Road Bridge are satisfied. A) The TMDs 1% by mass ratio in vertical and torsional can suppress vertical and torsional vibration by 11-39% and 46-67% respectively and it can suppress vertical and torsional vibration by 35% and 67% respectively during vortex shedding and it can extend the critical wind speed by 15-20%. B) The TMDs 2% by mass ratio in vertical and torsional for Industrial Ring Road Bridge can suppress vertical and torsional vibration by 19% and 35% respectively and it can suppress vertical and torsional vibration by 43% and 6% respectively during vortex shedding and it can extend the critical wind speed by 7%. C) The TMDs 3% by mass ratio in vertical and torsional for Akashi Kaikyo Bridge can suppress vertical and torsional vibration by 10% and 54% respectively and it can extend the critical wind speed by 84%. D) The TMDs 4% by mass ratio in vertical and torsional for Industrial Ring Road Bridge can suppress vertical and torsional vibration by 22% and 54% respectively and it can suppress vertical and torsional vibration by 45% and 66% respectively during vortex shedding and it can extend the critical wind speed by 64%. E) In case of 3 different damping ratios occupied for TMD 1% by mass ratio for Industrial Ring Road Bridge, it was found that the optimum damping ratio TMDs case can extend the critical wind speed by 15%. Meanwhile the less and the most damping ratio TMDs can extend the critical wind speed by 7% and 12%. The vibration suppression efficiency of the 3 cases TMDs are similar. F) In addition, the results shown that the improved section of Akashi Kaikyo Bridge by providing the 10 cm. width of strip opening in middle lane can suppress aerodynamic response well.