

CHAPTER 7

CONCLUSIONS

A design technique for various passive dampers and active tuned-mass damper for vibration control in high-rise buildings under wind loads is presented by the equivalent damping ratio method. From the numerical example of three high- and very high-rise buildings with various passive dampers, the conclusions are summarized as follows.

- (1) Buildings with dynamic dampers lead to increase in equivalent damping ratio and then result in significantly reduction in gust effect factors, equivalent wind loads, deflection, and acceleration of the buildings.
- (2) The peak along- and across-wind acceleration can be reduced by about 45% for 317.5 m high building attached with 1% mass ratio of TMD. However, the maximum lateral deflection at the top building can be reduced by only 28% for the same building and TMD.
- (3) For high- and very high-rise buildings, the peak accelerations in across-wind direction are greater than those in along-wind direction.
- (4) For the same mass ratio, the effectiveness of dynamic dampers can be ranked as MTMD > TMD > MTL D > TLD.
- (5) The equivalent wind load and maximum lateral deflection for wind exposure A are the significantly largest among three wind exposures. However, no significant difference in along- and across-wind accelerations for three wind exposure is found.

From the numerical examples of three high- and very high-rise building with and without TMD and ATMD, the conclusion are summarized as follows.

- (1) The ATMD design is very effective in reducing the displacement and acceleration responses and equivalent wind load of the buildings to an extent large than those that the passive alone can achieve. The mass ratio should be increased up to 2-3 % for very high-rise building to reduce the peak stroke of ATMD and active force.
- (2) The ATMD design is the requirement of a continuous supply of the energy to drive the control force and an increase in stroke length.
- (3) For very high-rise building, the TMD design alone may not be possible to reduce the response to an acceptable level because of limitation of mass ratio of the damper. Application of ATMD design in such building is valuable.