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# The Constructions Vibration Control by Tuned Mass Dumper

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## Abstract

In this paper the Vibration Control by the Tuned Mass Dumper (TMD), in important and symbolic constructions, are illustrated. Some TMD optimization procedures are discussed for different types of constructions (new tall buildings, an existing masonry chimney and a new footbridge) for the seismic and wind actions. By the TMDs, the structural behaviors improvements are shown, either for the Ultimate Limit State (ULS), either for the Serviceability Limit State (SLS). To appreciate the structural improvements by TMD installation, for each types of constructions, structural analysis by finite elements model (FEM) are carried out with and without TMD. Finally, for each TMDs, a design hypothesis are showed pointing out the installation procedures and the related costs.

**Keywords:** vibration control, TMD, tall building, chimney, footbridge, wind and seismic action mitigation

## 1 Introduction

Tuned mass damper (TMD) solutions to mitigate the effects of the wind and seismic loads on the structures are analyzed for three important constructions: a new tall building, an historical chimney and a footbridge. In the tall building case the mitigation regards the serviceability behaviour; in the footbridge case the TMD works either to control the vibrancy and to reduce the seismic effects; instead, in the historical chimney case, the TMD represents a structural improvement (in the following for the seismic action).

## 2 Wind effects mitigation for a tall building

To improve the structural behaviour under the seismic and wind loads in tall buildings a TMD installation could be a valid solution, specially if the tall building has a symbolic shape characterized by an high geometrical slenderness (λ) value (λ is the ratio between the building height and the minor side of the building plant). In some new tall building the architectural solution provides a λ value more than a limit range λ=5÷7.
The passive mass damper reduces the dynamic effects specially due to the wind actions so its contribution has to be considered in the serviceability limit state (SLS); in the ultimate limit state (ULS), using the Eurocode (EC) or national



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