Damping system for existing and new structures

Philipp EGGER
Civil Engineer
Vienna University of Technology
Vienna, Austria
Philipp.egger@tuwien.ac.at

Philipp Egger, born 1981, received his civil engineering degree from Vienna University of Technology, Austria. He works as a university assistant at the Institute for Structural Engineering at Vienna University of Technology.

Atitlan Diego HARTMANN
Civil Engineer
Vienna University of Technology
Vienna, Austria
atihartmann@gmail.com

Atitlan Diego Hartmann, born 1984, received his civil engineering degree from Vienna University of Technology, Austria.

Johann KOLLEGGER
Professor
Vienna University of Technology
Vienna, Austria
betonbau@tuwien.ac.at

Johann Kollegger, born 1956, received his engineering education at universities in Austria, USA, Canada and Germany. He obtained practical experience in consulting offices and construction companies and is now head of the Institute of Structural Engineering at Vienna University of Technology.

Summary

Several trends indicate that the design of structures is becoming more slender and filigree for esthetical and financial reasons. The innovative damping system offers new solutions for the contemporary construction with slender light-weight structures, higher strength materials and an increased awareness of earthquake risk. This paper describes how slender structures could be made more resistant against dynamical forces caused by wind and earthquake. On the structures dampers are mounted which are located parallel to the center line of the structure. The damping system can be implemented in different structure types like high rise buildings and bridges and in several ways along the structure. Experiments were carried out in the laboratory in order to show the efficiency of the new damping system. In order to predict the structural damping ratio of future structures several numerical models were elaborated and the results were compared to the laboratory experiments.

Keywords: structural damping, viscous damper, slender structure, dynamic loads

1. Introduction

Humankind always tended to build higher and more slender structures. Many details have been solved to increase technical progress and adapt the strength of the construction material to new construction methods. Nowadays the precise analysis of the structures is one of the fundamental reasons that such slender construction can be built. Contemporary architecture and modern bridge design show an increased sensitivity for dynamic excitation. Due to these trends the innovative damping system could make a useful contribution to the future design of slender light-weight structures. There are many different types of damping systems for the reduction of the dynamic hazards of earthquakes or strong winds. The damping system depends on the one hand on the choice of the type of the damper e.g. metallic dampers, friction dampers, viscoelastic dampers, viscous fluid-dampers, tuned mass dampers and tuned liquid dampers, and on the other hand the method of implementation. Our objective is to find a system of placing dampers along the whole structure which achieves energy dissipation from the bottom to the top of the structure. The alternative way requires the development of dampers which can easy be build and handled in the civil engineering world, without having the costs of the dampers derived from the mechanical engineering area.

2. System description

The new method protects structures like e.g. high rise buildings, towers, chimneys and bridges from vibrations, due to wind or earthquake loading. The structure supports dead, variable and dynamical

https://doi.org/10.2749/222137810796024916