



Wind Induced Response Analysis and Vibration Mitigation Design for Steel Tall Buildings Equipped with Viscous Dampers

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Abstract

The wind induced response of the steel tall building is obvious. Controlling the wind induced response of steel tall building can effectively improve the comfort, stiffness and strength performance of the structure. A large number of studies have shown that equipping damping device is a more effective wind-induced vibration control measure than increasing the structure stiffness. Viscous dampers can achieve multi-load and multi-performance structure vibration reduction and have a very broad engineering application prospect. In this paper, the wind induced response of steel tall building and the viscous damper system are studied to ascertain the optimal arrangement and quantity of viscous dampers and a 150m steel residential tower is taken as an engineering case, which shows that the integrated viscous dampers can effectively improve the structure performance of steel tall building under wind load and reduce the steel consumption of the structure.

Keywords: viscous damper; steel tall building; wind induced response analysis; high-rise buildings.

1 Introduction

Recently, to respond to "dual carbon" strategy, the Ministry of Housing and Urban-Rural Development has vigorously promoted development of prefabricated buildings. The assembly feature of steel structures ensures their wider application in residential building. Steel structure has light mass and high flexibility. Wind load is often the controlling load case for overall performance of the structure. The viscous damper can improve the comfort, stiffness and strength of the structure under wind load. In addition, it has relatively small volume and low price, and is easy to install and

maintain. It could be better applied in residential projects.

Since 1990, Makris et al. proposed application of viscous dampers in civil engineering structures [1], and domestic and foreign scholars have continued to promote development and application of viscous dampers. In 1999, TAYCO DEV INC applied invention patent of the toggle brace motion amplification device (patent No.: US5870863[2] and US 5934028[3]), which significantly improved the energy consumption efficiency of viscous damper and achieved wider application of viscous damper. Xin Zhao and Haojia Ma studied