



# Application of Damped Outriggers in Renovation of Super Tall Building Structures

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## Abstract

The primary task of super tall buildings renovation is to reduce the engineering amount for existing structures. The additional viscous damping device can effectively increase the structural energy consumption of super tall buildings under earthquakes, thereby reducing the internal force and deformation response of the structure, and achieving the purpose that reduce the amount of renovation works. Assembling the deformation amplification device can effectively improve the energy consumption capacity of the viscous damping device. There are two damping types of deformation amplification for super tall buildings: toggle brace dampers and damped outriggers. Toggle brace dampers is suitable for high-rise building structures with shearing deformation, and damped outriggers is suitable for high-rise building structures with bending deformation. Based on the actual engineering case, this paper studies the viscous damper (damped outriggers) with outrigger deformation amplification device. Firstly, the sensitivity of installing damped outriggers on different equipment floors is analyzed, and the influence of different installation positions on the efficiency of damped outriggers is determined. Secondly, the reasonable number of damped outriggers is studied to effectively reduce the reconstruction work of the existing structure and control the number and parameters of viscous dampers in a reasonable range. Finally, the influence of the damped outrigger on the structural response of the unbuilt part is analyzed, and how to further optimize the structural members of the unbuilt part is studied.

**Keywords:** super tall structure; renovation; damped outriggers; optimal design.

## 1 Introduction

In recent years, more and more super high-rise renovation projects have emerged for various reasons. Due to the new requirements of new owners, the plane, facade and use functions of buildings need to be adjusted. Moreover, due to

the long period from stopping construction to reconstruction, it is common that the specifications and standards adopted in the original design have been invalidated, the latest design codes and standards shall be adopted for review design. Therefore, how to reduce the engineering amount for existing structures has