Lateral stiffness design and optimization for over-track residential towers in metro depots

Fang Xu

Tongji Architectural Design (Group) Co., Ltd., Shanghai, China

Xin Zhao*, Shuang Wu

Tongji Architectural Design (Group) Co., Ltd., Shanghai, China

Contact:22zx@tjad.cn

Abstract

For over-track residential towers in metro depots, distinctive layer heights and structural systems arise due to reasons including architectural function and process. This results in the formation of a stiffness transformation at the base of the structure. In order to meet the stiffness ratio requirements, neglecting the use of optimization design methods may lead to large dimensions of components and high utilization of materials. This paper firstly summarizes the lateral stiffness optimization design methods for over-track residential towers in metro depots. Then a practical engineering case is given to illustrate how to use this method in practical engineering. The case study demonstrates that changing the structural system of the over-track, layer height correction and column bracing can make it easier to meet the stiffness ratio requirements at the base, thus improving architectural function and saving cost.

Keywords: Over-track in metro depots, Residential tower, Lateral stiffness, Optimization, Structural system, Layer height correction, Column haunching

1 Introduction

All With the advancement of urbanization in China, rail transit has gradually become the primary way of urban public transportation. At present, more than 43 cities in China have been approved for rail transit construction planning, with a total mileage of more than 8600 km [1]. Under the background of increasingly developed urban rail transit and increasing land resources occupied by rail transit depots, the rational development of the upper cover project of rail transit depots can make full use of urban land resources, optimize urban space construction, and improve social and economic benefits. For the development and construction of the over-track residential tower projects in metro depots, there is an obvious stiffness mutation at the bottom of the structure due to the architectural functions and processes of the layer under slab, platform layer and slab layer [2]. According to the project experience, the stiffness ratios of the slab layer to the platform layer and the layer under slab to the slab layer are the controlling condition for the stiffness design of the over-track structure. The limit value of the stiffness ratio of the over-track structure of the rail transit is stipulated in the Shanghai code of China. The limit value of the stiffness ratio of the layer under slab

https://doi.org/10.2749/manchester.2024.0435
Distributed by structurae