Key Points of Safety Assessment for the Impact of Foundation Pit Engineering on Adjacent Subway Structures (Postprint)

Authors: Zhang Qian, Hu Jiwei

Date: 2025-07-29T19:11:11+00:00

Abstract

With the continuous advancement of national urbanization, the ongoing improvement of infrastructure construction, and the progressive development of urban underground space, large-scale infrastructures increasingly intersect and influence one another, giving rise to the issue of protecting existing structures from subsequent construction. To ensure the safe and successful implementation of projects, comprehensive safety justification is indispensable. Three-dimensional finite element modeling and analysis, as an advanced technological approach, can provide relatively sufficient data support for decision-makers and has gradually become a necessary prerequisite for the protection of critical infrastructure nodes. Based on a practical engineering case involving safety assessment of the impact of the new construction project on Plot 831 of Yuanchuanghui on adjacent subway structures, this paper establishes a coupled "project foundation pit-stratum-subway structure" model using the MIDAS GTS/NX finite element numerical simulation software. It analyzes the influence of various construction conditions during the foundation pit excavation process on the structure of Metro Line 3, and presents the key points of three-dimensional numerical modeling for safety assessment work. Furthermore, to mitigate the potential impacts of foundation pit engineering on adjacent subway structures, corresponding control measures are proposed, providing valuable reference experience for similar safety assessment endeavors in the future.

Full Text

Discussion on Key Points of Safety Assessment for the Influence of Foundation Pit Engineering on Adjacent Subway Structures

Zhang Qian, Hu Jiwei
Guangzhou Metro Engineering Consulting Co., Ltd., Guangzhou 510000, China

Abstract

As urbanization accelerates and infrastructure development expands in China, underground space utilization has intensified, leading to increasing interactions between large-scale infrastructure projects and creating challenges where later constructions must protect existing structures. To ensure project safety and successful implementation, comprehensive safety assessments are indispensable. Three-dimensional finite element modeling analysis, as an advanced technological approach, provides decision-makers with robust data support and has become essential for protecting critical infrastructure nodes. This paper presents a case study on the safety assessment of impacts from the new construction project at Yuanchuanghui Plot 831 on adjacent subway structures. Using MIDAS GTS/NX finite element numerical simulation software, a coupled "foundation pit-stratum-subway structure" model was established to analyze the effects of various construction conditions on Subway Line 3 structures during foundation pit excavation. The paper introduces key considerations for three-dimensional numerical modeling in safety assessment work and proposes corresponding control measures to mitigate potential impacts of foundation pit engineering on adjacent subway structures, offering valuable reference for future similar safety assessments.

Keywords: foundation pit engineering; subway structure; numerical simulation analysis; MIDAS GTS/NX; subway structure deformation control

Note: Figure translations are in progress. See original paper for figures.