

樁基礎施工及載重 對既有潛盾隧道影響之3D數值模擬

張榮峰 胡逸舟 蘇鼎鈞
亞新工程顧問股份有限公司

陳俊宏
台北市捷運工程局

摘 要

城市軌道(例如捷運)之線形常需佈設於既有之公路系統上，以潛盾、高架或平面形式與其相互重疊，除可解決大都會區用地取得不易之問題外，更可大幅降低因與沿線既有建物近接或衝突所延伸之工程風險。惟當捷運路網逐漸成形，立體交叉或重疊之線形將使捷運及公路之高架基礎與隧道產生近接或共構施工；在如此複雜的土壤與地下結構物互制下，數值模擬逐漸成為大地工程分析與設計上一個重要的工具。本文以台北捷運環狀線一設計案為例，應用Midas/GTS之三維(3D)數值模型探討橋梁基礎施工及載重對鄰近既有潛盾隧道之影響，包括案例中之土壤、樁及隧道互制及一系列施工步驟模擬等，分析所得之隧道變形分布可供後續監測系統佈設及施工管控之參考。

關鍵字：3D數值模擬、台北捷運環狀線、土壤-樁-隧道互制。

3D Numerical Modeling of Pile Construction and Loading Effects on Existing Shield Tunnels

Jung-Feng Chang I-Chou Hu Ting-Chiun Su

Moh and Associates, Inc.

Chun-Hung Chen

Department of Rapid Transit Systems, Taipei City Government

Abstract

City rails (e.g., rapid transit) are always constructed above (via. viaducts) or under (via. tunnels) the existing road systems to reduce conflicts of land use and risks of construction effects on the adjacent buildings. As the network of the rapid transit system becomes well developed, however, the foundation of the viaducts may be constructed on or by the tunnels; such complicated soil-substructure interaction makes numerical simulations an important tool to geotechnical analysis and design. This paper presents a design project for the Circular Line of Taipei Rapid Transit, in which the three-dimensional (3D) model of Midas/GTS is applied to investigate the construction and loading effects of pile foundation on the adjacent shield tunnels, including simulations of soil-pile-tunnel interaction and a series of construction steps. The computed distributions of tunnel deformations can be used as references for monitoring system setup and construction control.

KEY WORDS : 3D numerical modeling, circular line of taipei rapid transit, soil-pile-tunnel interaction.

一、前 言

數值模擬近年來已漸漸應用於大地工程分

析與設計實務當中，此現象除了顯示彈性解析解或經驗公式並非能全然應用於日漸複雜的大地工程問題上，加上套裝軟體之功能及介面日益精進、使用及學習成本大幅降低，使得這些工程問