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淺論中小型基地之連續壁設計

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摘　要

都會區中之地下室開挖大部份採用連續壁為擋土結構。目前不論基地之大小，連續壁之分析設計一般皆考慮為平面應變之狀況。但對中小型基地而言，三向度效應之影響常導致連續壁之實際變位量遠小於考量平面應變所得之設計值，也就是說，連續壁之配筋量常超過實際所需。本文以五個中小型開挖案例為對象，探討如何將三向度效應納入設計考量。基本上乃是延伸扶壁之設計概念，將垂直於基地長向之主體連續壁考量為扶壁，而扶壁之長度則為基地寬度之一半。分析結果並與監測結果比較，顯示本文所建議之方式可合理模擬中小型基地連續壁之開挖行為。

關鍵字：連續壁設計、深開挖、扶壁。

A Note on the Diaphragm Wall Design for Small/Medium Size Excavations

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Abstract

Most urban basement excavations use diaphragm wall as part of the retaining system. When it comes to design, the diaphragm wall is generally considered to behave in a plane strain pattern no matter the size of excavation. However, experience shows that the diaphragm wall displacements of small/medium size construction sites are much smaller than expected, which is probably a result of the 3-D effect. In other words, the amount of rebar used in diaphragm wall is more than required. This paper studies 5 small/medium excavation sites to delineate the 3-D effects on the wall behavior. It is proposed that the side walls perpendicular to the main section be regarded as buttress walls in resisting wall displacement. The equivalent length of buttress wall is half the length of side walls. Using monitoring results as a basis for comparison, it is found that the proposed design approach can reasonably simulate the excavation behavior of small/medium size construction sites.

Key Words： Diaphragm wall design, deep excavation, buttress wall.

一、前　言

一般之連續壁設計採較保守之作法，將分析斷面視為處於平面應變(plane strain)狀態下之結構元件，意即基地之面寬無限長，因此設計斷面之行為不受角隅束制效應(corner effect)之影響。大面積或捷運站體等線型開挖較接近平面應變之狀況，但對一般中小型之建築基地而言，角隅效應或三向度效應(three-dimensional effect)對連續壁造成束制，致使連續壁之實際變位及應力狀態低於平面應變狀態下之設計值。早期對開挖行為不甚了解，採用較保守之平面應變設計本屬自然。但近年來對開挖行為已能大致掌握，又適逢鋼筋及混凝土等原物料價格暴漲，本文擬針對中小型基地之連續壁設計模式再作檢討，希望