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Design Charts for Estimating Response of R.C. Frame Building Adjacent to Deep Excavation Supported by Soil-Nailing Method

Excavation-induced displacements may cause damage to buildings and urban facilities. The displacement of walls is inevitable in soil nailing method to mobilize the tensile force in steel elements. FEM-based numerical analyses in MIDAS GTS NX were used to evaluate the response of a concrete building adjacent to deep excavation. The effect of various parameters of the concrete frame building, including the number of stories, distance to excavation, and the excavation stabilized by soil nailing at different depths was investigated in the building adjacent to the excavation. The design charts represent the foundation settlement, building rotation, excess axial stress in the concrete columns, and the excavation-induced shear strain in masonry infill walls. According to the results, the presence of a building can cause significant changes in the deformation profile of the ground surface. Results showed the adjacent buildings that are located at the excavation edge and a distance equal to the excavation depth experience the maximum displacement. The excess axial stress in the concrete columns of the building adjacent to the excavation was negligible. Furthermore, with increasing foundation depth, settlement and rotation of the building decreases. This study showed that the axial stress of the building column adjacent to the excavation due to excavation is less than 5% of the compressive strength of concrete. Most displacement in buildings adjacent to the pit occurs when the building is on the edge of the excavation. At a distance of 4 times the depth of the excavation from the edge, the settlement is insignificant.

Keywords: R.C. Frame Building, Deep Excavation, Soil-Nailing, Deformation, Midas.

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