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PROCEEDINGS
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A general view on mitigating methods when tunneling in Urban areas

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Due to the rapid growing of economic development and population, transportation space is always in high demand and underground space development becomes a vital trend in urban development. However, tunneling in urban areas with a shallow cover in soft soil conditions can lead to negative impacts on existing buildings. When existing buildings are in/on the influence zones induced by tunneling, they can be damaged in the case of without any mitigating methods applied. By classifying into three categories including methods in tunnel and tunneling design, soil improvement methods with/without changing soil properties, as well as reinforcement solutions for buildings, this paper presents an overview on recent methods for reducing effects of tunneling on existing buildings.

In the first category, solutions in tunnel design such as finding an optimal thickness-to-diameter ratio of tunnel segment and/or adding ballast layer in order to avoid the uplift. Designing of supporting pressures at tunneling face and at the tail has an important role in reducing and controlling surface settlements and volume loss values, also decreasing the scope of influence zone. In design for tunneling process, selections of tunnel boring machine parameters and risks and solutions in construction process are discussed and reviewed.

The other category is methods applied into surrounding medium with/without changing soil properties in order to improve soil conditions and/or compensate settlements on the surface and subsurface. In this paper, this category indicates soil improvement solutions including permeation grouting, jet grouting, soil mixing, ground freezing, compensation grouting, compaction grouting, micropiles and cut-off walls. An assessment of mitigating methods is referred for selecting a suitable method for particular soil conditions.

Reinforcing solutions for existing buildings are summarized in the final category. A brief description on potential reinforcement methods applied into existing structures comprised of installing jacks and adding tie bars and beams is shown in this paper. It is indicated that solutions should be derived from the results of structural analysis for existing buildings under tunneling conditions.

Although the introduction of potential mitigating methods applied in shallow tunneling in soft soils briefly listed in this study, designers and engineers can easily obtain a sufficient solution for tunnel projects based on this overview.

Keywords: *Tunnels, influence zones, mitigating methods.*



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