



# The affect of shield operation parameters and overcut On existing tunnel in multi-level crossing tunnels

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## Abstract

The development of transportation in large cities needs some new tunnels to be designed and constructed nearby existing tunnels. In this study a metro tunnel will be excavated by EBP shield at different level from the sewage tunnel and it's beneath. Both the relative position of tunnels and the excavation procedure of new tunnel effect the soil displacement and existing tunnel lining. Hence, the effects of shield operation parameters (face pressure, grouting pressure), overcut between shield skin and surrounding soil are studied using a 3D finite difference analysis. The results showed that the largest interaction effects occur at the invert of existing tunnel. Analysis result showed the effect on existing support system in longitudinal section of tunnel is larger than cross section. Most effect on support occurs when ground moves into overcut space. However, these affects decrease significantly with increasing the face pressure, grouting pressures and bentonite flow into steering gap between shield skin and surrounding soil.

**Keyword: Tunnel, EBP shield, Operation parameters, Overcut, 3D numerical model.**

## 1. INTRODUCTION

Ground movements are an inevitable consequence of excavating and constructing a tunnel especially in soft ground. It is not possible to create a void immediately and provide an infinitely stiff lining to fill it exactly. In the time taken to excavate, the ground around the tunnel is able to displace inwards as the stress relief is taking place. Thus it will always be necessary to remove a larger volume of ground than the volume of the finished void. This extra volume excavated is termed the 'volume loss'.

In the specific case of mechanized tunneling, the individual factors contributing to volume loss are:

- Face ground loss: It is caused by rotating of cutter head that remove material from tunnel face.
- Radial ground loss around shield: It is caused by moving ground to gap (overcut) between shield and ground and deformation of shield.
- Radial ground loss around lining: It is caused by moving ground to gap between lining and ground and deformation of lining.

Figure 1 shows ground loss around tunnel in mechanized tunneling. Settlements is caused by volume loss are mainly classified in short, medium and long-term settlement. Short-term settlement usually caused by tunnel excavation. Medium and long-term settlements are thought to be the result of creep and consolidation of ground.