

Construction of a shield tunnel under an operating railway track

- Quadruple track construction on the Odakyu Line -

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The current traffic system in this area has been plagued by chronically poor traffic flow. To alleviate traffic congestion at ground-level crossings, this project is aimed at building a new railway traffic configuration. In order to drastically improve transportation services changing the current double tracks to quadruple tracks, we employed continuous grade separation between road and railway.

1. Shield tunneling

The shield machine commenced excavation from the starting shaft and continued boring the tunnel under an existing railway track (under about 10 to 17 meters overburden). When arriving at the U-turn shaft, it made a U turn (see Photo 1) to excavate another tunnel going toward the original starting shaft. Consequently, each of the two tunnels thus provided had 8.1 meters in diameter and 645 meters in length.

These shield tunnels paralleled each other under a densely built-up urban area of housing, and after being completed, were extended laterally to build a station building. Then, the conventional two lines were relocated underground. Then, the upper section of the shield tunnel was excavated and remodeled into a box type tunnel frame with a cut and cover method.

2. Enlargement of the shield tunnel

At the section of the station building, approximately 180 meters of the existing railway track were temporarily underpinned with pile supports; the ground immediately under the station building was excavated and the shield tunnels were enlarged by cutting and then integrated into the RC frame. During the enlargement of the shield tunnels, construction progressed smoothly by providing deformation prevention measures to control resulting stress in segments (Figure 1).



Photo 1 U-turning of shield machine



Photo 2 Enlargement of the space by cutting segments

The connecting points between the RC frame and steel segments were checked through a prior demonstration experiment, for their behavior and integrity to determine the desired structure.

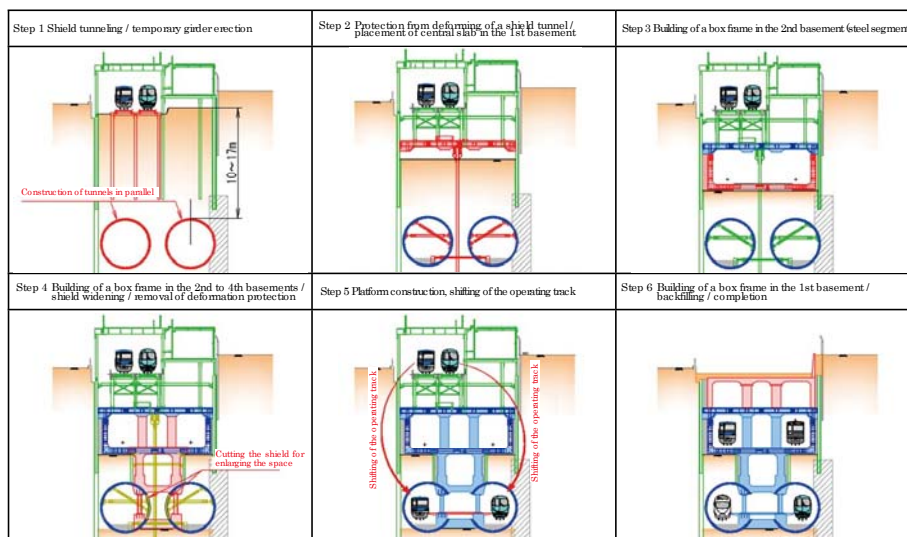


Fig. 1 Construction phase flow diagram