

Construction of Adjacent Tunnels Using the URUP Method

— Tate First Tunnel, Hachioji South Bypass —

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Introduction

The Hachioji South Bypass of National Route 20, currently under construction, is 9.6 km long, and near its center are tunnel structures of about 0.5 km. Initially, cut and cover method was planned for the tunnels, but since the area became increasingly residential with a compact cluster of houses, shield method was adopted to lessen the effects on the surrounding.

Several roads cross over the tunnels which have small overburden. Thus, a safe and reliable construction method was needed to minimize the effects on road surfaces, road attachment (such as retaining walls) and surrounding houses. Also, the distance between the two tunnels to be constructed was small and it was necessary to prevent the construction load of the following tunnel from affecting the lining of the preceding one.

1. URUP Method Adopted

In this construction, "URUP method (Ultra Rapid Under Pass Method)" was applied, in which the shield machine start excavation from the ground level without constructing a vertical shaft. Fig. 1 shows a plane view and longitudinal section view of the area. The shield machine begins excavation from the work yard of the launch side, proceeds on the outbound line, makes a U-turn at the purpose-built vertical shaft and excavates the inbound line next to the outbound one.

At the position immediately after the machine start excavation, there were two roads crossing aboveground, and the minimum overburden is 2.6 m. Since there was no vertical shaft, the machine started excavation with all necessary equipment set behind it on the ground (Fig. 2). Therefore, right after the launch, the machine was able to pass under the crossing roads without any changeover, which is usually needed during the initial excavation by a shield machine. By passing under the roads quickly without stopping for changeover, the effect on the roads was minimized.

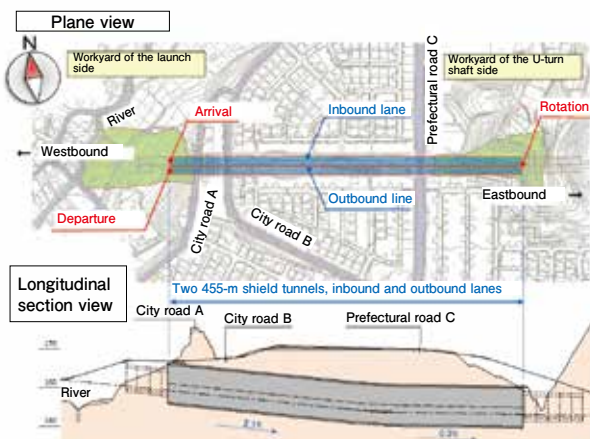


Fig. 1 Plane view, longitudinal section view



Fig. 2 Equipment set and launching at ground level

2. Measures for Adjacent Tunnels

The distance between the two tunnels was as small as 0.9 m, and it was crucial to secure the soundness of the preceding tunnel lining against partial loads such as tunnel face pressure and backfill grouting pressure caused by the adjacent construction of the following tunnel. Thus, the internal support was installed in the preceding tunnel based on the prior analysis (Fig. 3). The support was of the bogie type, and the lining in the affected area was supported by moving the position in accordance with the progress of the following tunnel. As a result of these measures, the excavation of the adjacent tunnels was completed in eleven months without any problems and the tunnels reached aboveground (Fig. 4).



Fig. 3 Bogie-type internal support



Fig. 4 A tunnel reaching aboveground