

Underground connection to the existing tunnel using a slide hood

— Public Sewerage District No. 10 Pipe Construction Work in FY2016 —

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Introduction

The site was located in a flat area where rainwater did not flow easily into rivers, causing frequent flooding. Therefore, a rainwater drainage countermeasure project is underway to create a safer town to live in. As a part of the project, this work involves the construction of a 610-meter-long rainwater augmentation tunnel using the EPB shield method. In this construction, the arrival method using a slide hood was adopted as a safe and reliable method for the lateral underground connection to the existing tunnel in operation.



Fig. 1 Site location

1. Characteristics of this construction

This project involves the underground connection to the side of an existing tunnel (I.D.4.75m), which was constructed in previous years. At the connection, a primary lining with steel segments for opening and a secondary lining with a thickness of 425mm is constructed. The overburden at the connection is about 14m, the water level is about GL-2m, and the soil is diluvial clay with N value of about 10 and diluvial sandy soil with a N value of about 50, with very soft alluvial clay and intervening sand layers directly above.

2. Challenges and solutions

There were no suitable size manholes near the underground connection, which limited the size of materials and equipment that could be brought into the existing tunnel. As a result, it was not possible to install an entrance device or bulkhead to stop the water flow.

In consideration of the balance between safety and cost, TBM equipped with a slide hood was used to make the underground connection (Photo.1). The cutter head is equipped with a telescopic spoke, which can be retracted for the underground connection (Fig.2). The TBM (O.D.3.64m) stopped at a predetermined position about 80 mm before contacting the existing tunnel, and after cutting the primary lining from the existing tunnel side, the built-in slide hood

was pushed out 1.2m in length to connect. As a result, the exposure of the ground around the connection was minimized, and the collapse of the ground and the occurrence of water inflow were prevented (Photo.2). In addition to the jet grouting, chemical grouting was additionally carried out at the connection location prior to the extrusion of the slide hood to protect the connection from water inflow, which was strictly controlled at less than 200 cc/min. With the above measures, the underground connection was completed without any major problems.



Photo 1 EPB TBM

【During Excavation】 【During Connection】

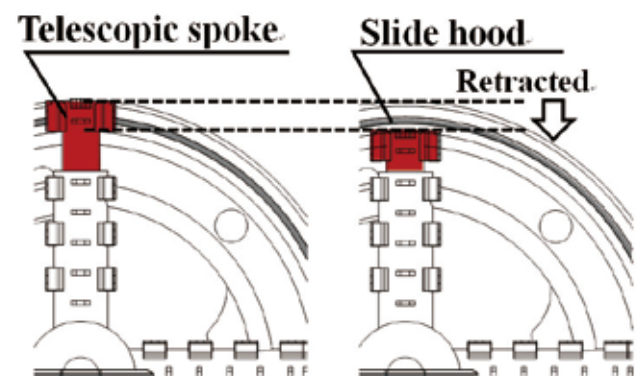


Fig. 2 Telescopic spoke of the cutter



Photo 2 Underground connection complete