

Research on the rational construction of shield tunneling

Period

1997.11 ~ 1999.5.

89P ~ 96P

(Purpose)

The secondary lining of shield tunnel is made to satisfy the function of tunnel by casting concrete to the inner surface of first lining, when the utility function of tunnel is difficult to satisfy only by the first lining (segment). In this study, the ideal way and the function of secondary lining of sewerage pipes were clarified, and the omission of the secondary lining was examined by the application of the combined technique which satisfies the function of secondary lining. It is the policy aiming to rational lining by clarifying the positions of various functions on the secondary lining and the contents etc. which does not construct the secondary lining like the conventional as a finish construction, just positively utilize its functions over the conventional in the case of necessity of secondary lining, and omit it in the case that the secondary lining is unnecessary. As the research result, the shortening of construction period and reduction of total cost can be achieved by making thickness of the tunnel lining thinner and the digging diameter smaller and reduction of the excavated soil quantity, etc, if omit the secondary lining.

(Result)

1. Functions of the secondary lining of the sewerage shield tunnel

" Correction of meander and gradient " and " security of roughness coefficient (the inside smoothen)" were considered as main functions in the recognition with "secondary lining are necessary for sewerage shield tunnel " ,and the functions of "water stop, water proof", "corrosion prevention", "correspondence to special load quantity", etc. are added to as additive value.

2. Meander and gradient correction

As a result of analyzing the meander quantity data from shield construction results (recently 5 years) form the Water Authority of Tokyo metropolitan, it is possible to omit secondary lining for the purpose of meander and gradient correction by improving the construction accuracy.

3. Roughness coefficient adjustment (the inside smoothen)

The judgment of whether to do the secondary lining for the purpose of the security of the roughness coefficient is related to inner shape of segment and application purpose of tunnel. On the inner shape, the new segments which the Volt box and joints metallic material are not utilized in segment are developed. And, the secondary lining omission becomes possible on the concavity of the segment by the hole filling construction. However, it is necessary to choose the method enable adhesive property, durability and workability of the material be excellent on hole filling construction.

4. Water stop and water proof

The water stop is conducted in segment. In the concrete secondary lining of the cast-in-site, the water leakage can not be denied owing to joints and poor Construction. Therefore, though the secondary lining contributes to delay the water leakage, it is hard to say that it becomes the essential protection. Water stop countermeasure assuming the secondary lining omission are security of high quality of the sealant, water proof of bolt hole, joint caulking, etc..

5. Corrosion prevention

By assuming the service area environment in proportion to the intended purpose of pipes, it is necessary to conduct countermeasures of corrosion prevention to segment. As the causes of the pipes corrosion, the abrasion, hydrogen sulfides, neutralization of the concrete, etc. are considered, and the largest cause is the hydrogen sulfide. As a countermeasure of construction in omitting the secondary lining, that increase of the reinforcing steel cover of segment, and corrosion-resistance strengthening of segmental lining and concreting material are mentioned .

6. Correspondence to the internal pressure load

For the inland water pressure, that the first lining is independently burden is made to be the principle.

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Key Words

Secondary lining omission, meander correction, inside smoothness, water proof, corrosion prevention, segment new technology