

Investigation research on the development of filling construction method of sharp curved shield

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(Purpose)

Generally in the sharp curved construction of the shield, supplementary construction method such as chemical feed method are required from ground or cabin in order to prevent the looseness in the outbreak division where the curve inside is excavated as overbreak by copy cutter.

However, the construction becomes difficult for the supplementary construction method, which is accompanied by the road work in recent years, because it not is able to obtaining the understanding of the nearby inhabitants for traffic obstacle by working zone and noise by night work and so on. In the meantime, when the injection is carried out from the shield, the excavation must be stopped, so that the problem of extension of construction period and increase of construction cost occurs.

Especially, in the sewerage shield, there are much sharp curved constructions under the cramped intersection in urban district, and the increase of such situation is worried about with the centering on reconstruction construction in the future.

This method is a result of developing for solving such problems. By using the method, the stability of the ground can be ensure by injecting plastic filler into overbreak from the shield which was a gap before inject. And, the thrust of the shield is surely transmitted by using the segment with the bag, and the linear accuracy can be raised. In addition, the filler is finally replaced with the back-filling material, is discharged from segment injected hole to the tunnel.

In this study the basic study for practical application of this method was carried out, and by arranging result of the demonstration construction, the technical manual was made.

(Result)

1. Application range of this method.

The application range of this method was examined from the viewpoint of curve radius, ground condition

2. Examination of filler

(1) The necessary function for filler was arranged, and test items and test method of filler were examined.

The necessary Functions for filler are as follows.

The looseness of ground in the overbreak can be prevented.

The falling of the gravel can be prevented.

It is not trouble with the promotion of shield.

The replaceability with the back-filling material is good.

(2) The filler was selected from the combination between clay mineral additive and improved viscosity material widely used as add-in material of the earth pressure shield in general, and the appropriate mixture was set from test results.

(3) The filler had the moderate viscosity, and taking such condition as a standard that the falling of gravel could be prevented, the control standard value for each characteristic was set.

3. Demonstration construction

At present, following items were examined from results of 3 constructions applied this method.

(1) Injection efficiency and substitution rate of filler.

The results investigation was carried out on injection ratio of filler and substitution rate between filler and back-filling material to overbreak and tail void.

(2) Confirmation of the effect of this method

The following were investigated: Performance type, ground movement, driving quantity per day for the sharp curved line. And, the cost comparison with the chemical injection method was carried out. By the results of 3 constructions, the effects of this method were confirmed in installation method, safety, economical efficiency.

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Key Words

Supplementary construction method, filler, segment with bag