

Cooperative research on the eccentric and multiaxial shield tunneling

Period

1997.1 ~ 1998.3

71P ~ 76P

(Purpose)

Recently, with the high density of city, the underground installations congest, and the neighboring construction on the established structure is often observed, the necessity of the technology which constructs the tunnel safely seems to be going to heighten without being affected by above in future. Especially, since the sewer tunnel was restrained in depth and linear in order to ensure the fixed pipe gradient, to minimize the effect of the neighboring construction on the established structure, the shield tunneling which can construct the tunnel has been required, while the underground structures are removed in respond with necessity. The eccentric and multiaxial shield was developed in order to respond to such society needs. In this report the preparation of the technical manual of eccentric and multiaxial shield (DPLEX) method of circular cross section, demonstration construction by this method was coordinated, the confirmation of the driving performance of eccentric and multiaxial shield tunneling of circular cross section and application of cabin injection, steel sheet pile removal, etc. in the cabin were examined.

Still, in this organization, for the shield tunneling which is possible for the excavation of the rectangle cross section, the shield tunneling design manual [rectangular cross section edition] for arbitrary cross section was made in September, 1996, the name of method has been changed for the multiaxial and eccentric shield from present manual in order to clarify the features of eccentric and multiaxially supported of cutter.

(Result)

As a result of the demonstration construction, the following matters were confirmed.

1) Confirmation of the stability of tunnel face

The management of Mud pressure in chamber and the earth removal quantity were possible as same as the conventional mud pressure shield. The better result of ground movements was also obtained with the minimum settlement than the conventional shield, by the simultaneous grouting with the management of the mud pressure.

2) Confirmation of the driving performance of the shield

For the driving performances of the shield, the jack thrust and advance rate were proven to have the same performance as the conventional mud pressure shield. And, it was confirmed that can advance at considerably small value of the cutter - torque in comparison with the conventional mud pressure shield.

3) Confirmation of attitude control and directional control of the shield

It was confirmed that attitude control and directional control of the shield including curve construction could be carried out as well as the conventional shield.

4) Confirmation of the grouting mechanism

The grouting quantities was 1000L ~ 1400L (average 230L), 140% -200% (average 170%) in term of tail voidance (0.7m³), and it was equivalent to results of construction for soft ground until now.

5) Confirmation of cutting performance for the concrete wall of shaft

Also, as a result of advancing at the speed in which the cutter did not stop, the jack thrust was under thrust allowance, as well as the value of the cutter torque was under largest equipment torque (27.2tfm). And, the wear coefficient expressing the wear amount of cutter bit per1 km distance was 0.02 ~ 0.08mm/kM when wear amount of bit was 0.16 -0.55m.

6) Confirmation of the workability on the steel sheet pile removal from the cabin

Since the working space in the shield was able to be ensured, it was possible to easily to carry out soil improvement with the rod of 1m . By establishing two manholes, the workers' safety, the transporting material and installation of air pipe for the ventilation were possible, and the steel sheet piles could be safely removed in the machine outside.

From demonstration construction result of the eccentric and multiaxial shield of the circular cross

section, it was confirmed that this method was effective shield tunneling for the processing conditions in which underground obstructions are abounding in the reconstruction works of the sewerage in urban area. Eccentric and multiaxial shield tunneling "design manual" [the circular cross section edition] will be issued on the basis of the data got from this demonstration.

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Key Words | eccentricity multiaxial shield, workability in the cabin