

Rotating Shield Method

Multi-directional tunneling method greatly increases construction efficiency

Horun (excavation) method

Characteristics

1. Compact vertical shaft
2. Acceleration of vertical shaft driving
3. Greater economy at greater depths
4. Great safety at great depths

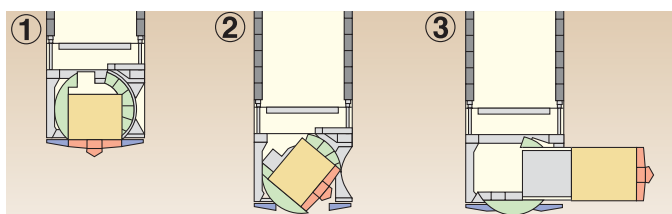
Mechanism of tunnel driving

Continuous vertical-to-horizontal shield machine
(vertical-to-horizontal shield machine)

Excavation is carried out by a single shield machine continuously from the ground surface first in the vertical shaft then in the adit. This method performs the functions of caissons or diaphragm walls required by conventional methods for driving a vertical shaft, so it contributes to easier construction, shorter construction period and reduced cost.

Perpendicular shield machine
(horizontal-to-horizontal shield machine)

A single shield machine continuously excavates a tunnel, curving horizontally at a right angle. The machine is highly effective in underground spaces below congested intersections or occupied by buried structures where no vertical shaft can be driven for turning the shield machine.



- ① Excavation by the vertical shield machine
- ② Spherical rotation
- ③ Excavation by the horizontal shield machine

Applications to actual tunneling



▲ Construction of the Bandai ~ Hannan trunk sewer
(Vertical-to-horizontal shield machine)
Shield diameters
Vertical diameter : 5.90 m
Horizontal diameter: 4.20 m
Type: Slurry shield (Vertical)
Earth pressure balanced shield (Horizontal)



▲ Construction of the Shimoji sewer
(Horizontal-to-horizontal shield machine)
Shield diameters
Main shield diameter: 3.93 m
Sub-shield diameter : 2.68 m
Type: Slurry shield

Kurun (rotation) method

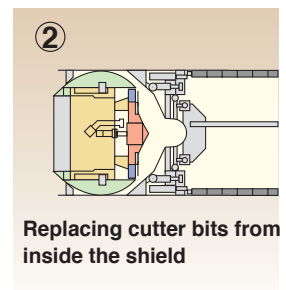
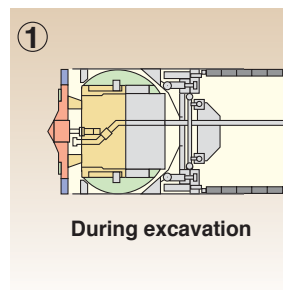
Characteristics

1. Cutter bits can be replaced any number of times at any time.
2. The number of days required for construction can be reduced substantially.
3. Great safety and reliability can be obtained.
4. Extraordinarily great economic benefits are produced.

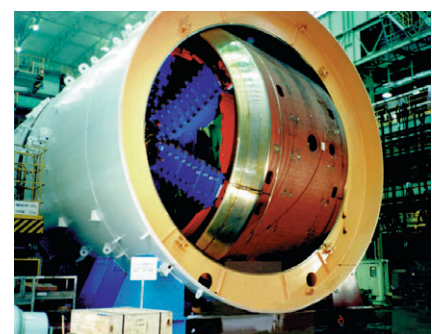
Mechanism of tunnel driving

Long-distance shield machine

The machine is effective in excavating long distances continuously. Cutter bits can be replaced simply by rotating the cutter head. The method has eliminated ground improvement and other measures required by conventional methods and ensures great construction efficiency and safety.



Applications to actual tunneling



▲ Construction of the Nippa Suehiro main sewer
(Long-distance shield machine)
Shield diameter: 9.45 m
Type: Slurry shield
Length: 4435 m