

DPLEX Shield Method

Appropriate for long-distance excavation of tunnels of large cross section

Characteristics

1. Excavation of tunnels of arbitrary cross section

Selecting the cutter shape similar to excavation face enables the excavation of tunnels of any cross section.

2. Appropriate for excavating tunnels of large cross section

A cutter with short turning radius requires low torque at the cutterhead. Multiple drive motors can be integrated into a compact unit. Thus, the shield tunneling machine can be assembled, dismantled and transported easily. The effect is greater for larger shield machines.

3. Long-distance excavation

A cutter with short turning radius means short bit sliding distance and reduces bit wear. Thus, tunnels can be excavated the length about three times that by conventional machines.

4. Additive injection from within the shield machine for full-face stabilization

The cutterhead drive motor is small enough to enable full-face soil stabilization from within the shield machine. Soil in curved sections or in the vicinity of the tunnel can be stabilized from within the machine.

Mechanism of tunnel driving

1. Principle of excavation

Supporting the cutter frame eccentrically at the ends of multiple crank shafts, and rotating the shafts in the same direction cause the cutter to move in a circle along the inside perimeter of tunnel cross section and create a cross section with a shape similar to the cutter.

2. Face stability

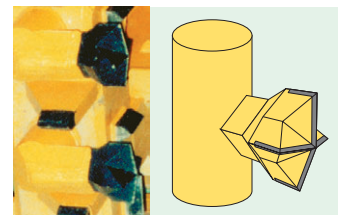
For stability the face, the EPB(earth pressure balanced) method is basically employed that produced good results, for round shield machines and is highly reliable.

3. Excavation control

During excavation, the rate of shield advance and rotational speed of the screw conveyor are adjusted to match muddy soil pressure to the combined total of earth and water pressures.

4. Cross-roof bit

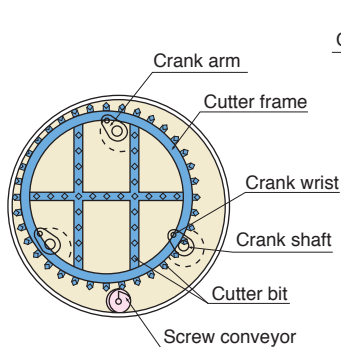
The cross-roof bit unique to this method enables cutting in all directions with the rake and relief angles being equal to each other.



Cross-roof bit ▲

Principle of excavation

Circular cross section



Rectangular cross section

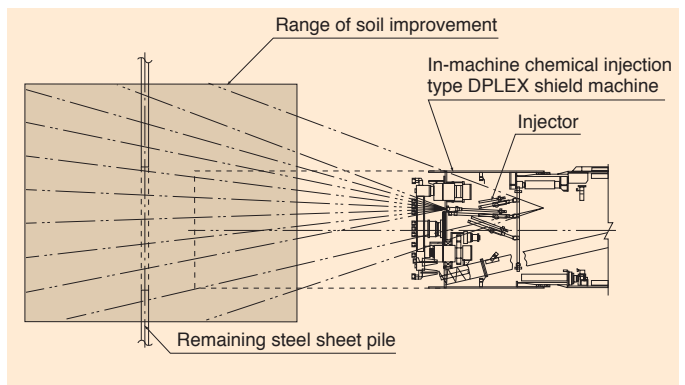
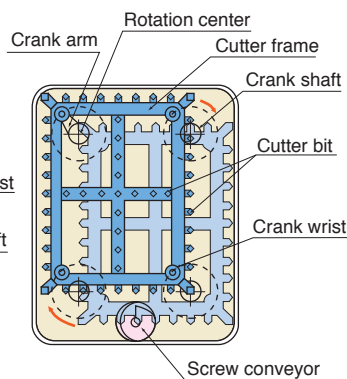
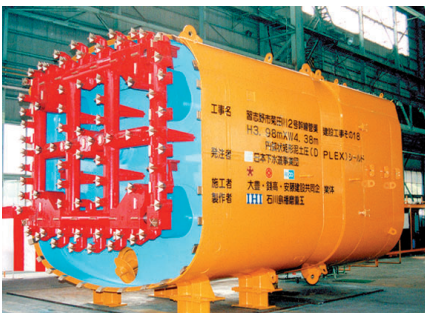


Diagram of soil improvement (chemical injection from within a shield machine) ▲

Applications to actual tunneling



▲ Phase-18 construction of Kikutagawa main sewer No. 2 in Narashino City (Cross section: 4.38 m wide and 3.98 m high)



▲ Re-construction at Minamisuna 1 chome and Kitasuna 1 chome in Tokyo (Diameter: 3.48 m)



▲ Construction in the Honjo work section of Teito Rapid Transit Authority subway line No.11 in Tokyo (Diameter: 9.6 m)