# DOT Tunneling Method

## Contributing to effective use of a wide range of underground spaces

## Characteristics

### 1. Occupation of small space

The method provides a more economical shape with smaller unnecessary space in the flat cross section in railway and highway tunnels than circular shield tunneling methods.

### 2. Construction of tunnels of vertical and horizontal Double circular cross sections

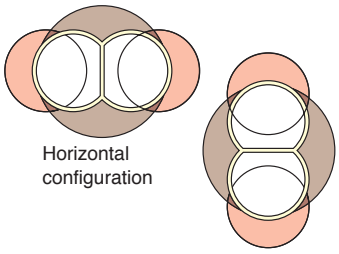
Flexible design is possible according to the surrounding environment and other conditions because combinations of tunnels can be constructed of horizontal and vertical Double circular cross sections.

### 3. Positioning of cutters in the same plane

Cutters of different shield machines in the same plane make cutting torques to balance and facilitate the control of driving of the shield machines.

### 4. Reduction of total cost

Selecting an economical cross section enables the reduction of space occupied by shield machine and of construction depth, which leads to reduction of total cost.




## Mechanism of tunnel driving

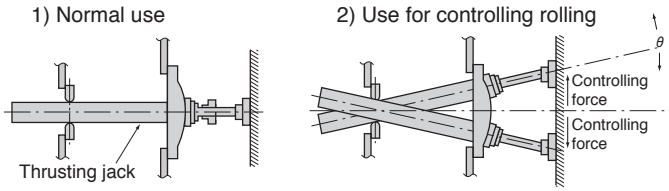
The Dot Tunneling Method is applied for an earth pressure shield machine with interlocking spoke-equipped multiple cutters that are positioned in the same plane to construct tunnels of double or triple cross sections.

### 1. Synchronous control of cutters

Adjacent cutters rotate in the opposite directions to avoid touching or smashing one another and are thus controlled synchronously.

### 2. Rolling control

Rolling of the shield machine is controlled by component force of thrusting jack by shifting along the circumference of the machine, and rolling control jacks placed on the longer sides of the machine.



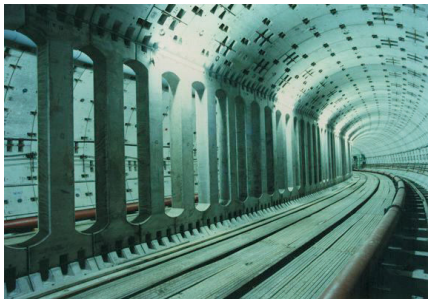

### 3. Erector

The DOT shield machine is equipped with cantilever-arm-type erector to erect joint and panel segments, so it provides wide working space.

## Applications to actual tunneling

Cross section: 10.69 m wide and 6.09 m high
Length: 850 m
Overburden: 8.3 to 5.0 m
Soil type: Silty sand, silt and clay

▲DOT shield tunneling in the Rijo section of the Hiroshima Astram line (new transportation system)



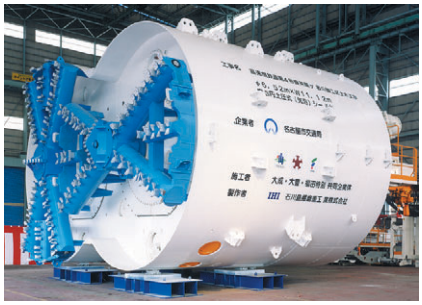
▲Construction of a curved section of the Hiroshima Astram line (new transportation system) (radius: 135 m)

Cross section: 7.65 m wide and 4.45 m high
Length: Upstream: 117 m
Downstream: 586 m
Total: 703 m
Overburden: 9.9 to 2.15 m
Soil type: Fine sand, cohesive soil and humus

▲ Phase-3 construction of Kikuta-gawa main sewer No. 2 in Narashino City

Cross section: 15.86 m wide and 9.36 m high
Length: 249 m
Overburden: 13.5 to 17.5 m
Soil type: Diluvial cohesive soil and gravel in buried terrace

▲Construction of a utility conduit in the Ariake-kita district in the Tokyo metropolitan area



Cross section: 11.12 m wide and 6.52 m high
Length: 1,007 m
Overburden: 11.5 to 32.1 m
Soil type: Sand and cohesive soil

▲Construction of the Chayagasaka section of Nagoya municipal subway line No. 4