

# ***MITSUI*** ***Enlargement Shield*** ***Tunnelling Method***



***Mitsui***  
CONSTRUCTION

# ENLARGEMENT SHIELD TUNNELLING METHOD

The Enlargement Shield Tunnelling Method is a safe way of cutting a primary shield tunnel wider from inside the existing tunnel by using an enlargement shield machine.

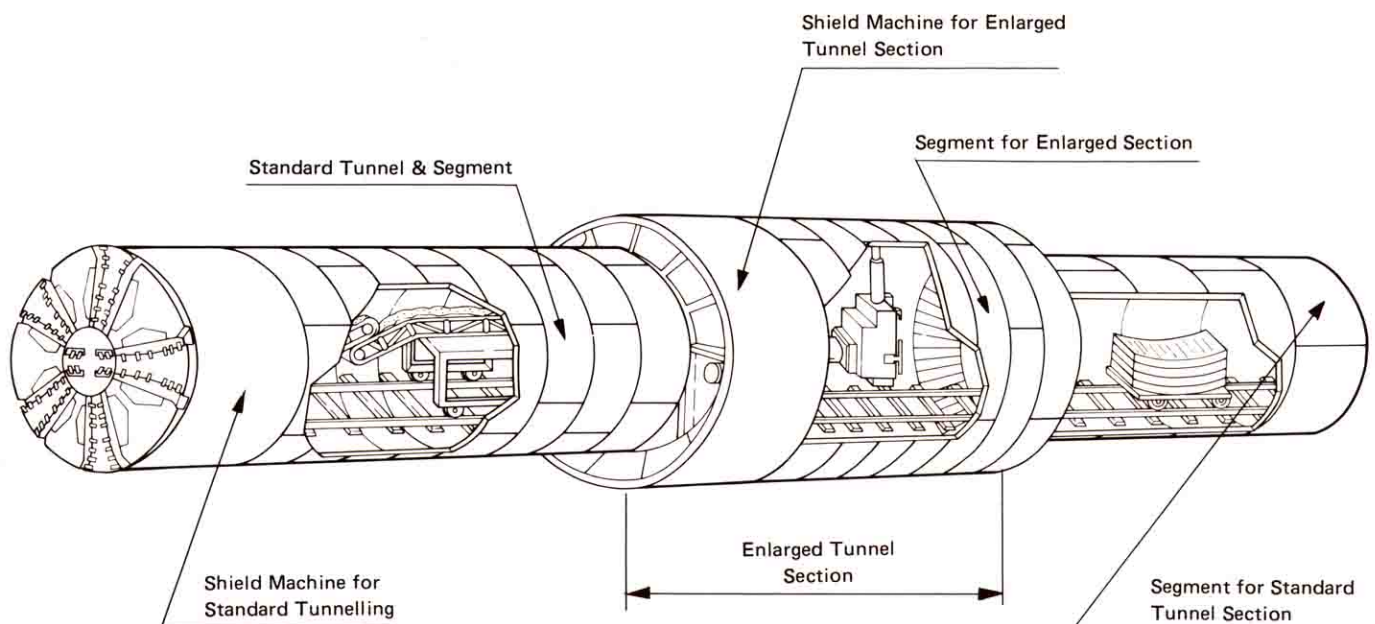
The cross-section of the enlargement shield machine may be any shape apart from circular. The enlargement width may be such that the primary tunnel is enlarged evenly all around its circumference or that it is widened only on one side.

The technique used for digging by the enlargement shield

machine is selected depending on the nature of the soil. Methods of driving the enlargement shield machine include the shield technique, hauling method, and the push-home method. The most suitable technique is selected depending on the jobsite conditions.

The enlargement shield machine, bigger than the standard shield tunnel is constructed on the site which has been cut wider with a circumferential shield machine by breaking it down and transferring it into the shaft.

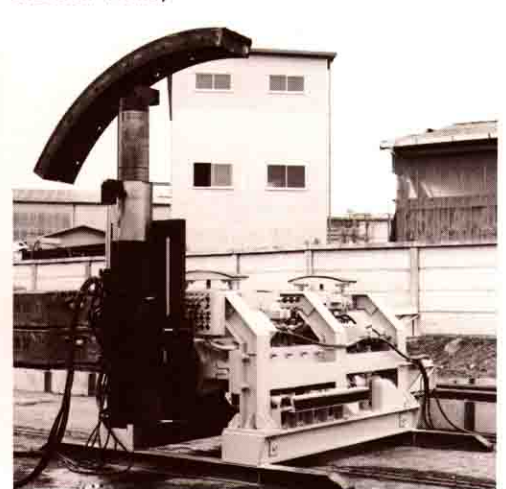
## Illustration of Enlargement Shield Tunnelling Method



Enlargement Shield Tunnelling Machine



Erection Trolley



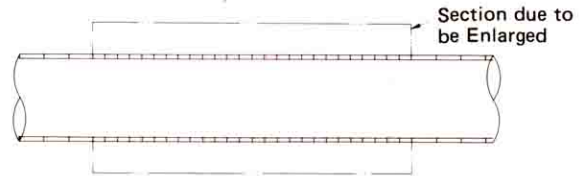


# ENLARGEMENT SHIELD TUNNELLING PROCEDURE

- **Completion of standard shield tunnel**

**Fig. 1**

During the construction of the standard shield tunnel, the guide ring for the circumferential shield machine driving and the narrow-width segment due for enlargement are assembled.

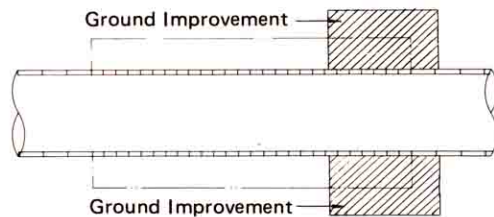


**Fig. 1**

- **Ground improvement for the circumferential shield machine driving**

**Fig. 2**

Site improvement of the section in which the enlargement shield machine is constructed and which becomes the starting point for during the shield is accomplished by a suitable ground improvement operation.

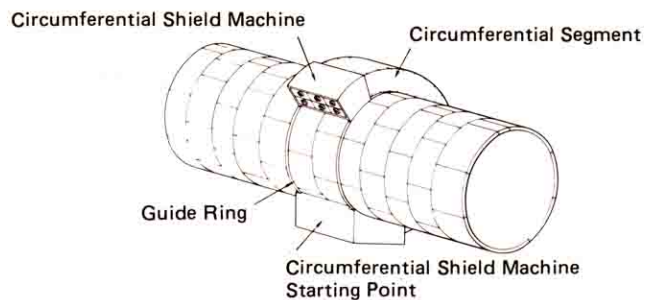


**Fig. 2**

- **Circumferential shield machine driving**

**Fig. 3**

The circumferential shield machine is mounted on the guide ring, and drives along in the circumferential direction. The excavated portion is lined with the circumferential segment as the machine drives.

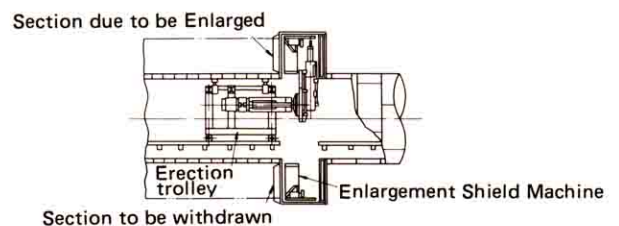


**Fig. 3**

- **Enlargement shield machine construction**

**Fig. 4**

The enlargement shield machine is constructed by dividing it and conveying it to the site cut wider with the circumferential shield machine.

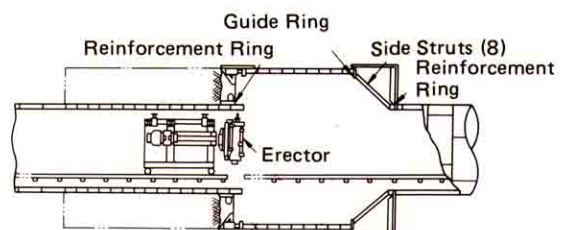


**Fig. 4**

- **Driving the enlargement shield machine**

**Fig. 5**

Reaction against driving is provided by the primary segment the enlarged tunnel is driven along the tunnel direction with the guide of the standard segment circumference. Thus the required enlarged section is completed by the enlargement shield tunnelling machine.

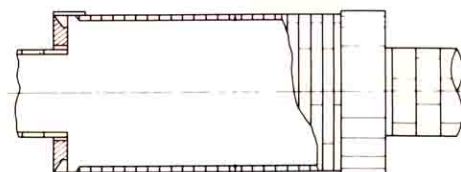


**Fig. 5**

- **Completion of shield driving operation**

**Fig. 6**

The driving operation is completed by demolishing the enlargement shield machine leaving a skinplate behind.



**Fig. 6**

# TECHNOLOGY AND EXPERIENCE COME TOGETHER IN MEETING PRESENT-DAY REQUIREMENTS

## Special Features of the Enlargement Shield Tunnelling Method

- There is no need to dig a shaft whenever an enlarged tunnel space is constructed, so that efficiency has been raised substantially at significantly lower construction costs.
- Construction work can be carried out underground along roads with a high traffic density and in busy urban areas without affecting life above ground. Another advantage is that the effect on the groundwater and on land sub-

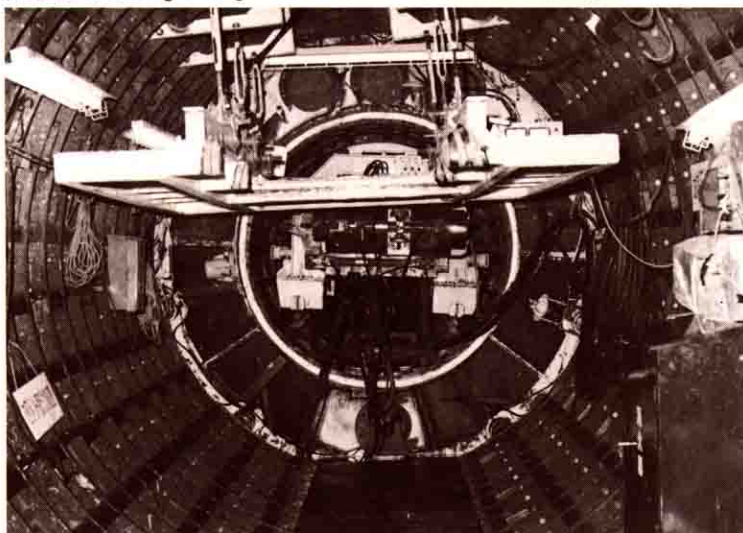
sidence has been significantly reduced.

- The primary shield tunnelling and the enlargement shield tunnelling can be executed in parallel for optimum efficiency.
- The standard segment of the enlargement space can be re-utilized.
- The enlargement shield machine and other equipment can be re-utilized for construction work on other enlargement sections.

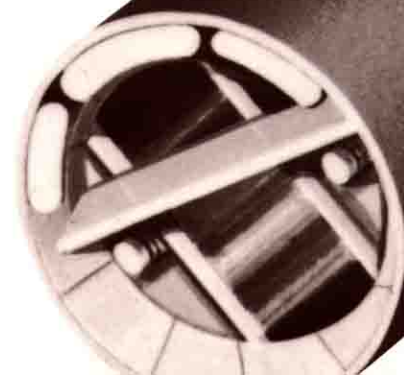
## Conceivable Applications

T U N N E L L I N G	Nature of jobside	Application
	Electric cable conduit tunnel	Underground cable connections Conduit branch points
	Water supply and sewage pipes	Conduit branch points Conduit junctions Intermediate inlet General pipeline enlargement Under-river pipeline inspection shaft
	Railway line	Emergency stop zone Ventilation, water discharge plant base Subway stations Subway curves
	Other jobs	Installation base for mine face equipment Underground shield machine start base Alteration of the tunnel machine cross-section section to meet tunnel use
	Jobs other than tunnelling	Enlargement of deep-sunk mine shafts
	Fire prevention measures	Emergency water storage tank

Picture showing enlargement construction work in progress



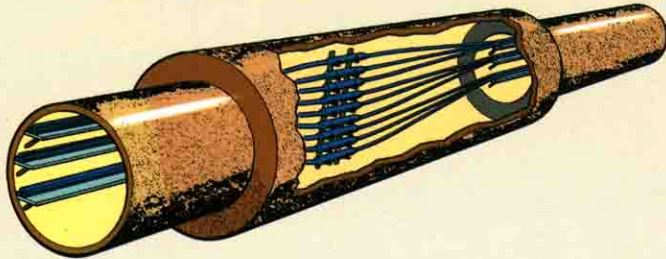
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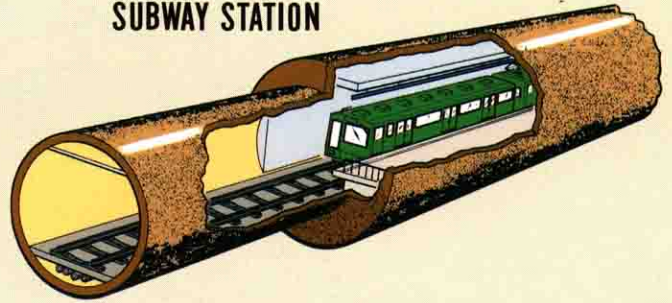


# THE APPLICATION OF THE ENLARGEMENT SHIELD TUNNELING METHOD

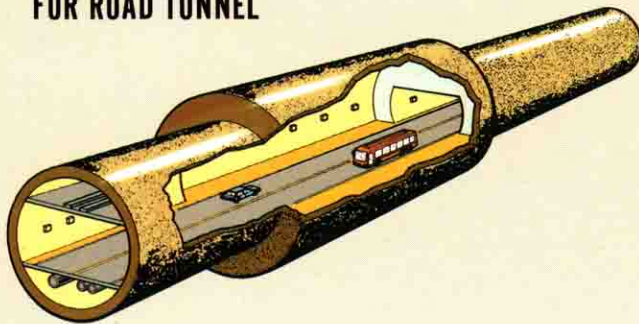
THE CABLE JOINT SECTION  
IN THE POWER CABLE TUNNEL



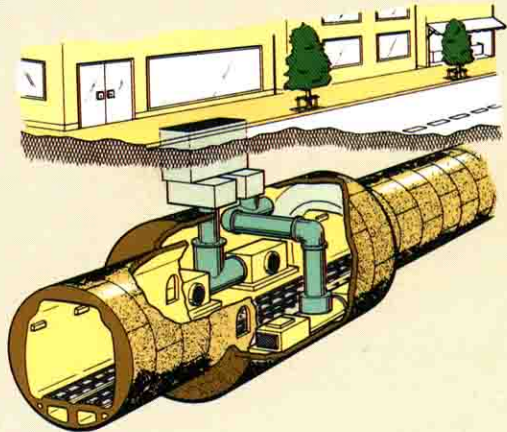
SUBWAY STATION



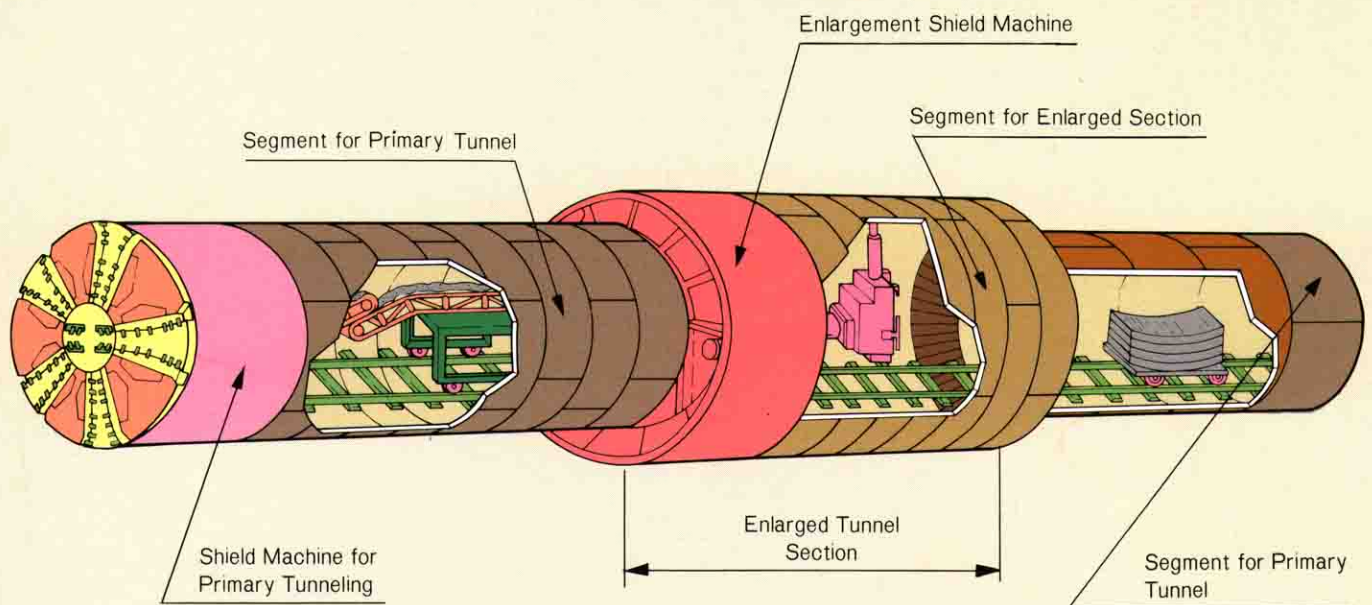
EMERGENCY PARKING LANE  
FOR ROAD TUNNEL



DRAINAGE & AIRATION MACHINE ROOM  
FOR ROAD & RAILWAY TUNNEL



# THE ILLUSTRATION OF THE ENLARGEMENT SHIELD TUNNELING METHOD



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