

# Tunnelling

## JUBILEE LINE EXTENSION LONDON, ENGLAND



### Southwark station and tunnels between Waterloo and London Bridge

**A** new underground station has been built at Southwark in South London. It is connected by an escalator link with the main British Rail station at Waterloo as part of the new Jubilee Line extension, connecting Stratford in the East, including the Canary Wharf development, to the centre of London.

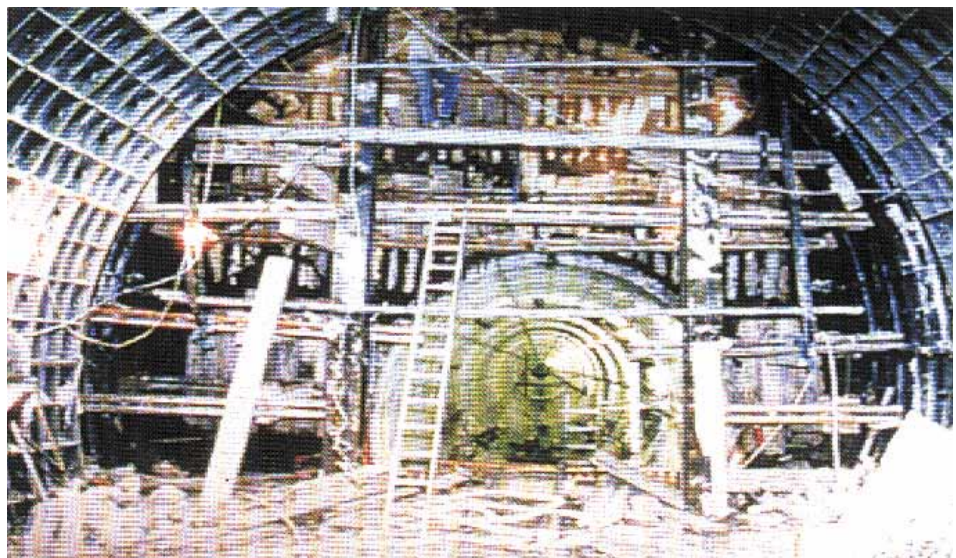
Contract 103 involved the construction of this new underground station and link, together with associated structure and the construction of 2.4km of running tunnel at a depth of 25m below ground level. Bachy Soletanche formed a joint venture with Aoki to act as the main contractors on this section of the new Jubilee Line.

#### Box construction

The new ticket hall and its basement were built in an open cut box excavation supported by secant piles and the intermediate concourse as a cut and cover structure within 1m x 25m deep diaphragm walls. These walls formed the finish to a 50m long link to Waterloo Station.



*Waterloo Link during construction*



*Interior view of tunnel during construction*

CLIENT:	LONDON UNDERGROUND LTD
MAIN CONTRACTOR:	AOKI SOLETANCHE
DURATION OF WORKS:	FEBRUARY 1994 - OCTOBER 1999

#### WORKS QUANTITIES:

Tunnels: 2.4km long running tunnels at depth of 25m





Completion work being carried out on station tunnel concourse

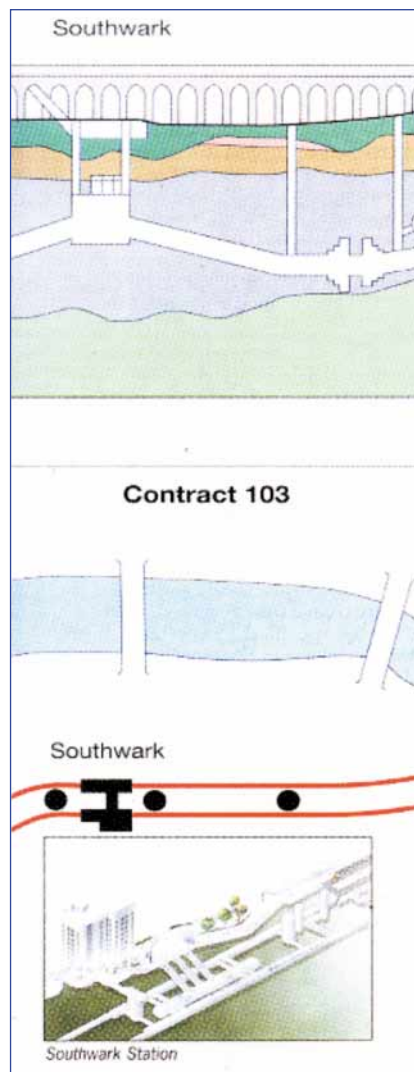
### Tunnel and shaft construction

The main 4.45 m i.d. tunnels were constructed in London Clay using a roadheader cutting boom mounted in a Dosco shield running 25m beneath 100 year old brick railway viaducts. The tunnels were opened up to 7m i.d. over a 140m length to form the main platform tunnels and a 74m long x 9.2m diameter SGI lined tunnel formed an intermediate concourse. Inclined tunnels, shafts and adits formed the escalator accesses and the emergency and the ventilation accesses to the platform and tunnels.

### Compensation grouting and settlement Control

A 1.5m thick grouted slab was formed by compensation grouting to control ground settlement .

Injection was carried out through tube a manchette installed from the



< Contract 103 - Jubilee Line Extension

surface and horizontally from temporary shafts. A total of 2000m<sup>3</sup> grout was injected to control the settlement within 25mm. Sophisticated measuring instruments with associated software were developed to monitor settlement.

In addition, soil nailing was installed above the lower concourse to provide a canopy of reinforced ground over the crown to reduce ground movement and to remove the risk of an inrush from the overlying Thames ground.

### Civil, building, mechanical and electrical works

The Joint Venture acted as management contractor for the completion of the above ground civil, building and architectural finishing works and as the Principal Contractor for the total works at the installation and commissioning stages.

