

# Construction of the Bosphorus Strait Tunnel

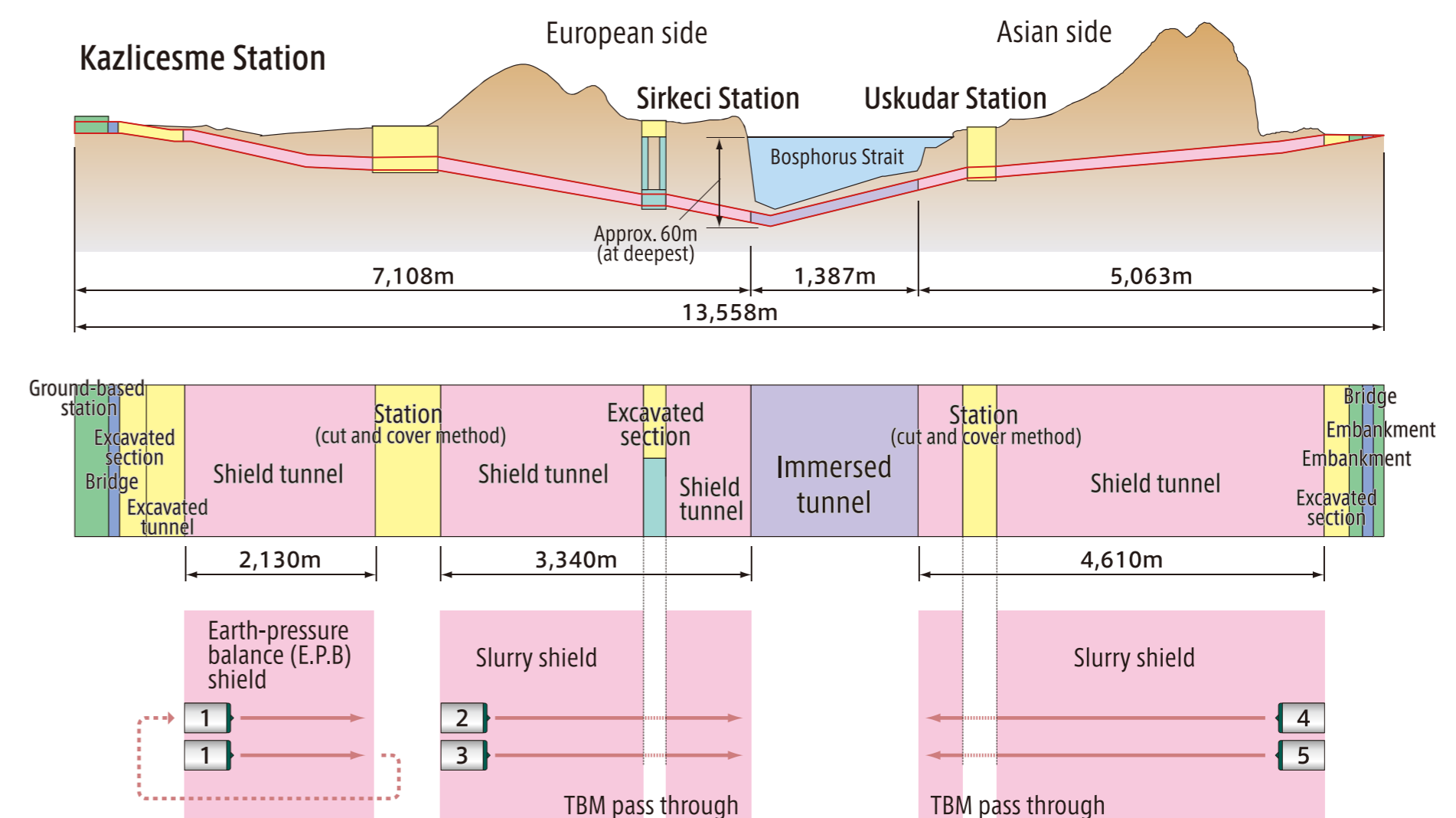
## 보스포루스 해협 횡단 터널공사

### Shield tunnel, NATM, etc.

#### Construction of the landside section using five shield machines (TBM) and NATM



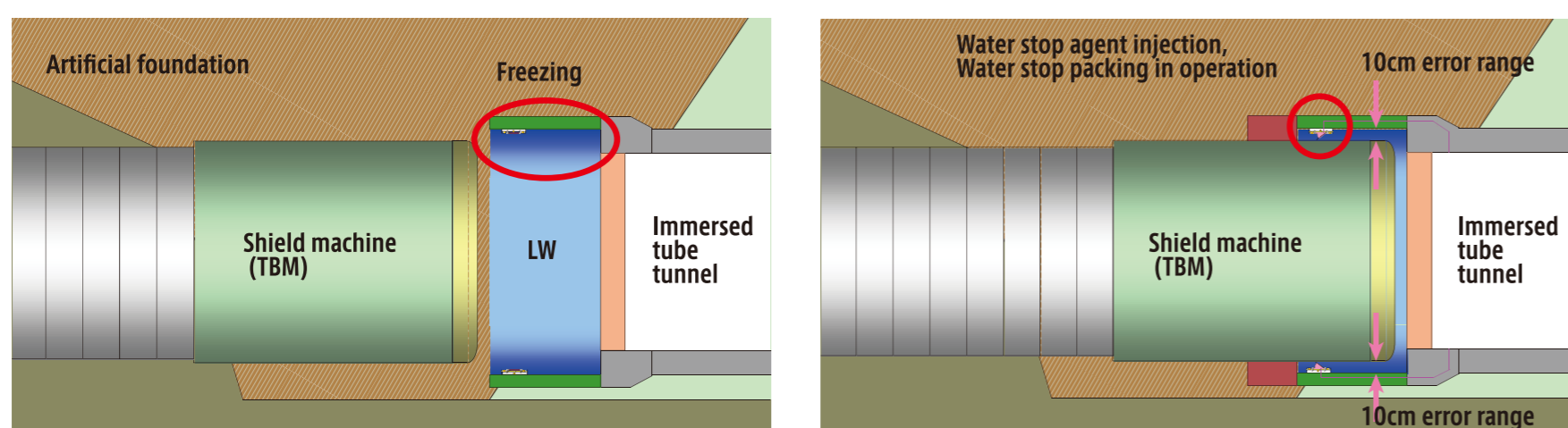
Preparations for the simultaneous start of TBM No. 4 and 5 followed by back-up cars



### The world's first direct connection of an immersed tube tunnel and shield tunnels

#### Connection with clearance of less than 10cm

- World's first direct connection of heterogeneous tunnels (an immersed tube tunnel and shield tunnels)
- Acceptable error range of less than 10cm at the joint
- Special water stop construction method was used around the joint
- Interior concreting realized a single unified tunnel



The immersed tube tunnel end is backfilled with artificial foundation to be excavated by TBMs.

Implementation of special water stop measures after the TBMs reached into the sleeves of the immersed tube tunnel



Prefabrication of the immersed tube tunnel with sleeves reached by TBMs

An error range of less than 10cm was realized here.



The moment of penetration The TBM seen from the inside of the immersed tube tunnel.



Shield machine (TBM)



Reaching the pass-through section (Asian side)

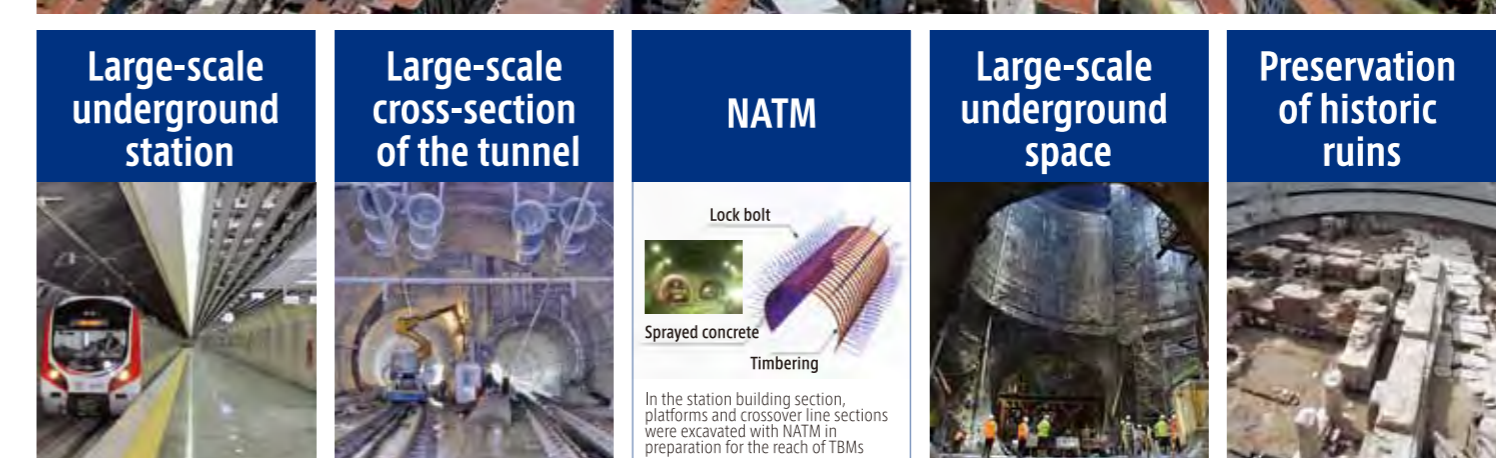


Transfer of the TBM at the pass-through section

### Construction of the station buildings, etc.

#### Construction of the tunnel under buildings in the city center

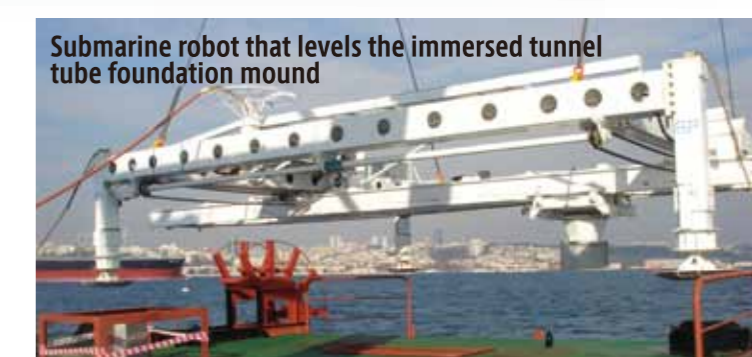
The Sirkeci Station on the European side was built beneath a densely built-up residential area in the old town. To minimize effects on existing buildings, NATM was adopted to build the station using two vertical shafts.



### Other technologies



To reduce construction time, a prefabricated temporary "access shaft" was installed in the first immersed tunnel tube on the Asian side instead of in-situ construction of vertical shafts on both shores.



A specially developed robot was used to level the crushed gravel of immersed tunnel tube foundation mound.



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