

Crossrail Tunnel Boring Machines



A total of eight custom-made 980 tonne tunnel boring machines (TBMs) will be manufactured for Crossrail. The first two machines will be launched from Royal Oak Portal and embark on their 6.4 km journey under Paddington, Bond Street and Tottenham Court Road before terminating at Farringdon.

The giant machines will carefully weave through the capital's congested sub-terrain, snaking between the existing Tube network, sewers, utilities, and London's hidden rivers at depths of up to 40 metres. A total of 21 km of twin-bore tunnel will be constructed. Tunnelling for Crossrail will complete in late 2014.

The eight TBMs will undertake a total of ten individual tunnel drives:

- Royal Oak to Farringdon travelling 6.4 km - using two EPB TBMs
- Limmo to Farringdon travelling 8.3 km - using two EPB TBMs
- Pudding Mill Lane to Stepney Green travelling 2.7 km - using two EPB TBMs
- Plumstead to North Woolwich travelling 2.6 km - using two Slurry TBMs
- Limmo Peninsula in the Royal Docks to Victoria Dock Portal travelling 0.9 km - will re-use a TBM from the Pudding Mill Lane to Stepney Green Drive

Key technical aspects of the tunnels and TBMs:

- Type of TBMs - six Earth Pressure Balance Machines (EPB) and two Slurry Machines to cater for differing ground conditions
- Slurry machines differ from EPB machines in three major ways: they have a sealed, pressurised, air-locked chamber behind the cutter head; they have inlet pipes; and use an outlet pipe rather than a conveyor system to remove the earth
- Diameter of Crossrail tunnels - 6.2 m
- Cutter head diameter - 7.1 m
- Typical progress rate of 100 m a week
- Total length of each TBM - 148 m
- Total weight - 980 tonnes
- Cutter head rotation speed - up to 3.19 rotations per minute
- Nominal thrust force - approximately 58,000 kN the equivalent force needed to lift 2,900 London taxis
- On board welfare facilities include toilets and a kitchen
- Surface control room will monitor progress in real-time and use GPS
- Ten hydraulic steering rams near the front of the machine steer the TBM within millimetre precision of its designated alignment
- A tunnel gang of 20 people will work with each TBM
- Once fully up and running they will operate nearly 24 hours a day seven days a week
- 250,000 concrete segments will be used to line the 21 km of twin-bore tunnels
- Concrete segments 1.6 m in width will be used to create the permanent tunnel walls. To allow for the tunnel to curve, segments differ in shape