

## Re: Six lane underground rail lines

**Source:** <http://sci.tech-archive.net/Archive/sci.physics/2005-01/1091.html>

---

**From:** Androcles (*dummy\_at\_dummy.net*)

**Date:** 01/02/05

Date: Sun, 02 Jan 2005 21:41:56 GMT

"habshi" <habshi@anony.com> wrote in message  
news:41d8692c.14596628@news.clara.net...

- > *There have been major advances in tunnel-boring machines (TBMs),*
- > *invented by the British engineer Marc Brunel in the 19th century. The*
- > *past 20 years have seen TBMs built much tougher, more reliable, and to*
- > *ever larger diameters. The availability of large TBMs is especially*
- > *important for highways because they are the largest tunnels in cross*
- > *section. Until the 1960s the largest TBMs were about 8m (25 foot)*
- > *diameter, hence most tunnels so built only had space for two lanes of*
- > *traffic. Thanks mainly to Japanese innovation, TBMs are now common at*
- > *10m (and even go to 14m as in the case of equipment used on the*
- > *Trans-Tokyo Bay tunnel) providing room for three lanes of full-sized*
- > *truck traffic. Once the principal challenge in tunneling was breaking*
- > *up the hard rock and getting the debris out. Now with "road header"*
- > *machines, relatively simple machines that deploy a large grinder on an*
- > *arm and a conveyor belt, and with simple mechanical excavators and*
- > *precise explosives that move the toughest rock, expensive TBMs and*
- > *large shields can sometimes be dispensed with.*
- >
- > *Another major advance in tunneling is the invention of the jet fan for*
- > *ventilation. So named because they look like the jet engine of an*
- > *aircraft, they are hung from the ceiling at intervals along the tunnel*
- > *and simply move the dirty air along the tunnel. It can be vented out*
- > *one end, taken to vertical exhaust risers, or diverted into treatment*
- > *channels and reinserted cleaned into the tunnel. On all but the very*
- > *longest tunnels, jet fans allow the tunnel builders to dispense with*
- > *the plenum or separate longitudinal ducting above a false ceiling that*
- > *has traditionally been used to ventilate tunnels. That can reduce the*
- > *quantity of excavation and construction by 10 to 20 percent, and*
- > *capital costs by comparable amounts. Pioneered in Europe and Japan,*
- > *jet-fan ventilated tunnels were long resisted by the U.S. Federal*
- > *Highway Administration on the argument that fire might disable the*
- > *jet-fans. A breakthrough came in 1996 when live fire tests in an*
- > *abandoned tunnel in West Virginia proved their safety, and they were*
- > *belatedly allowed in the last designed section of the Central Artery*
- > *project in Boston.*
- >

- >
- > *Q13. What soil types are drilled?*
- > *The subsoil excavated from both A86 West tunnels is typical of the*
- > *Paris Basin. It includes:*
- >
- > – *“Fontainebleau” sands*
- > – *High–grade clays (oyster marl, green clay and supra–gypsum marl)*
- > – *Limestone and calcareous marl (Champigny and Saint Ouen limestone,*
- > *marl, broken stone, rough limestone)*
- > – *Low–grade clays (false clays and plastic clays)*
- > – *Chalk*
- > *Q18. How will the A86 West affect surface level traffic?*
- > *The decision to link up the A86 West by tunnel will mean shorter*
- > *journey times across the western Paris area, and a 15% reduction in*
- > *surface level traffic on parallel roads.*
- > *(back to top)*
- > *Q1. What is the history of the A86 West link–up?*
- > *At an average distance of 6km from the Paris city ring road, the A86*
- > *constitutes a second Ile–de–France circumferential. It is intended to*
- > *reduce traffic on local roads, relieve congestion on the city ring*
- > *road, and facilitate travel between suburbs.*
- >
- > *The A86 West is the missing link needed to complete this 78km–long*
- > *outer ring road, 80% of which is already in service*

Not exactly granite, then.

Androcles.