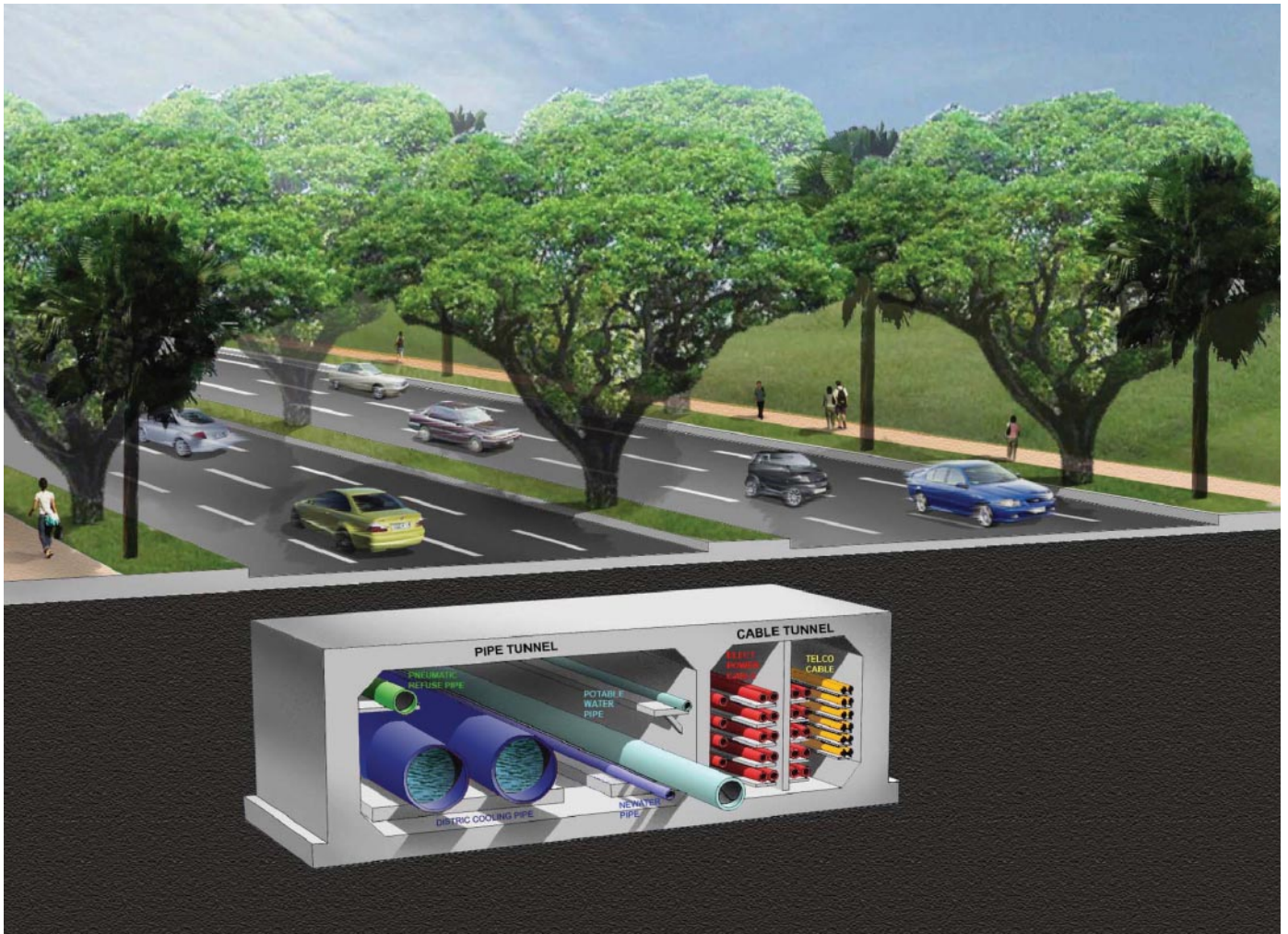


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## Marina Bay, Singapore

# Common services tunnel and district cooling system

Singapore has completed the first phase of a common services tunnel (CST) network and a district cooling system that will serve its prime inner-city property development, Marina Bay. Once fully complete, it will be a system of 20 km of purpose-built tunnels that will house and distribute various utility services for the 320 ha area Marina Bay. Currently the completed phase comprises of 1.4 km and is worth US\$51 million.

The district cooling plant, which will facilitate 24 hour air-conditioning services for up to 12,000 apartments in the area, is the first in Singapore to be implemented on such a large-scale.

Total government investment in the infrastructural base for the Marina Bay area is close to US\$1.26 billion.

The CST network and district cooling system represent state-of-the-art infrastructure planned and put in place by the government to support the successful development of Marina Bay. This 320 ha waterfront area is being developed into a major Asian financial hub, with a modern and vibrant year round environment supported by residences and leisure facilities.

Both infrastructures are being implemented to streamline services to the area as well as to help to create an aesthetic urban environment, by eliminating the need for visible, on ground systems and processes. In the long term, both represent savings in terms of land being freed for other use,

energy savings as well as on maintenance costs and manpower.

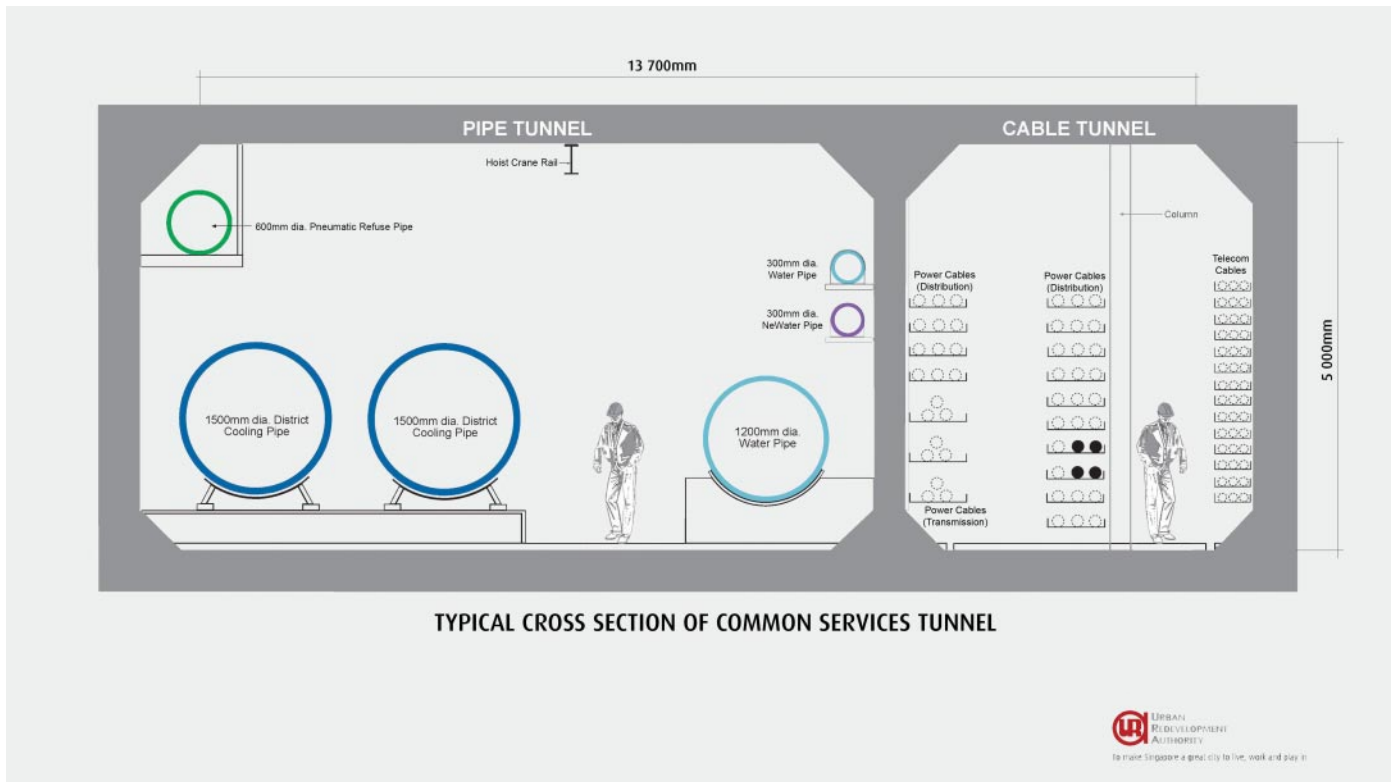
### The CST network

Utilities hosted by the tunnel include electrical and telecommunication cables, district cooling, water and potable water pipes. The tunnels are also being fitted for the future installation of a pneumatic refuse conveyance system.

The tunnel system is being constructed at an average depth of 2.5 metres below ground level and in most cases is being constructed to under cross the underground pedestrian network and the underground Mass Rapid Transit System (MRT). Dimensions for the main and branch tunnels are 14m width x 5m and 8.7m width x 4.8m height.

Approximately 200 tonnes of concrete were used on the tunnels, which were constructed based on conventional open-cut method with in-situ concrete structure construction. One Raffles





Quay development (ORQ) is already being served by the tunnel. Singapore's CST was designed by a joint-venture between Maunsell Consultants (Singapore) Pte Ltd and Nikken Sekkei Civil Engineering (Japan). It is based on a model used in Japan. Total investment of phase one is US\$51 million and phase two is US\$86.24 million.

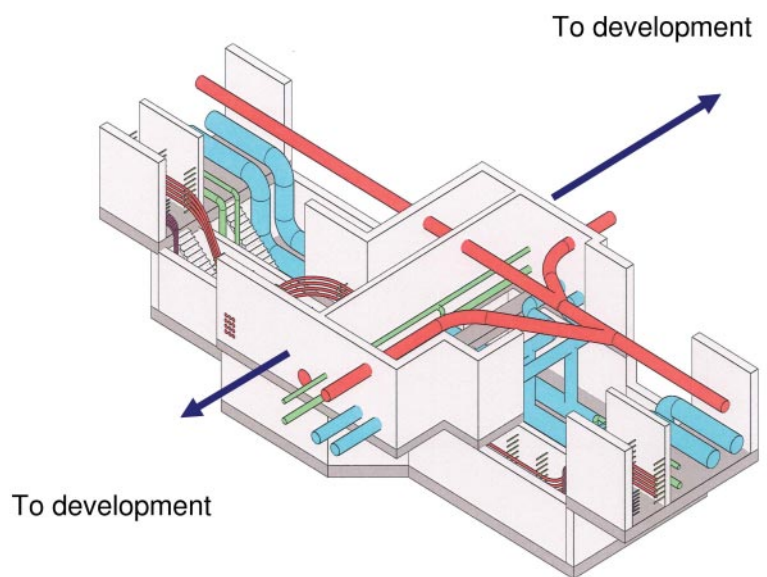
The construction of the 1.6 km phase two will be completed in 2009/2010 and will serve Singapore's first Integrated Resort development, the world's largest and most expensive of its kind.

### The district cooling system

The district cooling plant, located within the newly built One Raffles Quay development, will supply chilled water through a network of pipes housed within the CST for the air-conditioning of buildings in the area.

Chilled water production equipment is located at the basements of the development, with the cooling tower sitting on the roof of the podium. The plant has a production capacity of 150 MW<sub>r</sub>, with an installed capacity of 57MW<sub>r</sub>.

When fully on stream, the first district cooling plant will be able to serve 1.25 million sq m of GFA. The plant will help increase energy savings by about 15 per cent.



**COMMON SERVICES TUNNEL (CST) JUNCTION BOX**