

Hong Kong goes in for rehab

Trenchless technology is taking off in a big way in Hong Kong, with major projects under way. Ian Vickridge looks at the latest developments.

If ever a city needed trenchless technology it is Hong Kong – high density, high tech and high traffic congestion. So far little use has been made of trenchless methods for installing and rehabilitating utility services here. But the technology is about to take off in a big way in this vibrant region of southern China.

Two major leading-edge technology directional drilling contracts have just been completed and preparations are under way for extensive use of trenchless technology for installing and rehabilitating utility services under the busy streets. There is now a small but enthusiastic local society for trenchless technology, and a major exhibition and conference on trenchless technology will be held in there in November.

A major directional drilling project was begun in the late 1990s to meet the water supply needs of a new development for more than 15,000 inhabitants on Ma Wan Island. The project, now substantially complete, included installation of two 300mm diameter pipelines under the 1.1km wide 45m deep Ma Wan channel.

Work involved drilling a total distance of about 1.4km through difficult and complex ground with granite and volcanic tuffs, intersected by faults, and overlain in the shallower sections by marine deposits. Although the internal diameter of each pipe is 315 mm, the final reamed size of each bore was 800mm diameter, to meet conditions laid down by Hong Kong's Water Supplies Department (WSD).

Normal requirements for horizontal directional drilling (HDD) are that the bore be 1.25 to 1.5 times the diameter of the installed product. The HDPE pipe, with an outside diameter of 457.2mm, was inserted within a 600mm epoxy coated steel pipe with an additional external coating of polymer concrete to protect the epoxy from abrasion.

The large bore diameter made the scheme one of the largest and most difficult hard rock directional drilling projects ever undertaken anywhere.

Investigation of the feasibility



Hong Kong's congested streets will certainly benefit from the growth of trenchless technology.

While the main contractor Leighton and its specialist drilling subcontractor Lucas were busy on this project, another large directional drilling contract was let – to install twin ducts for electricity supply cables across the Ma Wan channel, a few hundred metres away from the WSD project.

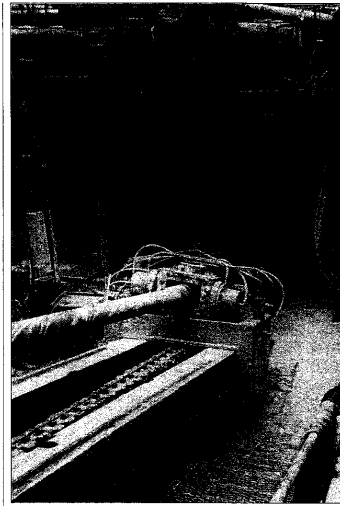
Lucas undertook this second difficult hard rock drilling project, this time as subcontractor to Skanska. The contract was made even more complex by the fact that it is curved in plan as well in elevation.

However, the use of smaller directional drilling rigs, now so common in the USA and Europe for installation of utilities, has been limited – until now. The WSD recently began rehabilitating the water mains in Hong Kong and local contractors are gearing up to bid for a slice of the work.

An underground asset management study (UAMS) in the late 1990s showed a significant proportion of Hong Kong's water mains were approaching the end of their service life.

The WSD has already begun to implement the study's recommendation that half of the system (3,000km) should be replaced or rehabilitated over the next 20 years.

Investigation of the feasibility



It is expected that well over half of Hong Kong's ageing water mains will be upgraded using trenchless technology.

of replacing or rehabilitating the first 300km has already been carried out and the WSD has emphasised that trenchless methods should be used wherever possible. Detailed design is now under way and contracts for the work will be let towards the end of this year.

The WSD plans a continuing cycle of investigation, design and construction contracts to complete the programme within the next 20 years. An study for the second 300km has just begun.

Although greater use of trenchless technology could undoubtedly help minimise the impact of the WSD work, there are particular difficulties to overcome in Hong Kong.

First, the WSD has a public commitment to limit any disruption of water supply to eight hours (compared with 30 hours in the UK), making it practically impossible to carry out rehabilitation work without using temporary bypass systems, which of course adds to the overall cost.

Use of temporary supplies is made more difficult by the large number of connections and the need to keep busy pedestrian routes open. The situation is fur-

ther complicated by the underground congestion caused by the many utilities buried in close proximity, the large number of bends in the pipes and the concrete surround to much of the pipework.

In spite of these difficulties, it is expected that well over half of the work will be done by trenchless methods. This poses another problem – the lack of experience in these techniques among local contractors. A few have already acquired some of the necessary equipment and have successfully carried out trial projects as part of the investigations. Some are also teaming up with international suppliers and contractors in order to be in a position to bid for the work next year.

However, there is still plenty of scope for specialist trenchless companies in Europe, the USA and elsewhere to develop working relationships with Hong Kong contractors, who face a steep learning curve in the use and application of trenchless rehabilitation and installation methods.

The WSD is not the only government department promoting trenchless technology in Hong

Kong. The Drainage Services Department (DSD) recently called for tenders for more than 4km of 1.8m diameter sewers to be installed at depths of up to 17m in the densely developed areas of Wan Chai East and North Point on Hong Kong Island. The DSD wants most of this built using trenchless methods to minimise disruption to traffic. The works are scheduled to begin in April and are expected to take about 48 months.

Pipejacking and microtunnelling are trenchless techniques that several Hong Kong contractors are familiar with. Microtunnelling machines were used to install 760mm outside diameter concrete fuel lines under the main taxiway at Kai Tak airport in 1993, and since then the technology has been used on various DSD projects, as well as by the Kowloon Canton Railway Company (KCR) for utility diversions under key rail lines in association with the recent West Rail projects.

The many areas of reclaimed land and made ground make the use of tunnelling methods difficult, but there are many experienced geotechnical engineers capable of dealing with these problems in Hong Kong. With the new DSD tunnelling projects, this expertise will no doubt increase.

The China Hong Kong Society for Trenchless Technology (CHKSTT) was established in 1999 and although still small it has an enthusiastic and growing membership which meets regularly.

With successful completion of some major trenchless projects and the immense potential for growth in the use of trenchless methods, it is no surprise that a major exhibition and conference, 'Trenchless Asia', will be held in Hong Kong in November 2002.

This is being organised by No-Dig Conferences and Exhibitions with the support of the CHKSTT and the International Society for Trenchless Technology (ISTT). It is expected to attract exhibitors from all over the world, who will have the opportunity of demonstrating their products and systems to an eager audience from Hong Kong, China and other South East Asian countries.

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Further details of the Trenchless Asia exhibition and conference can be found at www.westtrade.co.uk and details of the CHKSTT can be seen at www.chkstt.org.hk