

Replacement and Rehabilitation of Water Mains

Introduction

Hong Kong's fresh water and salt water supplies are provided through a network of 7,200 kilometres of water mains. Most of these water mains are underground. About 45% of the water mains were laid some 30 years ago. They are approaching the end of their service lives and have become increasingly difficult and costly to maintain. In view of the above, Water Supplies Department (WSD) has proposed the replacement and rehabilitation of some 3,000 kilometres of aged water mains in stages over 15 years to prevent further deterioration of the water supply network.

Works Programme

In view of the scale of the project, it is proposed to implement the works in 4 stages so that there would not be excessive traffic disruption and interruption of water supply due to construction of the works. Stage 1 Phase 1 of the works was commenced in December 2000. WSD schedule to commence the Stage 1 Phase 2 and Stage 2 works in 2005 and 2007 respectively.

Works Contracts

15 contracts have been awarded for execution of the Stage 1 Phase 1 works during the period from 2000 to 2004 throughout the Territory. The total cost of contracts amounts to HK\$1.4 billion.

Effects due to the Works and Mitigation Measures

The effects arising from the works have been thoughtfully taken care of as follows –

(1) Effect on Traffic

The road openings required for the works would have potential traffic impacts. Under our contracts, the contractors are required to submit detailed temporary traffic management schemes using updated traffic counts and on-site trial runs for the works. Moreover, it is also required under the contracts for the temporary traffic management schemes to be approved by the relevant authorities prior to implementation. It is expected that the traffic impact arising from the works

can be kept within acceptable levels by implementation of the temporary traffic management schemes.

(2) Effect on the Environment

Construction noise, dust and site run-off are identified as the key environmental concerns. Under the contracts, WSD have required the contractors to control noise, dust and site run-off during construction through the implementation of mitigation measures so as to comply with the relevant statutory requirements.

(i) Noise

The requirements of Noise Control (Construction Work) Regulation are included in our contracts. Monitoring will be carried out during construction to ensure that the sensitive receivers will not be adversely affected by the noise generated from the works.

(ii) Dust

The requirements of Air Pollution Control (Construction Dust) Regulation and “Recommended Pollution Control Requirements for Construction Contracts” issued by EPD are included in our contracts to ensure that the statutory guidelines are complied with at all times.

(iii) Site Run-off

All site run-off generated from the construction works will be treated in accordance with the Water Pollution Control Ordinance before discharge into the drainage system to avoid contamination.

Application of Trenchless Techniques

At locations where traffic impacts are significant, the contractors are required to use trenchless (also referred to as minimum dig) techniques to alleviate the traffic impact problems. These techniques would reduce the amount of road excavations and would shorten the time required for reinstatement of road surfaces and hence would alleviate the impact. However, these techniques are not without limitations, hence the selection of the appropriate construction methods would depend on site constraints and the effect of the works on traffic and the environment.

The trenchless techniques proposed by the contractors include –

(1) Cured-in-Place Pipe (CIPP) Method

This method involves the insertion of a polyester woven liner with epoxy resin by inversion (turning inside out) into the existing pipe barrel. The liner is bonded to the host pipe to form a close-fit pipe upon hardening of the resin.

Under ideal conditions, the contractors could install up to about 100 metres to 200 metres in one single operation. There are, however, limitations in the techniques. In practice, bends in the existing water main would shorten the length of water main to be rehabilitated.

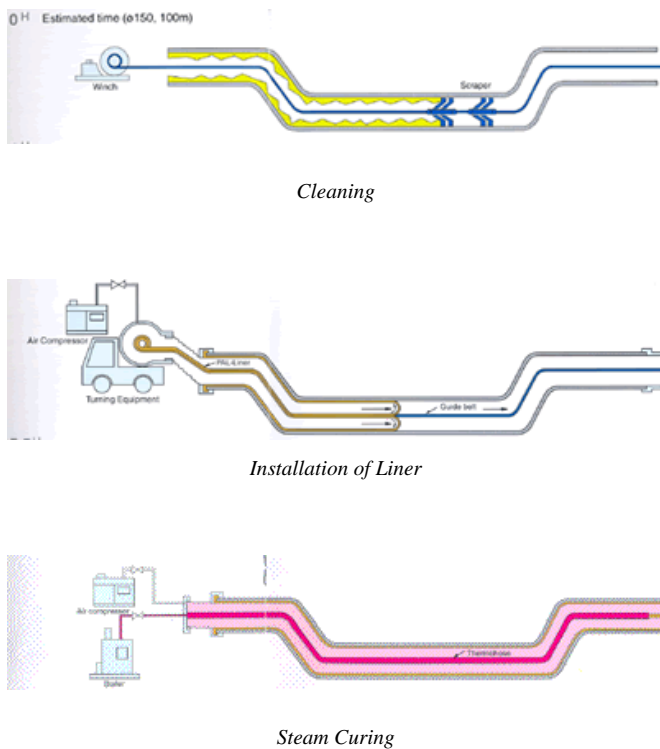


Figure 1: CIPP Process



Figure 2: CIPP Installation in Progress



Figure 3: Steam Curing of CIPP

(2) Close Fit Lining Method

Close fit lining technique involves the insertion of a temporarily reduced diameter or re-shaped pipe into an existing water main. The inserted pipe will be reverted to its original size on completion of the insertion process. These techniques rely on the flexibility and toughness of the polyethylene pipe to revert to its original size after being deformed. There is a small reduction in internal pipe diameter. Figure 4 shows the various forms of close-fit methods.

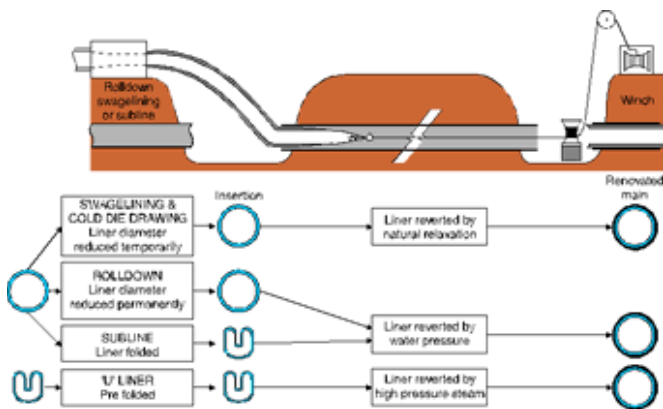


Figure 4: Classification of Close-fit Lining Methods

The swagelining and rolldown methods were not able to negotiate even small degree bends. Hence, there is a tendency for the contractors to employ the pre-folded liner methods. Under ideal conditions, this method could also enable the contractors to install up to about 100 metres to 200 metres in one single operation similar to the CIPP method.

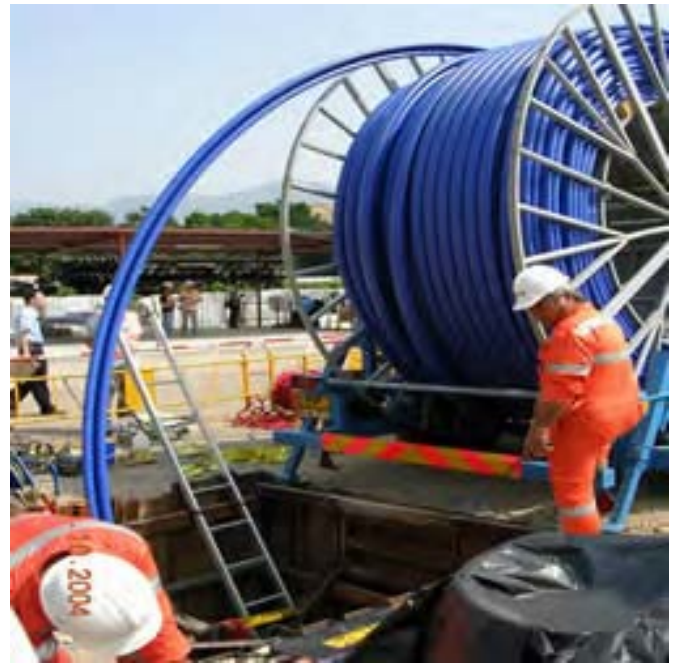


Figure 5: Pre-fold Liner Method in Progress



Figure 6: Pre-fold Liner Method in Progress

Interface with Works by Other Departments

It is essential to have a good management of the road openings works to minimise the associated traffic problems. Apart from the above mitigation measures, we also entrust part of our proposed works to other works contracts. WSD will keep close liaison with the relevant Government departments and utilities undertakers to ensure that the works will be well co-ordinated and carried out smoothly and cause minimum disruption to the public.