Improvement to Dongjiang water mains P4 at Sheung Shui and Fanling
(English translation of the Chinese transcript)

Narrator : Hong Kong has experienced a period of water rationing in the 1960s. With the assistance of the Guangdong authorities, Dongjiang water (DJ water) was conveyed to Hong Kong from 1965 onwards against numerous topographical barriers. At present, DJ water is the major source of water in Hong Kong. It accounts for 70% - 80% of the annual fresh water supply and facilitates the sustainable development of Hong Kong. Nonetheless, part of the DJ water mains laid in the 1980s had been used for over 40 years. It's time to have improvement works for them to ensure a stable water supply to Hong Kong.

Mr WAN Wai-yin (Senior Engineer, WSD) : The scope of improvement project for the DJ Water Mains P4 at Sheung Shui and Fanling involved replacement of about 5 kilometres of aged glass reinforced plastic (GRP) DJ water mains P4 with diameters of 2,100 millimetres (mm) to 2,300mm locating from Man Kam To in Sheung Shui to Kau Lung Hang in Tai Po. To cope with the tight schedule, the project team utilised innovative technologies to overcome various challenges, in particular at the area of heavy pedestrian and traffic flow nearby Sheung Shui Railway Station and the Fanling Highway to minimise impact on the public.

Narrator : In view of heavy road traffic outside the Sheung Shui Railway Station, conventional open trench method

could not be adopted. Hence, trenchless method was applied so that the area of road excavation could be largely reduced to minimise the impact on the public.

The project team opted to apply trenchless microtunnelling method by operation with a tunnel boring machine (TBM) of 3-metre (m) diameter from the launching pit to the receiving pit. As the TBM advanced, jacking pipes were inserted behind the TBM in sections until the TBM reached the receiving pit. After construction of a 361m-long tunnel at 12m-depth below ground level, new water pipes in a length of 8m each was installed inside the tunnel.

Mr LIU Qi (Engineer, WSD) : The project team faced two challenges during the design of water main alignment and pits location. The project team had to locate a suitable site for pit construction near the Sheung Shui Railway Station, as well as to avoid clashing with any underground utilities while adopting the trenchless method for mainlaying works. The project team utilised Building Information Model (BIM) technology to evaluate the feasibility of different proposed alignments according to various data such as the alignments and dimensions of the existing underground utilities and the foundation structures of bridges, etc. Eventually, we overcame all constraints and successfully determined the most suitable and practicable solution.

Narrator : Apart from that, the project team closely monitored the existing utilities such as railways, bridges and box

culverts, etc. during the course of works to ensure they were not affected by the operation of TBM.

The project team kept attention paid to the impact of the works on nearby residents and implemented various mitigation measures, such as control of noise, dust and wastewater discharged from work sites. Also, the project team maintained close communication with stakeholders and accorded due consideration to stakeholders' suggestions while formulating solutions for the project work.

Another challenge of this project was to rehabilitate a section of aged underground GRP pipes of 350m in length across the Fanling Highway with congested underground utilities such as high voltage cables, box culverts and the existing water mains, etc.

Taking into account the site constraints, the project team adopted slip-lining method by inserting polyethylene (PE) pipes of 2m outer diameter into the existing water mains. This rehabilitation method could effectively reduce traffic impact on Fanling Highway and save much effort on the advance works required for diversion of underground utilities.

Slip-lining method is suitable for water mains with relatively straight alignment. Based on the alignment of the existing water mains, the project team divided the works into two sections and then connected them with mild steel pipes.

Ms TO Wing-man (Engineer, WSD) : The slip-lining method consists of the following major procedures: Firstly, the project team set up temporary pits at two ends of the alignment. Then, part of the existing water main was cut open. After cleaning and inspection of the existing water main, new PE pipes with outer diameter of 2m and length of 6m each were connected together end-to-end by butt fusion welding and then pushed into the aged water mains by a winch. Lastly, the annulus space between the new and the old main was fully grouted to form a new main.

The use of slip-lining method in laying large diameter water mains is very uncommon in Hong Kong. Therefore, the project team had to exercise extreme caution during the planning and construction of the project to assure work quality.

Narrator : The project team adopted the principle of Construction 2.0 by utilising resources effectively and applying technologies to enhance work efficiency and site safety.

The project team also used 3D modelling in VR to simulate the work environment and provide specific training to raise safety awareness of workers and reduce safety risks.

Meanwhile, the project team adopted electronic document management system and digital works supervision system to streamline the workflow so that

the management staff could promptly retrieve project information.

Through the adoption of New Engineering Contract (NEC), Water Supplies Department (WSD) and the contractor acted in the spirit of mutual trust and co-operation to proactively participate in project management. The project team held weekly progress meetings to keep abreast of the site progress and to discuss on the operational situation, such that potential risks could be identified at early stage and followed up with remedial measures. This fully demonstrated the spirit of collaboration and teamwork.

The improvement works of water supply system will still have various challenges faced in the future. WSD and the project teams will join hands and utilise the latest technologies to provide reliable and quality water supplies to Hong Kong citizens to facilitate the sustainable development of Hong Kong.

******