

**For discussion
12 April 2012**

Legislative Council Panel on Transport

**Fire Service Equipment and Contingency Plans of Road Tunnels
Fire at Lion Rock Tunnel on 8 March 2012**

PURPOSE

This paper briefs Members on the fire service installations and equipment (FSI) at road tunnels in Hong Kong and the contingency plans in place; and the fire incident that occurred inside the south-bound tube of the Lion Rock Tunnel (LRT) on 8 March 2012 and the progress of investigation of the incident.

Fire Service Installations and Equipment of Road Tunnels

2. Road tunnels, like buildings in general, are required under the law to be equipped with adequate FSI. Currently, all road tunnels in Hong Kong are installed with FSI required by the Fire Services Department (FSD) such as fire hydrant/hose reel systems, portable fire extinguishers, smoke extraction systems and emergency lighting systems. Details of the relevant standards and requirements are set out in the Code of Practice for Minimum Fire Service Installations and Equipment (the Code). The FSI requirements for road tunnels are formulated by making reference to international safety standards and taking into account the conditions and actual operational needs of individual tunnels. FSD also revises the Code from time to time in light of various factors such as improvements in FSI technology and increasing public expectation for enhanced fire safety requirements. FSI requirements for road tunnels are at the Annex.

3. FSI to be provided at road tunnels is designed to specifically cater for their potential risks. Given the design of tunnel tubes, major potential risks include the tendency of dense smoke and noxious gases to accumulate; difficulty in evacuation and escape; and the need for fire rescue teams to confront high-temperature fire sources directly. Every tunnel operator is required under the law to engage a registered fire service installation

contractor to conduct annual inspection on FSI to ensure that they comply with relevant standards and legal requirements, and function normally. The Government also reviews the fire safety of road tunnels from time to time. Take LRT as an example, its south-bound and north-bound tubes were constructed at different times, and the first tube had already been open to traffic when the second one was constructed. Therefore, emergency escape accesses (EEAs) connecting the two tubes were not built. To enhance the fire safety of LRT, 11 drenchers were installed in each of its tubes in 1997. In case of fire, the drenchers could isolate the fire and prevent it from spreading inside the tubes, giving tunnel users more time to evacuate from the tunnel safely. Except LRT, all other road tunnels in Hong Kong are equipped with EEAs. In case of an emergency incident, tunnel users may travel from the tube where the incident takes place to the other tube via EEAs and leave the tunnel.

Contingency Plans for Road Tunnels

4. FSD, the Transport Department (TD) and all tunnel operators have drawn up contingency plans for handling various emergency incidents including fires. When such incidents occur, TD is responsible for co-ordinating emergency traffic and public transport arrangements and disseminating relevant real time information. Individual tunnel operators will conduct fire drills about every six months jointly with relevant departments, including TD, FSD and the Police to test the effectiveness of the contingency plans and functionality of FSI. Such drills ensure the efficient and prompt execution of the contingency plans in case of tunnel emergencies. Relevant Government departments will also review with the tunnel operators the contingency measures from time to time and make adjustments when necessary.

Fire at LRT on 8 March 2012

Fire Fighting by FSD

5. At 3:33 am on 8 March 2012, the Fire Services Communication Centre received a call from the operator of LRT, reporting a fire in the Kowloon-bound tube of the tunnel. FSD immediately dispatched a total of 9 fire appliances and 46 firemen to the scene from both Kowloon and the New Territories (NT). Upon arrival of the first fire appliance at 3:39 am,

the firemen found that smoke was emerging from the Kowloon-bound tube near the Kowloon exit. To locate the fire source inside the underground utility chamber, the firemen removed manhole covers one by one along the tunnel tube while spraying water and fire-extinguishing foam into the chamber. The built-in smoke extraction system of the tunnel and smoke extraction equipment of FSD were also employed to help remove the fumes, to facilitate the firemen locating the fire source in the underground utility chamber. Having assessed the situation at the scene, FSD called for reinforcement and subsequently upgraded the fire to No. 3 alarm at 6:18 am. The fire source was later confirmed to have originated in the underground utility chamber at about 300 metres from the Kowloon exit of the tunnel. After fighting the fire for several hours, the fire was brought under control at noon and put out at 12:30 pm. Altogether, 57 fire appliances, 8 ambulances, 256 firemen and 34 ambulancemen were deployed to the scene by FSD during the entire operation. The scale of deployment was above the standard attendance for No. 4 alarm fires.

6. After the fire broke out, the 35 workers carrying out water mains rehabilitation work followed the established emergency procedures and evacuated safely to the ground surface. No one was injured. A fireman suffered minor injury on the waist in the fire-fighting operation and was sent to hospital for treatment. The fire that occurred on 8 March originated from an underground utility chamber housing the water mains. As the drenchers water sprays could not check the spread of the underground fire, on-scene FSD officers considered that there was no need to actuate the system.

Rehabilitation Work of Water Mains and the Road Tunnel

7. Officers of the Water Supplies Department (WSD) conducted preliminary inspection jointly with its consultant¹ on the exterior of the water mains right after the fire. The inspection revealed minor leakage at one of the water mains laid under the south-bound tube of LRT. Immediate pipe

¹ WSD is implementing a territory-wide replacement and rehabilitation programme of water mains in various districts, including the water mains below the tubes of LRT. Three fresh water mains with diameters ranging from 1,200 to 1,400 millimetres have been laid below the south-bound tube of LRT for supplying fresh water to East Kowloon and parts of the Hong Kong Island. According to the original programme, the works commenced in August 2009 and would complete in mid-2012. The works are carried out by the contractor of WSD and are supervised by a consultant engaged by WSD.

repair was carried out by WSD's contractor and was completed in the evening that day. On 9 and 10 March 2012, the consultant carried out further inspection on the inside and outside of the affected water mains and found that all three of them were damaged by the fire to various degrees. According to a preliminary estimate, the repair of the inner and outer coatings of the water mains will take about 60 and 110 working days respectively.

8. As the road slab structure of the road surface of the south-bound tube of LRT was damaged by the fire, the Highways Department (HyD) carried out round-the-clock emergency repair works and the fast lane of the south-bound tube of LRT was re-opened to traffic at 6:00 am on 12 March 2012. The slow lane also resumed normal operation at 6:00 am on 19 March after days of 24-hour expedited repair works by HyD, three days earlier than expected. During the period when the repair works were being carried out, the traffic at LRT was slightly more congested than usual but generally remained normal.

Emergency Traffic Arrangements

9. As a result of the fire, the south-bound tube of LRT was once completely closed. TD activated the contingency measures immediately and implemented emergency traffic arrangements with relevant departments, the LRT operator and public transport operators to maintain smooth traffic between Sha Tin and Kowloon as far as possible. During the fire, the LRT operator followed the contingency plan by immediately halting all incoming traffic and prohibiting vehicles from entering any of the tubes; dispatching the emergency response team to the smoking scene to provide support; reporting to FSD and informing the Emergency Transport Co-ordination Centre of TD by direct phone line. Once the fire was put out by FSD, staff of LRT and relevant works departments entered the tubes to carry out examinations. In order to carry out emergency on-site repair works, the Kowloon-bound tube needed to be closed. After re-opening the fast lane of the south-bound tube in the morning of 12 March, TD and the LRT operator decided to adopt tidal flow operation at the tunnel before the tunnel resumed full operation, and regularly disseminated real-time traffic information to keep motorists informed of the traffic arrangement to allow them to choose more appropriate routes or switch to public transport, to alleviate the traffic at LRT.

Investigation into the Cause of the Fire

10. FSD is investigating the cause of the fire, including ascertaining the sequence of events from LRT staff and the contractor responsible for the rehabilitation work of the water mains on the day of the incident, with particular focus on the situation of the scene including the equipment and materials used and the works procedures, etc. Upon completion of the FSD's investigation into the cause of the fire, WSD will consolidate all the findings and conclusions and assess the need for further enhancing the safety measures for the repair and outstanding rehabilitation work for the water mains and for taking appropriate follow-up actions.

ADVICE SOUGHT

11. Members are invited to note the content of this paper.

Transport and Housing Bureau
March 2012

**Code of Practice for Minimum Fire Service Installations
and Equipment
Promulgated by Fire Services Department
(July 2005 version)**

Systems/Installations/Equipment Requirements for Road Tunnels

- (i) Dynamic smoke extraction system
- (ii) Emergency generator
- (iii) Emergency lighting
- (iv) Emergency power points
- (v) Exit sign
- (vi) Fire alarm system
- (vii) Fire control centre
- (viii) Fire hydrant/hose reel system
- (ix) Fireman's communication system(s)
- (x) Automatic fixed installation other than water (as required by the Fire Services Department (FSD))
- (xi) Closed circuit television system
- (xii) Fixed foam system (as required by the FSD)
- (xiii) Gas detection system(s)
- (xiv) Pedestrian cross over facilities or a small pedestrian tunnel
- (xv) Portable hand-operated approved appliance, such as fire extinguisher, fire blanket and sand bucket