For discussion
on 22 May 2006

Legislative Council Panel on Economic Services

Gas Safety

Purpose

This paper informs Members of the actions and measures being taken by the Administration, and the Hong Kong and China Gas Company Limited (HKCG) to ensure the safety of towngas supply in Hong Kong.

Government and HKCG's Role in Ensuring Gas Safety

2. The Gas Safety Ordinance, Chapter 51 (the Ordinance) is to control, in the interests of safety, the importation, manufacture, storage, transport, supply and use of gas, and to provide for matters incidental thereto or connected therewith. The Director of Electrical and Mechanical Services is appointed by the Chief Executive under section 5 of the Ordinance as the Gas Authority for the purpose of the Ordinance. The principal function of the Gas Authority is to promote and provide for the implementation of safe working practices for and in relation to the importation, manufacture, storage, transport, supply and use of gas.

3. HKCG is a registered gas supply company under the Ordinance. In accordance with Regulation 9(1) of the Gas Safety (Registration of Gas Supply Companies) Regulations, it shall be the duty of every registered gas supply company to conduct its operations in a safe manner so that members of the public are not exposed to undue risks from gas. HKCG is obliged to safeguard public safety, to comply with all relevant legislation and the associated safety requirements, and to put in place safety procedures with regard to the design, construction, installation, testing, operation, inspection, maintenance of all its plants and equipment as well as arrangements for dealing with emergency and crisis situations. Scheduled inspection and maintenance activities include daily safety checks and biennial to annual overhauls for gas plants and tank facilities, quarterly to biennial leakage surveys for different types of distribution pipelines, weekly to monthly safety checks and yearly overhauls for pressure regulating and distribution installations, and eighteen-monthly inspections for household installations. Generally speaking, HKCG exercises a relatively tighter scheduled inspection and maintenance programme when compared with other

developed countries such as the European Union and the USA.

4. The Electrical and Mechanical Services Department (EMSD) regulates and monitors the gas safety management system of HKCG. In addition to approving design and construction of new projects, EMSD monitors HKCG's operation and maintenance management, including conducting annual audits of their gas processing/treatment plants; quarterly audits of their production plants and equipment; bi-monthly audits of their pressure regulators; monthly audits of their pipe leakage surveys; fortnightly audits of their pipe-laying works; and day-to-day audits of consumer installations. At the management level, EMSD holds regular meetings with HKCG to jointly review issues in relation to HKCG's gas supply, plant and network management, equipment, installations as well as other safety-related matters.

Gas Incident at Ngau Tau Kok

5. On 11 April 2006, leakage was found on a medium pressure ductile iron (MP DI) pipe underneath Jordan Valley North Road in Ngau Tau Kok. A towngas explosion subsequently occurred inside Wai King Building, which is about 25 metres (m) away from the point of leakage. The gas explosion incident has caused two fatalities and nine injuries, and damage of varying degrees to the property and utilities of Wai King Building.

6. The Government is gravely concerned about this gas explosion incident. Immediately after the incident, the Government set up an inter-departmental group, comprising representatives of the Hong Kong Police Force, FSD, EMSD and Government Laboratory, to conduct a detailed investigation into the cause of the incident. Professional advice and support will be provided by the Buildings Department and Drainage Services Department (DSD) to assist investigation by the group where necessary.

7. The group convened its first meeting on 13 April 2006. The group members maintain close contact in exchanging information and arranging testing and examination during the investigation. Initial findings revealed a rare coincidence of the following, the combined presence of which may well have resulted in the tragic explosion –

(a) a 70 millimetres (mm) hole was found on an underground 300 mm diameter MP DI towngas pipe running along the Jordan Valley North Road, at a distance about 25 m from

the entrance lobby of Wai King Building;

(b) at a distance of about 750 mm from the hole on the gas pipe, a 300 mm diameter underground main sewer crossed underneath the damaged gas pipe. The sewer was also found damaged;

(c) The main sewer in question was found to have an abandoned branch sewer terminating beneath the pavement outside the main entrance and cleared of Wai King Building, with its free end plugged with 500 mm length of soil;

(d) openings for running of underground pipes into building were found through the ground beam at the main entrance of Wai King Building facing Jordan Valley North Road;

(e) a utility enclosure in the form of a void was found underneath the raised entrance floor inside Wai King Building. The void provided the passage for utility pipes to access the building via the openings on the ground beam, and reach a pump room at the rear end of the building; and

(f) inside the pump room there were electrical panels to control the operation of water pumps.

The holes found on the towngas pipe and the damaged main sewer are under detailed investigation. The section of towngas pipe with the hole was cut off and sent to a university for metallurgical/material examination.

8. The investigation has also looked at the likely path taken by the leaked towngas to the void under the entrance of Wai King Building. Initial findings suggest that dispersion through the atmosphere can be ruled out given the distance and openness of the space in between. Diffusion through the soil would be a very slow process as the distance of soil between the point of leakage and the utility void of Wai King Building was about 25 m, and this is unlikely to be the primary path.

9. The initial findings point to a possibility that the towngas went through some existing underground ducts or voids to Wai King Building. The gas could have been transported through the damaged sewer to a point close to the void beneath Wai King Building's entrance, and diffused across the soil plugged in the abandoned branch sewer and through the openings

in the ground beam into the utility void, and accumulated there. Irrespective of the path of diffusion, the gas accumulated in the utility void was probably ignited by electrical spark arising from normal pump operation control, and explosion occurred. The definitive cause of the explosion cannot however, be conclusively determined until the results of a full and detailed investigation into the incident are known.

10. The inter-departmental group is still carrying out detailed investigation into the incident. Upon completion of the investigation, the inter-departmental group will submit the incident investigation report to the Coroner's Court.

Immediate Measures Taken to Ensure Gas Safety

11. HKCG conducts routine leakage surveys, with the assistance of "Flame Ionisation Detector (FID)" on its underground towngas distribution pipelines three times a year to ensure safety of the towngas distribution network. FID is sophisticated detection equipment and is widely used by the international gas industries. It has very high sensitivity and is able to detect gas leak at very low concentration levels down to one part per million. The practice and methodology of leakage surveys currently adopted by HKCG are in line with internationally recognised approach to detect gas leaks from underground gas distribution pipelines. The frequency of leakage surveys carried out by HKCG is relatively higher than that of most other places.

12. Between 13 April and 1 May 2006, HKCG conducted a comprehensive leakage survey on all its MP DI pipes, and gas leaks were detected at 51 locations. Details are as follows –

(a) minute leakage was detected at three locations, namely the junction of Wong Chuk Hang Road and Nam Long Shan Road on Hong Kong Island, Prince Edward Road West in Kowloon, and Lai Yiu Street at Kwai Chung. The leakage was due to pipe corrosion, and HKCG has undertaken immediate replacement and repair works;

(b) of more than 200,000 pipe joints along these towngas pipelines, minute leakage was detected at 30 joints. HKCG has carried out repair works; and

(c) HKCG has inspected its above-ground installations in the course of conducting the above mentioned leakage survey

on the underground towngas pipelines, and carried out maintenance and repair works on 18 installations at which minute leakage was detected.

13. HKCG pointed out that such minute gas leakage was only detectable by using sophisticated equipment close to the point of leakage. Such leakage is commonly found in similar underground pipelines in other parts of the world. These leakages are caused by vibration due to road traffic, soil subsidence, and disturbance by road excavation work. As the leaked gas is lighter than air, it will quickly be diluted by air. According to international standard, such minute leakages will not give rise to any hazardous situation. EMSD is satisfied that the survey results indicate overall sound integrity of HKCG's underground towngas distribution pipelines, and there is no indication of public safety problem with HKCG's towngas distribution network. The current leakage incident rate of HKCG's distribution pipelines is 0.18 incident per km of pipe run per year. This leakage rate is lower than that of the UK and the USA, the corresponding figure of which is 0.7 incident per km of pipe run per year.

Further Measures to Enhance Gas Safety

(I) Enhanced Leakage Surveys of Existing Pipelines

14. After the gas incident at Ngau Tau Kok, HKCG has taken the initiative, as an enhanced safety measure, to increase the frequency of territory-wide routine leakage surveys of MP towngas distribution pipelines from currently three times a year to six times a year starting from 1 May 2006. EMSD has stepped up the monitoring on the leakage surveys of HKCG through monthly scheduled or surprise site audit inspections accordingly.

(II) Accelerated Replacement of Towngas Pipelines

15. DI pipes are still in service for gas distribution network in various parts of the world such as the USA, European Union, Singapore and Japan. These pipes, with protective coatings, meet international safety standards and should last for 50 years under normal circumstances. Since the 1990s, HKCG has gradually phased out laying of DI pipes and introduced new polyethylene (PE) pipes for underground distribution network to enhance gas safety. The PE pipes are free from ferrous corrosion problem, and possess enhanced quality of pipe joint and better resistance to ground subsidence.

16. In the light of last month's gas incident at Wai King Building in Ngau Tau Kok, EMSD urged HKCG to undertake further safety enhancement measure by accelerating its replacement programme of MP DI pipes by PE pipes. HKCG has already agreed to replace all 150 km of MP DI pipes installed for 20 years or more within two years.

Economic Development and Labour Bureau
Electrical and Mechanical Services Department
18 May 2006