

**For discussion  
on 14 June 2010**

**Legislative Council Panel on Health Services  
Replacement of Central Air-conditioning System for  
Prince Philip Dental Hospital**

**PURPOSE**

This paper seeks Members' support for the proposed replacement of the central air-conditioning (AC) system for the Prince Philip Dental Hospital (the Dental Hospital).

**BACKGROUND**

2. The Dental Hospital is a statutory body established in 1981 under the Prince Philip Dental Hospital Ordinance (Chapter 1081) and subvented by the Food and Health Bureau. It is a purpose-built teaching hospital to provide clinical training facilities for undergraduate and postgraduate students of the Faculty of Dentistry of the University of Hong Kong. It also runs courses for dental ancillary personnel at diploma/certificate level. Managed by a Board of Governors, the Dental Hospital provides day treatment dental services to patients suitable for teaching purposes and private fee paying patients. The nature of its services is therefore different from that of a general public hospital. Consultations are mostly provided by students of the Faculty of Dentistry of the University of Hong Kong under the professors' guidance. Hence, its service cycle is closely related to the teaching timetables of the University.

3. The Dental Hospital is currently using a sea water cooled central AC system for the supply of AC. The system is operated and maintained by the Director of Electrical and Mechanical Services under a service level agreement made between the Dental Hospital and the Electrical and Mechanical Services Trading Fund. Unless there are special events, the Dental Hospital generally turns on the central AC system only during office hours.

**PROBLEM**

4. During the course of operation, the sea water cooled chillers of the Dental Hospital's central AC system require two underground sea water pipes

for the supply and discharge of sea water for the purpose of heat dissipation. These two pipes are jointly owned by the Dental Hospital and the Tsan Yuk Hospital. The frequent bursting of the pipes in recent years not only affected the normal operation of the Dental Hospital, but also caused inconvenience to local residents. The Food, Environment, Hygiene & Works Committee of the Central and Western District Council has expressed concern over the frequent leakage or bursting of these two pipes which have affected the commercial tenants and residents nearby.

## **PROPOSAL**

5. The Secretary for Food and Health proposes to seek the funding approval of \$26.1 million from the Finance Committee of the Legislative Council for the installation of fresh water cooled chillers to replace the sea water cooled chillers, and the installation of the associated cooling towers for the Dental Hospital.

6. The scope of this project consists of the replacement of the sea water cooled chillers of the existing central AC system by fresh water cooled chillers, installation of associated cooling towers, as well as mounting of associated electrical wires, and water pipes along with other accessories from LG3 floor to the top floor of the Dental Hospital. All installation works will be carried out within the premises of the Dental Hospital and no road excavation work needs to be carried out in the vicinity. Upon completion of the project works, the Dental Hospital will no longer need to rely on sea water for cooling.

## **JUSTIFICATION**

7. The two sea water pipes of approximately 2 km in length are made of asbestos cement, running from a sea water pump house located near the waterfront of Sheung Wan along Connaught Road West, and passing through busy roads such as Des Voeux Road West and Queen's Road West, before reaching the Dental Hospital via Eastern Street and Hospital Road (please see **Annex A**). These pipes have been put into use for 30 years. The conditions of the pipes have been deteriorating recently, leading to frequent bursting and leakage. Since October 2001, the pipes have burst 18 times, with nine bursts occurring in the recent three years (please see **Annex B**).

8. The repair works of these burst pipes took six to seven days on average to complete in the past three years. In two of the bursts occurring in 2007, the repair works lasted for as long as 19 days and 24 days respectively. As the central AC system of the Dental Hospital has to be shut down during repair, the normal operation of the Dental Hospital will be seriously affected, particularly in hot and humid seasons. The suspension of AC in the Dental Hospital, which is a teaching hospital, will result in the cancellation or change of patient appointments and postponement of teaching schedules of the Faculty of Dentistry of the University, thereby affecting the study programmes of teachers and students. Besides, the health of clinical teaching staff and students who have to wear surgical masks and protective gowns while carrying out clinical teaching activities may be affected due to the hot and stuffy environment without AC, and their learning and work efficiency will also decrease. The Dental Hospital management had received complaints from the stakeholders, including patients, clinicians, staff and students, during the periods when the AC was suspended.

9. The excavation works arising from the pipe bursts had adversely affected the traffic along Eastern Street, Des Voeux Road West and Connaught Road West. They also caused inconvenience to the shops and residents nearby as a result of flooding caused by the pipe bursts and the subsequent excavation works. The Central and Western District Council has expressed concern over the frequent bursting of the pipes.

10. Given the restrictions and rules governing repair works carried out on busy roads, coupled with the frequent bursting of the pipes, exorbitant repair costs amounting to about \$485,000 a year on average have been incurred. Currently, the Tsan Yuk Hospital adjacent to the Dental Hospital is also using sea water from the same sea water pipes. When the project to replace the Tsan Yuk Hospital's AC system is completed by 2011-12, the Tsan Yuk Hospital will no longer rely on the sea water pipes and share with the Dental Hospital the costs of repairing the sea water pipes and maintaining the sea water pump house. As such, it is estimated that the maintenance costs to be borne by the Dental Hospital in future will be doubled to about \$970,000 a year. In the long run, it is not cost-effective to continue the maintenance of these old pipes.

11. As the planned construction of the MTR West Island Line will soon commence in the vicinity of these sea water pipes, we are concerned that the

pipe burst problem may further worsen. Hence, there is an imminent need to seek a long-term solution to the pipe burst problem.

12. The Electrical and Mechanical Services Department has proposed the following five options for consideration -

	<b>Option</b>	<b>Estimated capital cost (\$ million)</b>	<b>Estimated annual utility cost (\$ million)</b>	<b>Energy efficiency*</b>
(1)	Replacement of underground sea water cooling pipes	50	2.6	1
(2)	Supply and installation of cooling towers and fresh water cooled chillers	26.1	3	2
(3)	Supply and installation of air cooled chillers	36.6	3.7	3
(4)	Supply and installation of standalone AC units and fresh water cooled chillers	22.5	4.26	4
(5)	Supply and installation of standalone AC units and air cooled chillers	27.8	4.85	5

\*1 – the most energy efficient

5 – the least energy efficient

13. Among the five options, option (1), i.e. replacement of underground sea water cooling pipes, is the most energy efficient. However, in view of the high capital cost, long completion time and possible nuisances caused to the nearby shops and residents when the replacement works are carried out, we consider the option infeasible. In gist, option (1) has the following shortcomings -

- It is estimated that the works will take at least five years to complete, and the risk of sudden bursting of the existing cooling pipes still exists.
- The pipe replacement works have to be carried out by phases and traffic diversion will be involved. The existing pipes are laid along Connaught Road West, Eastern Street, Queen's Road West, Des Voeux Road West and near the portal of the Western Harbour Tunnel. As the traffic in these areas is heavy, traffic diversion will obviously further affect the traffic condition in the vicinity.
- Much coordination will be involved when the replacement works are carried out and consultation with various government departments and utility companies will be required. Besides, the works schedule will be subject to various unknown factors and difficult to control.
- Suspension of the whole central AC system of the Dental Hospital is necessary when the works are carried out. The normal operation of the Dental Hospital will inevitably be affected.

14. In view of the above problems and their serious consequences, we consider option (2) (i.e. replacement of sea water cooled chillers by fresh water cooled chillers) is more feasible. It is also environmentally sound and economically viable. This is because the works will only be carried out within the premises of the Dental Hospital without affecting the shops and residents nearby and will only take two winter seasons to complete. On its environment aspect, about 99% of the fresh water from the tap used by the fresh water cooled chillers and cooling towers can be recirculated for use under normal operation. Only around 1% of the fresh water will be evaporated and has to be topped up. Using fresh water as the cooling agent is one of the most energy efficient ways for central AC supply. This method also meets the requirements set by the Government regarding the use of energy efficient facilities in Government works projects and installation works.

15. According to estimation by the Director of Electrical and Mechanical Services, while the expenses on water and electricity will increase by about

\$400,000 under option (2) as compared with option (1), they are still lower than the existing annual repair costs of the pipes. As for options (3) and (5), both the estimated project cost and expenses on water and electricity are higher than those under option (2). Although the estimated project cost under option (4) is the lowest, the expenses on water and electricity of this option are higher than those under option (2), and hence option (4) is not economical for long term operation. Overall, we consider option (2) to be most desirable. The Hong Kong Productivity Council is currently conducting a study for the Dental Hospital on the major capital works required to be carried out in the coming five years. On the grounds of energy efficiency and savings in operational expenditure, the Hong Kong Productivity Council also agrees that option (2) is the best option.

## **FINANCIAL IMPLICATIONS**

### **Non-recurrent Expenditure**

16. We estimate that the capital cost of the proposed replacement project will be \$26.1 million, with the breakdown as follows –

	<b>\$ million</b>
(a) AC equipment	15.43
(b) Electrical works	1.30
(c) Builder's works	4.70
(d) Contingency	1.07
(e) Management fee	3.60
<b>Total</b>	<b>26.10</b>

## **Recurrent Expenditure**

17. The increase in utility cost and maintenance cost of the central AC system will be fully offset by the savings in the maintenance and repair of the seawater pipes.

## **IMPLEMENTATION PLAN**

18. There are three chillers in the Dental Hospital. During spring and summer time, all chillers must be in operation to provide the required cooling load but in winter time, only one chiller will suffice. As some of the chillers have to be turned off when the replacement works are carried out, the works will only be undertaken in winter when the required cooling load is lower so as to minimise the impact on the daily operation of the Dental Hospital. The whole project will be conducted within the premises of the Dental Hospital (please see **Annex C**). The tentative timetable is as follows -

- Tender invitation  
  
(Mid-July – mid-August 2010): 1 month
- Evaluation and approval of tender  
  
(Mid-August – end September 2010): 1.5 months
- Submission of equipment/installation methodology, authority approval and subsequent equipment/material delivery  
  
(October 2010 – end January 2011): 4 months
- Installation, testing and commissioning of the chillers (Phase I)  
  
(February – end May 2011): 4 months
- Installation, testing and commissioning of the chillers (Phase II)  
  
(November – end December 2011): 2 months

19. It is anticipated that the replacement works will start in February 2011 for completion in December 2011.

### **PUBLIC CONSULTATION**

20. We consulted the Food, Environment, Hygiene and Works Committee of the Central and Western District Council on the proposal on 25 March and 20 May 2010. The proposed project was supported by the Committee.

### **WAY FORWARD**

21. We will seek funding approval from the Finance Committee for the replacement of the central AC system for the Dental Hospital.

### **ADVICE SOUGHT**

22. Members are invited to support the proposed project.

Food and Health Bureau

June 2010

Alignment of the Sea Water Cooling Pipes



 sea water cooling pipes

**Annex B**

**Record of Burst of the Sea Water Cooling Pipes of  
the Prince Philip Dental Hospital since 2007**

<b>Time of Burst</b>	<b>Time of Completion of Repair</b>	<b>Location</b>	<b>Repair Cost</b>	<b>Time to Repair (in hours)</b>
10 Jan 2007 ~1615 hours	29 Jan 2007 ~1130 hours	Near the intersection of Eastern Street and Des Voeux Road West	~\$473,600	~451
22 Mar 2007 ~0815 hours	24 Mar 2007 ~0845 hours	Near the intersection of Eastern Street and Connaught Road West	~\$73,100	~49
5 May 2007 ~1030 hours	8 May 2007 ~0100 hours	Near Chung Kong Road	~\$96,000	~63
31 Dec 2007 ~1000 hours	23 Jan 2008 ~1700 hours	Pump House at Sheung Wan	~\$69,600	~559
21 Apr 2008 ~1800 hours	27 Apr 2008 ~1700 hours	Near the intersection of Eastern Street and Des Voeux Road West	~\$397,600	~143
2 June 2008 ~1800 hours	3 Jun 2008 ~2300 hours	Near the intersection of Eastern Street and Des Voeux Road West	~\$86,300	~29
11 Mar 2009 ~0900 hours	13 Mar 2009 ~0800 hours	Near the work site of the Drainage Services Department at Western Fire Services Street	~\$58,000	~47
2 Sep 2009 ~1000 hours	7 Sep 2009 ~1900 hours	Pump House at Sheung Wan	~\$27,840	~129
21 Sep 2009 ~0740 hours	22 Sep 2009 ~0200 hours	Eastern Street	~\$174,000	~19
<b>Annual Average Repair Cost and Average Mean-Time-To-Repair</b>			~\$485,000	~165

Annex C

Proposed Locations for Installation of Cooling Towers on Top Floor

