

**For discussion
28 January 2011**

Legislative Council Panel on Transport

Highway Repair and Maintenance by Highways Department - Current Approach and Future Development

Purpose

This paper briefs Members on the current approach and future development of highway repair and maintenance by the Highways Department (HyD).

Background

2. With the growth of Hong Kong's economy and the improvement of people's quality of life, transport demand of the public is ever increasing. For this, in addition to optimising highway and railway networks and improving public transport services, it is also of paramount importance to ensure that repair and maintenance of existing highways are properly handled.

3. HyD is responsible for the repair and maintenance of highways in Hong Kong. In recent years, a number of new highways, bridges and tunnels have been completed one after the other, while existing highways have started to show signs of aging, hence, repair and maintenance works is increasingly demanding. At the same time, the public is having increasing aspirations in respect of the degree of comfort, safety, environmental friendliness and aesthetics of road transport. Hence, HyD needs to strive for continuous improvement in highway design to meet public expectation.

Policy on Highway Repair and Maintenance

4. Highway facilities are prone to daily wear and tear. Whilst minor defects may cause inconvenience to road users, major defects may undermine road safety. HyD's primary duty in highway maintenance is to rectify road defects or prevent them from occurring, so that our highways are always in their best condition for use by drivers. Highway

repair and maintenance works can be divided into two types : corrective repairs and planned maintenance.

5. Corrective repairs focus on rectification of defects, after receiving reports of damaged road facilities from the public or identification of road defects during regular inspections, with a view to reinstating the defective road surface as soon as possible. Corrective repairs mainly include patching of pot holes, sealing of cracks on pavements, fixing damaged traffic signs, etc.

6. Planned maintenance is, in contrast, preventive in nature, the priorities and programmes of which are determined on the basis of the design standard and current conditions of individual highway facilities, as well as the quality and durability of the materials employed. The aim of these maintenance works is to allow more comprehensive rehabilitation works bringing long lasting improvement, after the facilities show signs of the wear and tear, but before serious defects emerge. Such works are usually of a larger scale and take more time to complete.

7. HyD has an established practice of conducting regular inspections on public road across the territory to identify, as early as possible, defects that pose dangers or cause inconvenience to the public and arrange for follow-up actions. The frequencies of these “safety inspections” mainly depend on road types : expressways carrying high-speed traffic and high traffic throughput are inspected daily; trunk roads and other primary distributor roads in urban areas are inspected weekly; other roads are inspected once every one to three months. In addition, HyD’s road inspection teams also conduct “detailed inspection” for all road types once every six months, to determine the surface and structural conditions of the roads and collect relevant data for planning mid- and long-term repair works so that maintenance could be done in an organized manner for preventive purpose.

Major Works Items requiring repair and maintenance

8. In conducting highway repair and maintenance works for road facilities, items involved are mainly road surfaces and street furniture. Such facilities are of utmost importance to road safety, but at the same time are prone to wear and tear or damages due to long term usage or traffic accidents. Hence, special care must be taken in carrying out repair and maintenance works.

Road Surfaces

9. At present, Hong Kong's road network measures around 2 075 km in total length. Depending on their characteristics, these roads are paved with either bituminous materials or concrete. Three-quarters of the roads in the territory are paved with bituminous materials and the remaining one-fourth are paved with concrete¹. Generally speaking, the design life of bituminous pavement is 20 years and that of concrete pavement is 40 years. This notwithstanding, continuous use still causes wear and tear of the roads²; it is thus necessary to arrange various degrees of repair works. The rate of wear and tear is closely related to the usage rate of a road. In general, the road surface of most highways can remain in their best conditions for 8 to 10 years without the need to carry out major repair works.

10. When making corrective repairs to rectify road surface defects (e.g. pot holes or cracks), HyD will try to adopt methods that can reinstate the road promptly with minimum impact on traffic. This involves, for example, using light construction plant and rapid-setting materials. According to HyD's performance pledge, the department will complete repairs within 48 hours upon receipt of reports of road defect.

11. Planned maintenance of road surfaces involves the resurfacing or reconstruction of longer road sections, so as to achieve longer lasting improvements. Planned works will have higher standard of quality control than corrective repairs, and will require larger construction plant (e.g. concrete mixers, concrete cutters, asphalt millers, pavers, etc.) . Since the works will be carried out under temporary traffic arrangements, the need to re-open the roads to traffic is not imminent, and ordinary materials instead of rapid-setting materials can be used. This can help reduce cost and at the same time improve durability after re-paving or reconstruction.

¹ Previously, roads carrying a high volume of heavy vehicles were mostly paved with concrete, which is more durable than bituminous pavement. However, with advancing technology, the durability of bituminous materials has improved. And as the traffic impact caused by repair and maintenance works on bituminous pavement is less than those on concrete pavement, road surfaces are normally paved with bituminous materials nowadays.

² The major factor contributing to damage of road surfaces is wear and tear generated by traveling vehicles. If traffic throughput or vehicle weight (including overloading) exceeds the estimated figures determined in the design stage of a particular road section, the rate of wear and tear will also accelerate. Other factors contributing to damage of road surfaces include excessive braking, or leakages of engine oil or gas oil that corrode the bituminous pavement. On the other hand, flooding or accidents involving underground pipes may also cause damage to roads.

Street Furniture

12. Beside road surfaces, road facilities maintained by HyD also included various types of street furniture. They include traffic sign plates, crash barriers, railings, gully gratings, street lights, and traffic bollards, etc. These installations are also essential for ensuring uninterrupted traffic flow and road safety. However, they are particularly prone to damage caused by daily wear and tear, traffic accidents, and also vandalism or theft. In this regard, HyD has pledged to complete repairs of damaged traffic signs within 48 hours upon receipt of notifications.

13. In addition to replacing damaged street furniture, HyD will also inspect and clean these facilities on a regular basis.

Continuous Improvement

14. HyD has made special efforts in integrating environmental considerations into all stages of its work so as to increase environmental and greening elements in the planning, design and construction of capital works projects. In highway repair and maintenance, HyD has also adopted a proactive approach, through asset management as well as research and development, in placing importance to the improvement of the environment, and at the same time enhancing the effectiveness of such work. The following paragraphs give a brief account of the measures taken by HyD in recent years to improve road repair and maintenance. HyD will continue to explore and examine the possibility of introducing suitable new technologies for road repair and maintenance.

Management of Repair works

15. HyD has introduced a Geographic Information System (GIS) for the ease of record-keeping and speedy searches of information on public roads or street furniture maintained by HyD. Efficiency of maintenance works can thus be enhanced and resources can be utilised more effectively. Continuous efforts are also being made by HyD to enhance the performance of the GIS for better planning of repair works in future.

Beautification Works

16. At the same time, HyD carries out, on the basis of actual need, streetscape enhancement works such as planting at suitable locations and

improving road surfaces, lighting and street furniture. Plants are also grown and systematically maintained by HyD on roadside slopes and along expressways, so as to ensure that the vegetated areas are always coated in rich greenery and at the same time traffic signs at roadsides are not blocked by overgrown vegetation posing danger to drivers. To ensure public safety, HyD will carry out risk assessments and appropriate risk mitigation measures for trees under their management according to the Tree Risk Assessment Arrangement promulgated by the Tree Management Office. HyD will also carry out greening works with available resources, including planting works under regular road maintenance contracts at locations suitable for greening (but not yet done so), and exploring more opportunities for greening.

Improvements to Bituminous Pavement Works

17. Highway maintenance works usually generate a substantial amount of construction and demolition materials, including the old bituminous pavement resulting from milling of road surfaces. To minimize the amount of waste generated by such road works, HyD has taken the initiative to recycle used bituminous materials. The procedures involve the milling of defective road surfaces, and transporting the bituminous waste generated from maintenance works to the factory for sorting and screening. The recyclable portion will then be mixed with raw bituminous materials for paving the road surfaces. HyD has already incorporated the requirement of using recycled asphalt pavement (RAP) into four highway maintenance contracts and six highway construction/improvement contracts. Under the above contracts, contractors are required to use bituminous materials with a RAP content between 10% to 15%. Moreover, HyD is examining the feasibility of extending the use of RAP to other contracts, and further increasing the percentage of RAP content in bituminous materials in such contractual requirements.

18. Other than recycling bituminous materials, HyD has also introduced, on a trial basis, a thermal patcher that is suitable for performing minor repair works on bituminous pavement. This involves the use of infra-red radiation emitted from a truck mounted thermal patcher to heat up and soften the defective bituminous surface of the pavement. The softened bituminous material will be mixed with raw materials as needed, and then compacted to ensure that new pavement formed is seamless and not bumpy. Not only can the thermal patcher promote recycling the bituminous surfaces, but also improve the

structural integrity through the seamless reinstatement technique. This type of patcher is small in size and can speedily operate in corrective repair works. And as the thermal patcher only occupies a small area of road surface, it can be used in narrow roads where the operation of large machines is not suitable. In two maintenance contracts that came into effect in 2009, HyD has already required the contractor to accord priority to the use of thermal patchers in permanent reinstatement of defective bituminous surfaces where the area involved does not exceed 2.5m².

Design and use of materials for Street Furniture

19. HyD is also committed to incorporating environmental considerations in the design and use of materials for street furniture. Taking gully grating as an example, HyD has conducted trials on the use of gully gratings made of synthetic materials composed of fiberglass and waste rubber tyres. This type of gully grating is in line with the environmental friendliness principle. HyD has already developed corresponding design specifications and incorporated them into the new highway maintenance contracts for 2011, specifying that it is acceptable to use this type of gully grating.

20. Trials are also being conducted by HyD to explore the feasibility of using non-illuminated retro-reflective traffic bollards (NRTBs) for energy saving. The NRTBs, which can function without electricity, are visible to motorists in the daytime as well as nighttime. The repair and maintenance costs are substantially lower than those of conventional traffic bollards. At present, there are about 10 500 traffic bollards in the territory. Results of HyD's initial trials involving 500 NRTBs show that an annual saving of 55 000 kWh (i.e. 5 %) in total electricity consumption can be achieved. Moreover, the average annual damage rate of NRTBs is only 5%, which is substantially lower than that of conventional traffic bollards, which amounts to 35%. HyD is conducting further research on other designs of the NRTBs to ascertain their technical functionalities and cost effectiveness, with a view to using this type of bollards extensively at suitable locations so as to achieve the purpose of ensuring road safety in an environmentally friendly manner.

**Highways Department
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