# Research & Technology

We continue to focus our researches on environmentally friendly technology, such as introducing enhanced application of recycled aggregates in sub-base materials and developing a holistic strategy to extend the life of bituminous pavement.

## Use of Recycled Aggregates for Full Depth Sub-base in Carriageway

Recycled aggregates are crushed concrete or crushed rocks generated from construction or demolition works, and are currently allowed to be used in 60% of the thickness of the sub-base in carriageway to partly substitute natural aggregates. To further enhance environmental friendliness, the Highways Department has been conducting studies to review the latest overseas' practices in using recycled aggregates to replace all natural aggregates in the sub-base in full depth. Site trials have also been carried out at Castle Peak Road – Tai Lam Section near Siu Lam, Sha Tau Kok Road and a road section near Lam Kam Road roundabout to verify their performance. With the satisfactory performance of the road pavements at these trial locations and with agreement of the Development Bureau, the Highways Department aims to introduce the use of recycled aggregates in full depth of the sub-base of local distributors and feeder roads.

Laying Recycled Aggregates as Sub-base in Trial Site

Recycled Aggregates Used as Sub-base Materials

## Adoption of the Long-life Bituminous Pavement Strategy

Full depth road reconstruction down to soil foundation unavoidably induces inconvenience to road users and causes nuisance to nearby residents. To effectively eliminate the large scale reconstruction of bituminous carriageway, the development of a long-life bituminous pavement strategy for Hong Kong thus comes into place. The strategy makes reference to the latest international understanding that a pavement designed to an adequate roadbase thickness would not manifest structural failure. With timely maintenance and appropriate rehabilitation works, the service life of a well-designed and properly constructed pavement structure can be prolonged sustainably and the need for major reconstruction becomes remote.

Resurfacing Works at Yu Tung Road, Tung Chung

The strategy comprises an integrated approach covering proper design and construction, regular monitoring of road defects, timely implementation of stop-gap repairs and rehabilitation works to restore the pavement serviceability and integrity and to avoid distress proliferation to such a manner that full depth construction is required. The relevant design guidelines have been promulgated in 2013 for implementation. In the long run, the overall life cycle cost for our road asset and environmental impacts induced by their reconstruction can considerably be reduced.

## Use of Polymer Modified Stone Mastic Asphalt Robust Surfacing

PMSMA Surfacing at Sha Tau Kok Road

To better reap the benefit of the long-life pavement strategy, the performance and durability of the surfacing layer are of a vital role. Local maintenance experience tells that early distresses of heavily trafficked bituminous carriageways are not uncommon. Unstable behaviours of bituminous surfacing under high local temperature and severely stressed locations are major contributing factors leading to the premature development of rutting and shoving on our normal surfacing materials. After a series of laboratory evaluation and progressive field verification, stone mastic asphalt with polymer modified bitumen (PMSMA) has been confirmed to be a more durable material, though more costly, bringing in higher stability against heavy traffic loading, even during hot summer, to suit the prevailing local environment. Based on these findings, the Highways Department since 2012 includes provisions in its term contracts to use PMSMA to address early distresses of heavily trafficked bituminous carriageways. The frequency of resurfacing at heavily stressed road sections as well as its associated traffic and environmental impact are reduced after using this robust surfacing.