

ROAD INTERSECTION AS STORMWATER DETENTION BASIN

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ABSTRACT

This study is exploring the potential of transforming road junction with dual functions in supporting traffic flow and accommodating stormwater detention. High loading capacity in specialist concrete could be used to construct precast concrete modular units, as it could be strong enough to allow passing of vehicles. It could also be molded to form hollow chambers that function as temporary stormwater storage. A modelling case study is presented to showcase the application of such stormwater on-site detention system. Initial modelling has indicated that the design could reduce the flow of urban runoff by 40-50% on road surface; and the running water could be fully captured within a height 0.4 m of underground storage.

Keywords: Flash flood; junction; road drainage; subsurface; pavement.

1 INTRODUCTION

Nowadays, cities are becoming busier with more and more vehicles each year. Hence, road drainage is one of the important necessities to have well-managed roadways. During the rainy season, rainwater can accumulate rapidly on the road surface and thus causing the occurrence of flash flood. The phenomenon that called “stripping”, well explains the problem of water damage to asphalt pavements (Kandhal et al., 1989). This could cause the road to crack and forming potholes on the road. These situations should be avoided because it can be costly to observe maintenance on the roads. Besides, stormwater runoff forms a thin film of water and as it flows at the edge of the road pavement, its speed increases. It is also known as hydroplaning.

In the particular case in Figure 1, the road junction has a wide impervious surface area. This causes the time taken for the stormwater runoff to discharge out of the site to be longer. Therefore, ponding happens on the road junction for a certain period of time. The infiltration process is not possible on this particular land cover because road pavement is made of asphalt. The ponding on the road junction can be a disturbance because it can cause accidents, washouts, and delay to drivers and pedestrians. Besides that, it is known to cause deterioration to the road structures after repetitive flash flood events.



Figure 1. Surface runoff on the road (<http://www.straitstimes.com>, Published 10 Dec 2015).

2 MOTIVATION

In addition to poor road drainage, road junction, as according to JKR Sarawak, suffers damages quite often due to the traffic loads of reducing speed at traffic lights instantly and picking up speed when the traffic light changes the cycle to red or green. There is a request to improve the strength of the pavement materials for the road junction. Thus, this study is attempting to solve both problems simultaneously using precast concrete units under the road junction for pavement and urban runoff control.