A review on green pavement hydrological design and recommended permeable pavement with detention storage

A review on green pavement hydrological design and recommended permeable pavement with detention storage

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Abstract. This paper reviews innovation of green pavement technology for storm water management in an urban environment. This can be related with hydrological performance and assessments of the permeable pavement. Features of the typical permeable pavement are presented and discussed. Topics covered include recognizing important of permeable pavement, stormwater management benefit and detailed hydrological properties and design. The information in this paper provides stakeholders with an overview of research and development of green pavement. In particular, it discussed the benefit and advantages of the green pavement in current use. On the other hand, the permeable pavement with subsurface detention namely StormPav is presented. The hydrological design modification and innovation, as well as hydrological design and stormwater management benefits have been summarised. Therefore provided another option for green pavement infrastructure series to be used in roadworks.

Keywords: Stormwater management, green pavement infrastructure, permeable pavement, hydrological design, hydrological assessments

1. Introduction

Urban development affects land-use changes and thereby influences the natural hydrological cycle [1]. Percentage of land covered by impervious surfaces varied significantly with the changes of land use Arnold et al. [2] to cause a depletion in groundwater recharge, reduction in infiltration rate, creation of more runoff and thereby increasing the flood events [3,4]. Surface-water flooding in urban areas has become a critical issue due to the changing of precipitation patterns, congestion of the stormwater drainage system, expanding of urban areas and aging of drainage infrastructure [5]. The conventional approaches in stormwater management were mainly designed to reduce the peak flow but not the runoff volume. Consequently, it may lead to the occurrence of flood at downstream areas due to the excessive runoff. This is primarily a major issue in stormwater conveyance systems. It was normally addressed by enlarging the hydraulic capacity of the systems [6] and expanding existing urban drainage systems [4]. However, enlargement of the existing system had been proven its ineffectiveness in terms of economy and sustainability [4]. As a result, sustainability has appeared as the main concern while designing the stormwater management infrastructure since 1990s.

In past, there are numerous attempts to embrace sustainability in the design of stormwater intercourse [7-10] . Among the efforts, source control of stormwater with green infrastructure (GI) or