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STORMPAY PAVEMENT USING DIFFERENT WHEEL LOADS

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ABSTRACT: Distress models are required during design to ensure the pavement have a longer service life that is conducted for different axle weight. This research addresses by modeling and analyzing StormPav pavement under various wheel loads to ensure pavement structures can withstand these loads. StormPav pavement is made up of precast concrete with Grade 50, which is also known as the innovative IBS Green Pavement, which has a combination of structural, environmental and economic advantages. The analysis of mechanistic behavior for different structures of pavements and mechanistic behavior of precast StormPav pavements using different wheel loads. WinJULEA and KENPAVE are software used for this research for modeling the real scenario to obtain the deflection, stress, strain and stress of each layer of pavement. It is found that total ESAL increases when there is a heavier truck acting on top of the pavement, and precast StormPav pavement receives the lowest total ESAL compared to flexible and rigid pavement. Among various types of pavements, precast StormPav has lesser maximum deflection, which had 65.11% lesser compared to the flexible pavement due to its largest elastic modulus. Besides, when there is loading from a 24-tonne truck acting on top of the precast StormPav pavement, total deflection is 0.761mm and increases 0.064mm (8.345%) when there is loading change to 26-tonne truck, as precast StormPav pavement is made up of concrete grade 50, which can resist to heavier loading. Precast StormPav pavements have the highest maximum allowable load repetitions to prevent fatigue cracking due to their increased flexural strength, which enables them to withstand greater stresses above the structure. As a result, it can be concluded that precast StormPav pavement is a viable alternative to the pavement because it requires less time for construction and sustains less damage when subjected to heavier loads.

Keywords: Distress, StormPav, KENPAVE, WinJULEA, Wheel Load

1. INTRODUCTION

The two most common pavement structures in the road industry are flexible and rigid pavement. There is a pavement type selection process (PTS) that transportation agencies, including Jabatan Kerja Raya (JKR), can follow when selecting appropriate pavement structures for a particular project. The PTS process involves the detailed analysis of various pavement design factors, such as design volume, material properties and environment [1]. Besides, the initial cost, costing for overall annual maintenance, and other costings during its service life cost also play an important role in the pavement selection process. Each type of these pavement structures is different compared to each other in several aspects. This involves the design procedure, period for service life, deterioration (distress models), construction, and rehabilitation options [2].

The pavement can be evaluated by analyzing the road pavement's performance. Among the numerous types of distress, the most significant one that has a significant impact on pavement performance is fatigue cracking and rutting [3]. Fatigue cracking occurred as a result of horizontal tensile strain at the asphalt layer's base. Meanwhile, excessive vertical compressive strain at the subgrade layer's top will result in permanent deformation or rutting of the pavement structures. In pavement design, fatigue and rutting modes of distress must be considered and balanced to fully utilize the pavement material in an economically feasible design [4].

Apart from that, the drainage system incorporated into the pavement structure plays a significant role in the pavement's performance [3]. The drainage system is responsible for the management of existing watercourses, the removal of water from pavement structures, and the control of subsurface water in pavement structures, particularly rainwater runoff. As a result, it is critical to ensure that the pavement is equipped with an effective drainage system that can service the road and drain water caused by rain floods. Moreover, there is insufficient filtering vegetation