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STRUCTURAL DISPLACEMENT BEHAVIOUR OF PRESTRESSED CONCRETE SLEEPERS SUBJECTED TO PASSENGER TRAIN LOADING AND THE SOIL CONDITION AT NORTHERN REGION OF MALAYSIA

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MSc

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

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ABSTRACT

Nowadays, trains are a main transportation connecting people and transferring goods in Malaysia. However, KTMB reports showed that the number of passengers is increasing every year. Due to the increasing number of passengers, the railway track maintenance team actively carried out the location had displacement of concrete sleeper due to ballast void or soil settlement. Since, the railway track development increased gradually in Malaysia, the incidents involved train derailment also reported in news. One of them, caused by soil erosion at Johor Bahru. Meanwhile, the other incident believed that related with displacement of concrete sleeper caused the soil condition itself. Therefore, the aims of this research are about to study structural displacement behaviour of prestressed concrete sleepers subjected to passenger train loading at Northern region. The study began with site monitoring of ETS passenger trains and six coaches commuter, the different soil condition by selected location at Pinang Tunggal and Kobah, sand silt and soft soil respectively. The equipment used in this study at site investigation were vibrator analyser and piezometer. Vibrator analyser is a machine connected from a piezometer to a computer that had been installed with a software called Dewesoft. Meanwhile, piezometer is attached on concrete sleeper to record data from the trains which passed through in term of displacement. In Dewesoft, a double integration from raw data processed in terms of acceleration and time was running to determine the displacement of a concrete sleeper. Another monitoring for experimental works also carried out which involved for one sample concrete sleeper as dynamic load testing. The testing procedures as following Australian Standard 1085.14:2012. However, the equipment at laboratory was using Universal Testing Machine to place concrete sleeper for testing. Meanwhile, piezometer and LVDTs were connected to the data logger and vibration analyser accordingly and reading showed the computer. As evaluation for both monitoring, it concludes the factors influenced the displacement were the highest acceleration given the high impact on displacement of concrete sleeper. Another thing was the soil condition found had water table during preliminary works testing. Among the results gained from testing carried out clearly showed that displacement at Pinang Tunggal with soil conditions and silty have recorded 7.40 mm higher than displacement at Kobah soft soil 0.15 mm. The conclusion showed that the impact of speed trains caused the displacement of concrete sleeper at railway track even at different soil conditions. A thorough research has been done to determine the actual displacement concrete sleeper at different soil has been proved. The authority should then be told that the areas must be maintained according to the different of displacement based on soil conditions.

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TABLE OF CONTENTS