UNIVERSITI TEKNOLOGI MARA

EMPIRICAL MODEL OF GROUND BORNE VIBRATION FROM RAILWAY TRAFFIC

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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.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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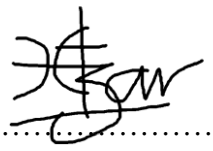
Signature of Student	:	 ……..
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ABSTRACT

Ground-borne vibration induced by rail traffic imposes adverse impacts towards residential areas that are located close to the railway tracks. Residents that are exposed to regular ground-borne vibration would not only experience sleep disturbance but also could develop more serious health problems over the long term. This includes the mental well-being of the residents living nearby. Direct exposure to the ground-borne vibration induced by trains could also potentially affect the productivity and quality of life of the residents. The important of ground borne vibration elements in design stage was the motivation of this research being conducted. This research is intended to propose an additional solution to the existing guidelines and standards on vibration limits and environmental control set by the authority. The empirical research integrated Malaysian railway traffic, climate and geological conditions. In this study, identifying the vibration level induced by rail traffic will determine the level of annoyance and discomfort experienced by the residents living close to the railway tracks. This data can be used to mitigate the problems created by the ground-borne vibration in Malaysia. In order to explore the solution to the presented problems, this study has developed a prediction model of regression to forecast the peak particle velocity of the ground-borne vibration induced by commuter and freight trains. The models developed have considered a few parameters that can be obtained from site surveys using minimal or without tools altogether. The data collected was measured along the ground rail tracks involving human-operated trains. A landed residential area located near to the railway tracks were chosen as the case study area. The data collected, from all selected areas showed that the ground-borne vibrations exceeded the allowable limit stated in the Malaysia Department of Environment's guideline. Based on these substantial findings, the regression models for the ground-borne vibrations was developed in this research. Finally, the peak particle velocity models have been successfully developed, validated and the sensitivity analysis was conducted. Developing an empirical model that can predict the ground-borne vibration was required in the modelling process using actual data from the rail traffic following the rail traffic parameters. The regression analysis was conducted, and it was found that the distance and speed were the significant variables to predict the peak particle velocity. In the sensitivity analysis, the distance of the source to the receiver was recorded to be more sensitive variable for the commuter trains while for the freight trains, the speed was proved to be more sensitive variable. The established empirical models are anticipated to predict the ground-borne vibration due to the rail traffic particularly during the preliminary stage of the project and in the mitigation planning stage. The findings of this research are expected to provide a new perspective for the railway planners and designers to improve the national design in order to improve the quality of life for the residents living close to the rail track. This research study is hoped to firmly bridge the information gap towards a fundamental understanding of the ground-borne vibration that consists numerous areas of learning regarding the condition of the rail traffic operation.

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