

**RELATIONSHIP BETWEEN INTERNATIONAL ROUGHNESS INDEX (IRI)
AND PRESENT SERVICEABILITY INDEX (PSI)**

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AND PRESENT SERVICEABILITY INDEX (PSI)**

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requirements for the award of the degree of
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Dedicated to...

My beloved mom, dad, family and friends

APPRECIATION

Syukur Alhamdulillah, after a year of struggle and hard work, with the will of Allah Almighty, Finally this thesis is complete. The utmost thanks to Allah for giving me the strength to complete this thesis and the strength to keep on living.

For my mother, father and my family, thanks for all the support and contribution that you gave to me. Thank you for staying with me through thick and thin time and thank you very much for believing in me. I will never be here, if you never been there for me. All of you will never be forgotten.

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ABSTRACT

A good road structure may help in reducing the number of accident. Wearing course is the top layer of road structure which is the layer that exposed to the vehicle tires and environment. The International Roughness Index (IRI) and Present Serviceability Index (PSI) are both index that can be used as indicators of road roughness and serviceability. IRI was measured by using the walking profilometer. PSI data was collected manually. Both IRI and PSI was measured along the 100 m section of road. This study only focused on one type of road which was asphaltic pavement located in UTM (University Teknologi Malaysia). The objectives of this study are to determine the IRI, PSI and relationship between IRI and PSI. The statistical analysis which is R^2 value was used to evaluate the relationship between IRI and PSI. From this study, it was found that the IRI value increased when the PSI value is decreased. Mostly, the roughness of tested road for this study is unacceptable based on JKR (*Jabatan Kerja Raya*) Specification. While the PSI rating shows the tested road for this study is still in good condition.

Key Words: International Roughness Index (IRI), Present serviceability Index (PSI), Asphalt Pavement, Statistical Analysis

ABSTRAK

Sruktur jalan yang baik dapat mengurangkan kemalangan jalan raya. Lapisan haus merupakan lapisan yang paling atas yang terdedah kepada tayar dan persekitaran. *International Roughness Index* (IRI) dan *Present Serviceability Index* (PSI) adalah dua index yang digunakan untuk sebagai penunjuk kepada kekasaran permukaan jalan dan kebolehhidmatan jalan. IRI diukur dengan menggunakan *Walking Profilometer*. PSI data diukur secara manual oleh pengukur. Kedua-dua IRI dan PSI diukur sepanjang 100 m section jalan. Di dalam kajian ini, focus hanya diberikan kepada turapan anjal yang terletak di dalam kawasan UTM (Universiti Teknologi Malaysia) sahaja. Objektif kajian ini adalah untuk mendapatkan IRI, PSI, dan hubungan diantara IRI dan PSI. Analisis statistic iaitu nilai R^2 telah digunakan untuk menilai hubungan diantara IRI dan PSI. Daripada kajian ini, didapati IRI akan meningkat sekiranya PSI berkurangan. Kebanyakannya, jalan diuji tidak memenuhi spesifikasi JKR. Tetapi berdasar nilai PSI, ia menunjukkan kebanyakan jalan yang diuji masih lagi dalam keadaan baik.

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LIST OF ABBREVIATIONS

IRI	International Roughness Index
PSI	Present Serviceability Index
Rd	Rutting Depth
C1	Crack Length
Sv	Slope Variance
Pa	Patching Area

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CHAPTER 1

INRODUCTION

1.1 Background of the Study

Road network is the backbone of land transportation and facilitate the overall national development. Large amount of money have been invested in developing road infrastructure and a significant amount have been spent for their maintenance. Yearly maintenance allocation per kilometer for maintenance in 2002 is about RM 36,000 for Federal Roads and RM 15,000 for State Roads (Joseph Lim et al.2002).Before the maintenance process, the evaluation need to carry out to measure the level of failure of the pavement.

There exist of two types of pavement failure which are structural failure and functional failure. The first type, structural failure describes pavement structure incapable of carrying the traffic loads imposed. The second type, functional failure describes pavement structure incapable of carrying out their function at the intended serviceability. For example, causing discomfort to passenger or high stress to vehicles given their excessive roughness. The serviceability or riding quality of the road pavement is the major indicator of its service performance (T. F. Fwa et al.2005).

In order to classified or evaluate the pavement performance, the Present Serviceability Index (PSI) was used widely. The PSI was developed in equation to

correlate various parameters about the distress of pavement such as slope of variances, cracking, rutting and patching.

In addition, road roughness index such as International Roughness Index useful as an indicator of the level of the pavement smoothness. The index measures the roughness in term of the number of inches per mile.

1.2 Problem Statement

One of the primary responsibilities of the transportation department is to maintain their network. The surface quality and surface roughness has a strong influence on the public judgment of its serviceability. In general, a good performance of the pavement is the highest riding quality. International Roughness Index (IRI) and Present Serviceability Index (PSI) are both the parameter that used to represent the smoothness and the performance of pavement. The IRI obtained from direct measurement on the pavement by using the Walking Profilometer. The PSI measurement is conducting manually by the raters. Therefore, the PSI of the pavement may be different compared to the other raters. Besides that, a lot of time needs to spend in order to find out the PSI data because the raters must be observe manually along the road section. So, correlations need to produce between IRI and PSI in order to evaluate the pavement. From that correlation, its can be can estimate the IRI value based on PSI value. Therefore this study put in interest on the asphaltic concrete initiative and correlation between IRI and PSI.

1.3 Objectives of Research

The objectives of this research are to determine:

- The Present Serviceability Index (PSI) of the section of road at the study area
- The International Roughness Index (IRI) of the section of road at the study area
- The relationship between International Roughness Index (IRI) and Present Serviceability Index (PSI)

1.4 Scope of Research

This research was mainly focused on investigation of the functional failure of the asphaltic concrete pavement at the study area in order to find out the PSI and IRI data. Based on the observation, the deterioration of the road such as cracking, rutting depth and patching was measured. Besides that, the data of the PSI and IRI will use to classify the serviceability performance of the particular road at the study area. The study area was focused on the flexible pavement in UTM campus.

1.5 Significant of Study

The main objective of pavement construction is to provide the safe and comfortable quality of the road for users. However, the pavement condition deteriorates because of traffic, rainfalls, temperature, etc. The estimation and maintenance of pavement condition has some problems, for example lack of long-term pavement data, incomplete records, imprecise model, etc. In conclusion, this study attempts to develop the relationship between IRI and PSI. The findings of the study will also benefit to the authorities for further maintenance and classification of road conditions.