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Assessment on Existing Speed Bump at Parit Raja

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Abstract

This study was to investigates the speed bump dimensions and compliance for road safety. It highlights issues like vehicle damage and hindrance to emergency vehicles. The issue emphasizes improper installations causing safety concerns. The aims of this study was to assess dimensions, compliance, and deviations, focusing on contributing to road safety in the selected location (Parit Raja, Malaysia). Manual inspections using safety jackets and measuring tape inform the research, with statistical testing revealing non-compliance with JKR standards. As result, the authors found that specification of speed bump at Parit Raja does not follow the compliance of speed bump by JKR, as well as authors recommended to include immediate adjustments, monitoring programs, and collaborative efforts for improved road safety.

1. Introduction

This study in Parit Raja focuses on the dimensions and compliance of speed bumps to enhance road safety. Speed bumps, commonly made of asphalt, concrete, or rubber, aim to reduce accidents by strategically slowing down vehicle speeds. Vertical elevations on the road, often known as speed bumps, speed humps, or speed cushions, are frequently used in densely populated urban areas as a means of traffic calming (Antić et al., 2013). Vertical speed control devices, such as sleeping policemen or speed bumps, are often used and may be installed in various dimensions. Residential roadways are the usual location for these devices (Dinasty Purnomo, Handayani, and Syafi'I, 2018). When using it, cars must maintain speeds of little more than 10 kilometres per hour (Werner, 2015).

As to the Guidelines of Construction of Road Hump by Majlis Perbandaran Seberang Perai (2015), this is particularly relevant when taking into account the presence of public gathering places like schools, mosques, and recreational grounds in residential neighbourhoods. A comparison between speed bumps and speed humps highlights their impact on public transport routes. The trip of emergency vehicles like fire trucks, ambulances, police cars, and other similar vehicles will be affected because the drivers will have to take care of the vehicles while still doing their important jobs (Kosakowska, 2022). Improper installations, deviating from standards set by JKR, pose challenges. According to Salman and Mian (2023), unsafe road conditions can make drivers act in uncertain ways and do a lot of damage to cars, people, and walkers. Adding traffic control devices like speed bumps and humps could make it take longer for public transport to finish its runs (Kiran, Kumar, and Abhinay, 2020). The advantages of speed regulation are evident on several fronts: it not only enhances road safety but also contributes to improved cooperation among all road users, a greater quality of life for residents, and the development of more user-friendly communities. Speed bumps are a more direct way to make cars stay within the speed limit than speed humps, which only slow people down because they are bigger (Johnson and Nedzesky, 2016). Consequently, it promotes the use of active transportation (Antić et al., 2013). The study aims to assess dimensions, compliance, and deviations in Parit Raja, suggesting corrective measures for standardized and safer traffic calming. There were two prevalent instances of bumps: the first included humps that were

much lower than the typical height, resulting in inefficient and underutilised humps. This hindered the achievement of the primary purpose of the hump (Min, Ismail, and My, 2016). The aim of this study to determine the dimensions of speed bump at study location compliance the standard and specification set by Arahan Teknik Jalan JKR (2012) and to analyse the specification of current speed bumps at study location and compare with the standard and specification set by Arahan Teknik Jalan JKR (2012).

2. Research Methodology

This research comprises three sections: study area, data collection, and data analysis. The study area, Parit Raja, is detailed, encompassing residential, university, and commercial areas, chosen for its varied speed bumps and high vehicle traffic. The data collection process involves manually gathering information on speed bump specifications, focusing on dimensions and adherence to JKR (2012) standards. The equipment used includes safety jackets and measuring tape. The analysis section outlines the methodology, incorporating statistical significance testing, such as the Level of Significance, P-Value, and T-Test, to compare collected data with JKR standards. The research aims to provide insights into speed bump compliance in Parit Raja, ensuring they meet prescribed requirements for effective traffic calming. The flowchart and visuals illustrate the research process, enhancing clarity and understanding. The flowchart for the study is as shown in Figure 1.

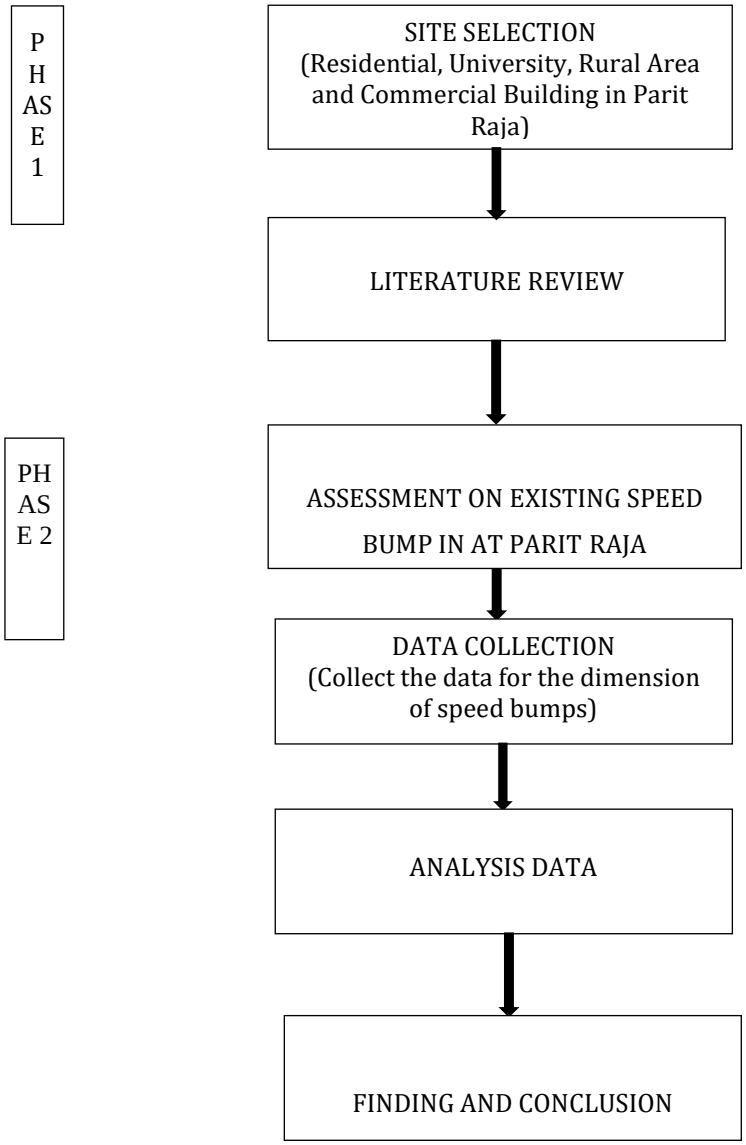

Fig. 1 *Flowchart of Study.*

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2.1 Data Collection

Data collection involves physically investigating the current usage of speed bumps in Parit Raja to assess compliance with Arahan Teknik Jalan JKR (2012) standards. The process is manual, conducted on-site without laboratory involvement. Utilizing safety jackets and measuring tape, the study aims for accuracy by collecting numerous speed bump samples. During on-site visits, dimensions and spacing of speed bumps are recorded in notes for further analysis. The equipment used for data collection is depicted in Figure 2, aligning with JKR guidelines requiring a height of 7.5 cm and a width of 30 cm for speed bumps (Jabatan Kerja Raya, Malaysia, 2018)

Fig. 2 *Measuring Tape*

2.2 Manual Data Gathering

The data manually collected at the study area include urban areas, residential area, industrial area and university. The data collected should be required in advance because in the study area there is a lot of traffic calming such as speed bumps, speed bumps and speed bumps. However, in this study, the data should be focused on the speed bump dimension data only. The data recorded and analyzed using Statically Differences.

3. Result and Discussion

3.1 Summary Specification of Speed Bumps at Parit Raja

Specification of speed bumps include height and width. This study analyzed the dimension of speed bump at Parit Raja whether it follows the specification b JKR or not. Table 1 provides a synopsis of the results of the investigation which aimed to identify the specification of speed bumps in four areas at Parit Raja.

Table 1 *Summary of Specification Speed Bumps in Parit Raja,Johor*

Location	Width (mm)	Height (mm)	Quantity
Residential Area	410	62	7
	400	75	
	300	100	
	400	75	
	300	65	
	300	75	
	350	75	
Rural Area	300	45	11
	300	75	
	360	43	
	300	75	
	330	50	
	300	75	

	300	65	
	340	75	
	300	75	
	350	54	
	400	62	
Commercial & Business Area	400	75	10
	300	75	
	300	50	
	300	75	
	410	62	
	300	75	
	300	50	
	300	75	
	400	75	
	300	75	
University Area	300	50	2
	300	50	

3.2 Specification by JKR

The term "traffic calming" refers to the practise of reducing the harmful impacts of cars on the environment and the quality of life of local residents, transforming dangerous driving into safe driving, and altering the environment of pedestrians and non-motor vehicles by the use of scientific infrastructure. Therefore, as prescribed, JKR has issued a predetermined specification for the installation of bumps. This specification consists of the height and width of the bumps. Specifications by JKR (2012) can be seen in the table 2 below:

Table 2 *Specification by JKR (2012)*

Materials used	Measurement
Asphalthic PremixWearing Course	(Round Top) * Width: 300mm * Height: 75mm at midpoint and transition at both ends * Distance: min 100m between hump to hump, min 10m from road junction

3.3 Level of Significance (α)

The level of significance (α) in statistical analysis is like a threshold set by researchers to decide if their findings are meaningful. It represents the chance of mistakenly rejecting a true idea, known as a Type I error. Commonly chosen values for α are 0.05, 0.01, or 0.10. When conducting tests, if the calculated p-value (the probability of seeing observed results if there's no real effect) is equal to or less than α, researchers reject the idea of no effect (null hypothesis). If the p-value is greater than α, they don't have enough evidence to reject it. The level of significance helps balance the risk of making errors in interpreting results, making it a crucial part of hypothesis testing.

3.4 P-Value

The level of significance (α) in statistical analysis is like a threshold set by researchers to decide if their findings are meaningful. It represents the chance of mistakenly rejecting a true idea, known as a Type I error. Commonly chosen values for α are 0.05, 0.01, or 0.10. When conducting tests, if the calculated p-value (the probability of seeing observed results if there's no real effect) is equal to or less than α, researchers reject the idea of no effect (null hypothesis). If the p-value is greater than α, they don't have enough evidence to reject it. The level of significance helps balance the risk of making errors in interpreting results, making it a crucial part of hypothesis testing. Table 3 below shows that the use of the level of service for data analysis.

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Table 3 *Summary of P-Value Deinition*

p-Value	Interpretation
≤ α (e.g., 0.05)	Reject the null hypothesis; evidence for an effect
> α (e.g., 0.05)	Fail to reject the null hypothesis; lack of evidence for an effect

3.5 T-Test

A T-Test is like a tool used in statistics to figure out if two groups are different from each other and it suitable for this study. In analyzing the data collected for this thesis, the t-test was chosen due to its suitability for small sample sizes, providing a robust evaluation of whether observed group differences are likely to be genuine or merely a result of chance. For the analysis the data using T-Test, the use of Microsoft Excel is practiced facilitating the calculation of data indirectly facilitate this study to obtain results whether the data collected is different or not with the specification of JKR. the distribution of data for the analysis performed in Microsoft Excel as shown in the Table 4 and 5 below.

Table 4 *t-Test: Paired Two Sample for Means for Width of Speed Bumps*

Speed Bumps	*PR*	*JKR*
Mean	33	30
Variance	17	0
Observations	29	29
Pearson Correlation	-	
Hypothesized Mean Difference	0	
df	28	
t Stat	3.734	
P(T<=t) one-tail	0.000	
t Critical one-tail	1.701	
P(T<=t) two-tail	0.001	
t Critical two-tail	2.048	

From the Table 4, the data show that p-Value for analysis of speed bump at Parit Raja compare to specification by JKR is 0.001. According to the Level of Significance, this study uses 5% equal to 0.05. Based on data from the table, p-value is less than the level of significance which is there is significance difference.

- **Null Hypothesis (H_0):** There is no significant difference between specification of speed bump at Parit Raja, Johor and specification of speed bump by JKR (2012).
- **Alternatives Hypothesis (H_a)**: There is significant difference between specification of speed bump at Parit Raja, Johor and specification of speed bump by JKR (2012).

If the p-value is less than the level of significance (α = 0.05 in this case), this study rejects the null hypothesis. Due to speed bumps at Parit Raja do not compliance specification width of speed bump by JKR.

From the Table 5, the data show that p-Value for analysis of speed bump at Parit Raja compared to specification by JKR is 0.003. According to the Level of Significance, this study uses 5% equal to 0.05. Based on data from the table, p-value is less than the level of significance which is there is significance difference.

- **Null Hypothesis (H_0):** There is no significant difference between specification of speed bump at Parit Raja, Johor and specification of speed bump by JKR (2012).
- **Alternatives Hypothesis (H_a)**: There is significant difference between specification of speed bump at Parit Raja, Johor and specification of speed bump by JKR (2012).

If the p-value is less than the level of significance (α = 0.05 in this case), this study rejects the null hypothesis. Due to speed bumps at Parit Raja do not compliance specification height of speed bump by JKR.

Table 5 *t-Test: Paired Two Sample for Means for Height of Speed Bumps*

Speed Bump	*PR*	*JKR*
Mean	7	7.5
Variance	2	0
Observations	29	29
Pearson Correlation	-	
Hypothesized Mean Difference	0	
df	28	
t Stat	-3.233	
P(T<=t) one-tail	0.002	
t Critical one-tail	1.701	
P(T<=t) two-tail	0.003	
t Critical two-tail	2.048	

4. Conclusion

Based on the result of the analysis data, the conclusion of this research can be concluded as follows:

1) Width Difference: Speed bumps in Parit Raja are wider (33 cm) than the standard (30 cm) set by Jabatan Kerja Raya (JKR), with a significant gap found in the t-test (p-value = 0.001). Corrective actions are needed for compliance with safety standards.
2) Height Variation: The height of Parit Raja speed bumps (7 cm) differs significantly from the JKR-specified height (7.5 cm), as confirmed by a t-test (p-value = 0.003). Immediate adjustments are required to meet JKR standards.
3) Urgent Corrections: Both width and height differences highlight the need for prompt corrective measures, possibly adjustments or reconstruction, to align speed bumps with safety regulations.
4) Safety Priority: Rectifying these disparities is crucial not just for meeting regulations but also for enhancing road safety. Timely actions by authorities are essential for a safer and standardized traffic calming setup in Parit Raja.

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Conflict of Interest

Asyraf Bin Othman, one of the authors, certifies that there is no conflict of interest related to the publishing of this journal paper and that there are no personal or financial ties that might improperly affect the content. Any possible financial or personal conflicts of interest that could have affected the research's findings or interpretation have been declared.

Author Contribution

The author confirms sole responsibility for the following: study conceptual and design, data collection, analysis and data interpretation of results, and manuscript preparation.

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