Comparison of critical sliding velocity for different condition of pavement

Visar BAXHUKU, Odhisea KOÇA, Alishukri SHKODRA

***Abstract*—** This paper presents the monitoring of vehicle movement, namely the developing of speed of vehicles during movement in a certain curve. The basic geometry data of curve are measured, with the purpose of calculating the critical sliding velocity. During the research was realized measuring developed speed of passenger vehicles, for the real conditions of the road surface – dry road with average damage. After setting values, the analysis was done in function of safety movement in curve

Index Terms — Critical, sliding, velocity, moving , curve, passenger vehicles, safety.

---

1 INTRODUCTION

Critical sliding of vehicle during movement in curved road, is the critical point when starts non-stable movement or uncontrolled vehicle, which in the most extreme case ends with his rollover. This phenomenon appears as a result of changes in the size and direction of the forces influencing, where the emphasis is particularly in centrifugal force (fig.1).

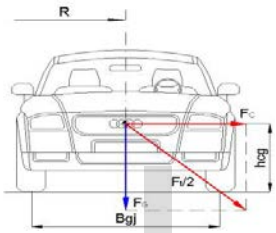

Fig.1. Influential forces in the vehicle during the movement in twist

In mathematical way calculated critical sliding velocity of vehicle during movement is done through expression-formula (Rotim, 1997):

$$v_{rresh} = 11.27 \cdot \sqrt{R \cdot \frac{\mu_t + \mathrm{tg}\,\beta}{1 - \mu_t \cdot \mathrm{tg}\,\beta}} \qquad (1)$$

when are:
Vrresh – critical sliding velocity,
R- the radius of curve,
μ_t - lateral coefficient of friction,
β - lateral road slope.

2 CALCULATION AND MEASURING CRITICAL SLIDING VELOCITY

Through this expression we can calculate critical sliding velocity of vehicle during movement in curve. But by analyzing the parameters influencing, should be investigated threw measurement of vehicles speed development, in the same curve. For this purpose, are consider in scrutiny three specific curves in the road M 25.2 (Prishtinë – Gjilan).

Initially, is calculated critical sliding velocity of vehicles during movement in the curve, for each curve, expressed in fig.1 results are presented in tabular form:

Nr	Twist	Calculated critical sliding velocity [km/h]		
		Dry	Wet	Ice and snow
1	Curve I (R=110 m; β =6.14^0)	86.64	72.69	48.92
2	Curve II (R=140 m; β =4.28^0)	93.64	77.62	49.09
3	Curve III (R=130 m; β =4.75^0)	92.22	76.92	50.32

.

3 OBSERVATION OF MOVEMENT VELOCITY

Observing the speed of vehicles on selected curve, is done by measuring the speed achieved through speed radar Speedgun. Measurements are made without informing drivers, in order to avoid the attention and movement to be unidentified. Measured speed are presented in the following table for dry road conditions:

Measured speed	Minimal speed [km/h]	Average speed [km/h]	Maximum speed [km/h]
Curve I	45.00	61.47	76.00
Curve II	45.00	64.00	82.00
Curve III	47.00	68.53	84.00

4 GRAPHIC PRESENTATION

Graphically presented measured of speed and those calculated presented as follows:

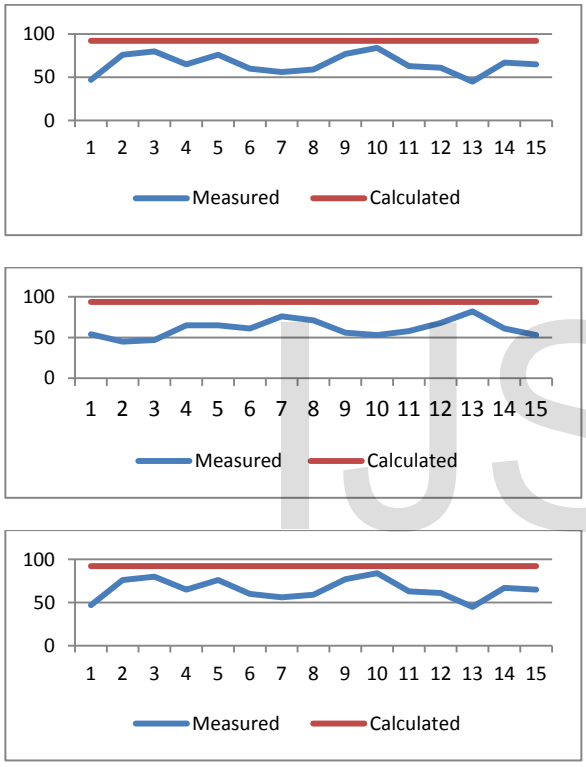

Fig.2. Measured and calculated velocity

5 CONCLUSION

By analyzing numerical and graphical data calculated and measured, as well as using the analogy with the expression level of security, we can represent the report between the calculated speed and what was realized (Geca, 2001):

$$S = \frac{v_l}{v_{rresh}} \qquad (2)$$

v_l-movement speed,
v_{rresh}-critical sliding velocity.

For cases monitored we have:

S_I=0.877;
S_{II}=0.875;
S_{III}=0.91.

Based on the obtained values and the expression for calculating the critical sliding velocity, can conclude that the speed of the vehicle is performed near the border values.

REFERENCES

[1] Dr. Franko ROTIM
"Elementi Sigurnosti Cestovnog Prometa"
Zagreb, 1997,
[2] Dr.sc. Ahmet GECA
"Siguria dhe Informimi në Komunikacion"
Prishtinë , 2001
[3] Inxh. Ismet SEJDIU
"Rrugët dhe objektet e komunikacionit"
Prishtinë, 2000
[4] L.David Roper
"Physics of Automobile Rollovers"
August 2003- USA
[5] Visar Baxhuku,
"Critical Sliding Velocity of vhicle moving in bended road"
Prishtina, 2007