MARYLAND DEPARTMENT OF TRANSPORTATION

STATE HIGHWAY ADMINISTRATION

RESEARCH SUMMARY

Evaluating the Correlation Between Slip Resistance and Skid Resistance of Pavement Markings at Crosswalks

WHAT WAS THE NEED?

Pavement markings are crucial for ensuring the safe and efficient movement of vehicles, cyclists, and pedestrians at crosswalks. They provide essential guidance in lane navigation, road sharing, and safety compliance. With a growing emphasis on safety in urban areas, crosswalk markings are becoming more prevalent. These markings, while effective in terms of visibility, must also meet friction standards to ensure the safety of all road users. Thus, there is a need to evaluate their friction performance under various conditions. The research addresses the gap in understanding the frictional properties of pavement markings and the relationship between slip resistance (pedestrian safety) and skid resistance (vehicular safety). This study aims to fill that gap through comprehensive laboratory and field testing.

WHAT WAS THE GOAL?

The primary objectives of this project were to (i) assess slip resistance for pedestrians and skid friction for vehicles on crosswalk areas where pavement markings are used, and (ii) relate vehicle pavement skid resistance to pedestrian slip resistance for a variety of conditions (i.e., wet versus dry, and/or icy conditions).

WHAT DID THE RESEARCH TEAM DO?

To achieve the project objectives the following research was undertaken:

Friction Evaluation of Pavement Marking Materials: Laboratory and field testing were undertaken using the British Pendulum Tester (BPT) to assess slip and skid resistance of a select number of pavements marking materials. The laboratory testing included dry, wet, and icy conditions, while the field testing included dry and wet conditions (see Figure 1). In both field and laboratory testing the pedestrian slip resistance (PSR) and vehicular skid resistance (TSR) were evaluated.

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The laboratory and field data were complemented with statistical analysis to reinforce the meaningfulness of the observed effects. In addition, the statistical analysis focused on assessing significance of differences between PSR and TSR across different pavement markings and surface conditions (D, W, I).

Relating Vehicle Skid and Pedestrian Slip Resistance: Following the statistical analysis, the relationships between vehicle skid friction and pedestrian slip resistance on various marking and surface conditions were examined. Furthermore, relationships between the laboratory and field measurements were obtained for both TSR and PSR under various surface conditions.

Recommendations for Potential Specification Revisions: The results of this study and the relationship between vehicle skid and pedestrian slip resistance were used for providing recommendations for potential specification revisions regarding pavement markings used at crosswalks.

WHAT WAS THE OUTCOME?

Key findings from the analysis showed consistent performance across both PSR and TSR measurements in dry, wet, and icy conditions. While statistical analysis confirmed the high repeatability of the BPT measurements, meaningful differences were observed between surface conditions (i.e., dry versus wet). All materials experienced reduced friction in wet and icy environments. Good relationships between lab and field data were established and relating to the various surface conditions.

Overall, this investigation provides critical insights into the relationship between pedestrian slip resistance and vehicular skid resistance. The findings suggest that Maryland's current specifications, which focus on vehicle skid resistance, could be expanded to incorporate pedestrian slip resistance requirements for improved safety at crosswalks.

HOW WILL MDOT SHA USE THE RESULTS?

The research findings allow the State Highway Administration (SHA) to start the process of revising the British Pendulum Number (BPN) skid resistance specification requirement from 50 to 55 for pavement marking materials used in crosswalks and enhancing motorist and pedestrian safety.

LEARN MORE

To view the complete report, click here.

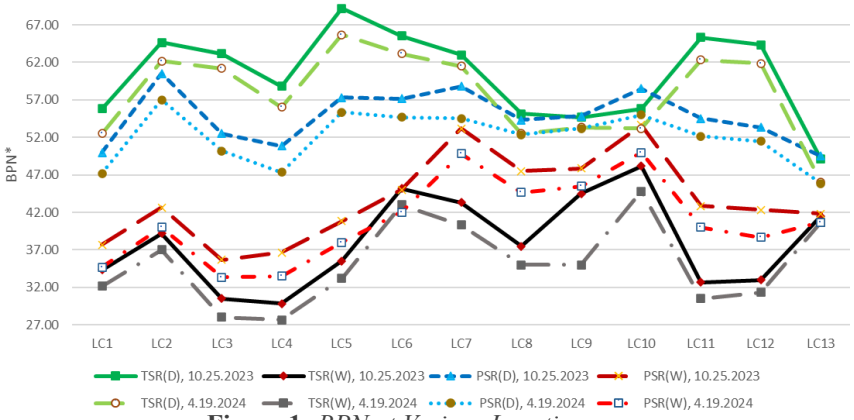

Figure 1: *BPN at Various Locations (Dry, Wet) for Preformed Thermoplastic*

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