



RESEARCH PROJECT CAPSULE [22-1P]

April 2022

TECHNOLOGY TRANSFER PROGRAM

Performance Index Rating and Maintenance Cost Assignment for Ramps, Acceleration Lanes, and Deceleration Lanes in Louisiana

JUST THE FACTS:

Start Date:

April 1, 2022

Duration:

27 months

End Date:

June 30, 2024

Funding:

TT-Fed/TT-Reg – 5

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Sponsored jointly by the Louisiana Department of Transportation and Development and Louisiana State University

POINTS OF INTEREST:

Problem Addressed / Objective of Research / Methodology Used / Implementation Potential

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PROBLEM

A performance index (PI) is used to characterize the extent of pavement deterioration and is computed from a combination of various distress or ride quality measures (cracking, rutting, patching, and roughness). Louisiana DOTD selects different index values to trigger appropriate maintenance actions depending on the type of pavement being considered. International Roughness Index (IRI) is an important pavement performance indicator that evaluates the longitudinal profile of a travel lane. However, the validity of IRI values can be affected by features of the roadway and operating conditions (e.g., speed) of the profile-measuring equipment.

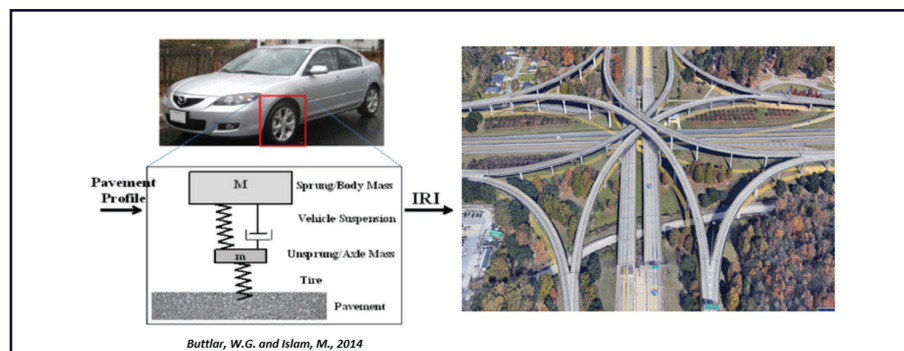
Operating conditions that have the potential to influence IRI measurements include low-speed, acceleration, deceleration, stop-and-go, and curved alignment. Since travel on ramps, acceleration lanes, and deceleration lanes typically involve such conditions, IRI values for these roadway sections are often invalid and not used.

Currently, Louisiana DOTD uses the PI and IRI values from a nearby “analysis lane” to classify ramps, acceleration lanes, and deceleration lanes. Assuming the same maintenance trigger values for these roadway sections may not be justified. It is imperative to develop guidelines to effectively determine the PI and IRI values for ramps, acceleration lanes, and deceleration lanes.

OBJECTIVE

The objectives of this study are to:

1. Ascertain whether there are differences in IRI and PI values of analysis lanes as compared to ramps, acceleration lanes, and deceleration lanes at project and network level.
2. Propose a framework for measuring and characterizing IRI and PI values for ramps, acceleration lanes, and deceleration lanes
3. Establish and propose guidelines to address additional treatment costs specific to ramps, acceleration lanes, and deceleration lanes at the project and network levels.



Buttler, W.G. and Islam, M., 2014

Figure 1. Inertial profiler and a typical ramp section

METHODOLOGY

The first phase of the study will include the calibration and use of a specialized profiler system (zero-speed profiler) to evaluate the effects of profiler operating conditions on IRI. LTRC's high-speed and walking profiler systems will be used for ground truth calibration and to ascertain the accuracy of the zero-speed profiler.

Calibration of the zero-speed profiler will be conducted at DOTD's primary baseline calibration sites. After the calibration, a minimum of three road sections will be selected from these calibration sites to determine the effects of profiler operating conditions on IRI utilizing the zero-speed profiler and LTRC's high-speed profiler system.

These three roads will be selected to include flexible, rigid, and composite pavements. Six profiler operating conditions will be evaluated for their effects on IRI: varying-speed operation, acceleration, deceleration, stop-and-go operation, profiling from a dead stop, and operation on a curve.

The second phase of the study will include the selection and evaluation of pavement sections with ramps, acceleration lanes, or deceleration lanes. Twenty pavement sections will be considered for evaluation. Pavement sections will be selected to cover different types of highway systems (interstate highways, arterials, and collectors) and different pavement types (flexible, rigid, and composite). The study will also consider at-grade and grade-separated ramps.

For each evaluated pavement section, IRI and PI data will be obtained from DOTD's pavement management systems (PMS) database. Both the zero-speed profiler and high-speed profiler will be used to collect IRI data from the selected pavement sections at the prevailing operating conditions. The collected data will be analyzed and compared with PMS data to ascertain any differences in PI ratings for ramps, acceleration lanes, or deceleration lanes as compared to analysis lanes.

Guidelines will be prepared to characterize the IRI and PI of ramps, acceleration lanes, and deceleration lanes. The research team will establish whether there are additional treatment costs specific to these sections relative to the analysis lanes and will propose a framework to address these additional treatment costs.

IMPLEMENTATION POTENTIAL

Guidelines will be prepared for measuring and characterizing IRI and PI values of ramps, acceleration lanes, and deceleration lanes, including a framework for assigning maintenance trigger values and treatment costs for all components of the highway system. These guidelines will assist DOTD engineers to select cost-effective treatment methods for the prompt performance of maintenance activities on Louisiana roads. Further, DOTD engineers can use the proposed guidelines for construction quality control and acceptance purposes.