Joint Transportation Research Program

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Comprehensive Testing Guidelines to Increase Efficiency in INDOT Operations

Introduction

When the Indiana Department of Transportation designs a pavement project, a decision for QC/QA (Quality Control/Quality Assurance) or non–QC/QA is made solely based on the quantity of pavement materials to be used in the project. Once the pavement project is designated as QC/QA, quality characteristic values through a certain testing requirement (test types and sample sizes) are obtained and evaluated in comparison with certain testing criteria to ensure that the constructed pavement will meet the pavement design life. In the current INDOT practice of pavement materials testing, a testing requirement (QC/QA or non–QC/QA) is uniformly applied based on pavement quantity, regardless of road condition factors, such as traffic load, climate, and speed limit, that largely affect the pavement lifetime realistically. However, the actual risk will vary depending on the severity of road conditions; severe climate and heavily loaded traffic cause certain roads to fail much earlier than their designated design life, while other roads last much longer. There is an opportunity here to balance required testing resources by differentiating testing requirements for different road conditions. Stricter testing requirements for roads under severe conditions will reduce the error of placing out-of-specification materials in the field. However, since there will be various testing requirements that achieve a certain degree of risk, it is possible to classify road sections for different intensities of testing requirement. For example, a reduced testing requirement (or even non–QC/QA) may suffice for low and middle volume traffic roads as long as the requirement achieves the target risk level.

Findings

Extended regression models were developed for pavement performance prediction and, using the variance of predicted performance, the risks of premature failure were estimated. We found that the number of commercial vehicles and heat index (number of hot days/freezing index) are good indicators for the risk of IRI and Rut, respectively. Using these two indicators, we were able to classify road sections into four groups and found this classification works well in distinguishing risky and safe road sections. The findings show the importance of traffic condition and weather condition on the degradation of pavement performance.

Implementation

In addition to tonnage, INDOT should consider weather and traffic conditions to determine whether the project is assigned as QC/QA or not. The classified four groups have certain risk characteristics:

1. high risks on both of IRI and Rut (H-H);
2. low risk on Rut and high risk on IRI (L-H);
3. high risk on Rut and low risk on IRI (H-L); and
4. low risks on both IRI and Rut (L-L).

Depending on the risk characteristics, the intensity of test requirement can be classified accordingly. For example, since the L-L group has low risk in both IRI and Rut, the size of test sample can be reduced or they can be classified as non–QC/QA. And the H-H group might need to be classified as QC/QA even if the tonnage is less than 5,000 tons.

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Classification of Road Sections by CV and HI

H-H	H-L
High heat index and high number of commercial vehicles	High heat index and low number of commercial vehicles
L-H	**L-L**
Low heat index and high number of commercial vehicles	Low heat index and low number of commercial vehicles

Mean Risk of Each Class

H-H	H-L
Mean risk of IRI: 98.3%	Mean risk of IRI: 34.1%
Mean risk of Rut: 98.8%	Mean risk of Rut: 87.3%
Mean risk of PCR: 27.7%	Mean risk of PCR: 43.8%
L-H	**L-L**
Mean risk of IRI: 98.0%	Mean risk of IRI: 16.3%
Mean risk of Rut: 8.8%	Mean risk of Rut: 1.08%
Mean risk of PCR: 33.9%	Mean risk of PCR: 27.2%

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