INVESTIGATION OF PERFORMANCE OF SUPERPAVE THROUGH MECHANISTIC-EMPIRICAL APPROACH, FIELD EVALUATED PERFORMANCE, AND LABORATORY TEST RESULTS: A CASE STUDY FOR ONTARIO HIGHWAYS

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INTRODUCTION

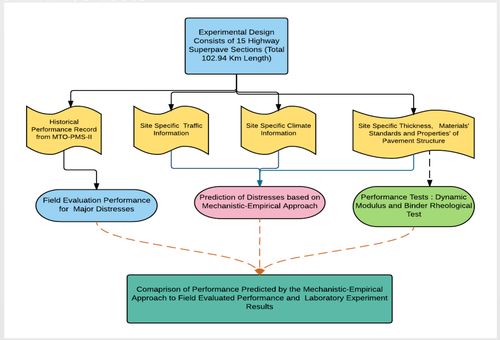
- The Superpave (*Superior Performing Asphalt Pavements)* is a product of Highway Research Program (SHRP) initiated by Federal Highway Administration (FHWA) during the late 1980s.
- Superpave was intended to be an improvement over Hveem and Marshall design methods of asphalt mixtures. Since then, majority of highway agencies have implemented the Superpave system in their highway design and construction practices.

PROBLEM STATEMENT

- Although Superpave provides pavement engineers with a method of selecting materials and designing for better performance, the prediction and evaluation of its performance is not integrated in agency pavement management systems (PMS)
- There is a need to investigate the realistic prediction of the performance of Superpave and how it is used in the pavement management system.

OBJECTIVE AND METHODOLOGY

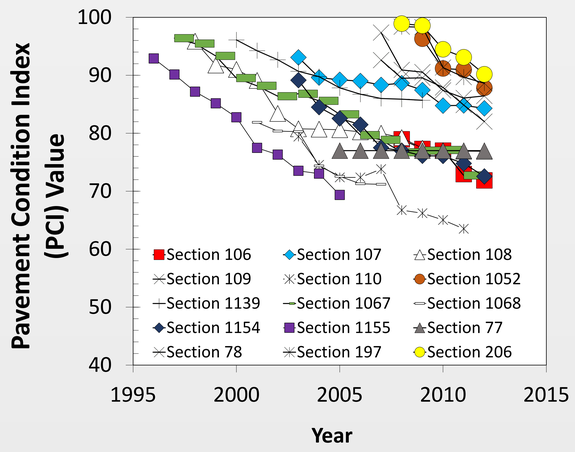
- Main objective was to compare the distresses predicted by the Mechanistic - Empirical (M-E) approach to the field evaluated performance and Laboratory performance tests.

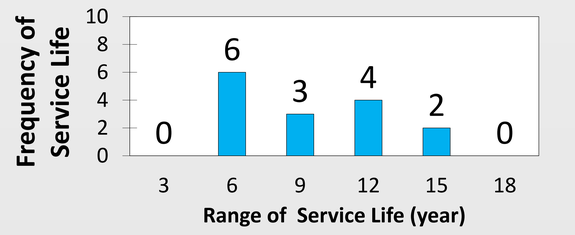


ROAD PERFORMANCE DATA AND ROAD SECTIONS

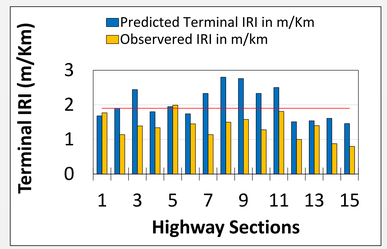
- Detailed annual performance data collected from the Ministry of Transportation Ontario (MTO) Pavement management systems (PMS-2) database
- Total 15 road sections selected from Southern Ontario major highways ,included: 11 sections from central region, 4 sections from western region.

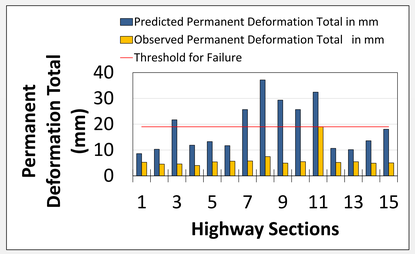
INVESTIGATION OF FIELD EVALUATED PERFORMANCE

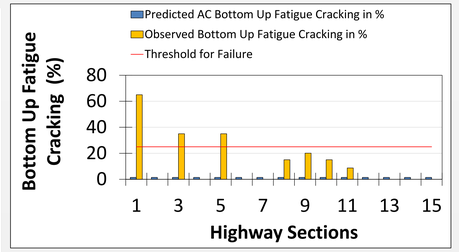


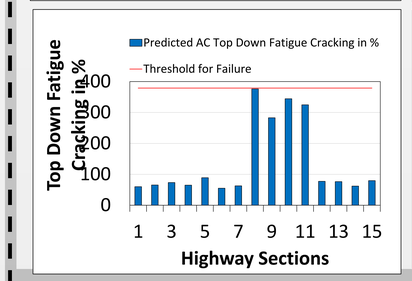


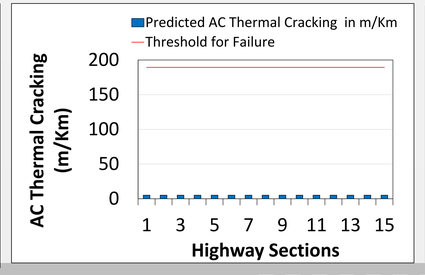
COMPARISON OF PREDICTED PERFORMANCE TO FIELD EVALUATED PERFORMANCE

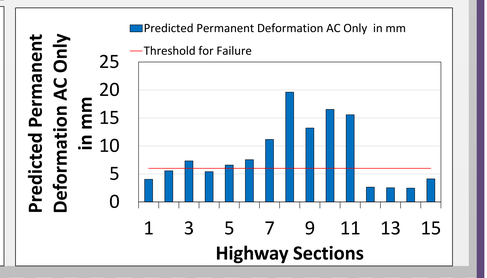












COMPARIOSN OF FAILURE IN PREDICTION AND FIELD EVALUATION

Failure	Total Cracking (Reflective + Alligator) in %	Terminal IRI m/Km	Permanent Deformation Total in mm	AC Thermal Cracking in m/Km (for prediction), in % (for field evaluation)	AC Bottom Up Fatigue Cracking in %	AC Top Down Fatigue Cracking in m/Km (prediction) , % (field evaluation)	Permanent Deformation AC Only
Number of Failure Sections in Predicted Distresses	14	8	6	0	0	0	8
% Predicted Failure Sections of Total	93%	53%	40%	0.0%	0.0 %	0.0%	53%
Average Predicted Value	23.67	2.02	18.68	5.15	1.45	140	8.3
Standard Deviation	7.96	0.46	9.30	0.00	0.00	121	5.6
Number of Failure Sections in Field Evaluation	NA	1	1	0	3	0	N/A
% Field Evaluated Failure Sections of Total		6.7%	6.7%	0.0%	20%	0.0%	
Average Field Evaluation Value	NA	1.36	6.18	0.0	12.9	2	N/A
Standard Deviation		0.34	3.6	0.0	19.1	5.3	

CONCLUSIONS

- M-E approach shows over perdition of failure than field observed values
- No failure was found for thermal cracking and top-down fatigue cracking.
- IRI and permanent deformation are over predicted than those in field observations.
- Comparing traffic level and length of service life reveals that pavement sections with higher service life forecast predicted failure in IRI, total permanent deformation, and AC permanent deformation
- From the laboratory performance test, the lower level of fatigue resistance suggested by the master curve justified the bottom-up fatigue failure in the field observed scenario.
- The master curve also suggested the higher level of permanent deformation resistance.

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