Development Of Layer Coefficients For New Hampshire Pavement Design

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Introduction and Motivation

- Layer coefficient (a-value) is a measure of the relative ability of a unit thickness of a material to function as a structural component of the pavement.
- The mixture performance and production costs are highly affected by the layer coefficients.
- Layer coefficients range of 0.35 to 0.54 are used by various DOTs in United States for surface course asphalt mixtures.
- New Hampshire Department of Transportation (NHDOT) is currently using layer coefficient values of 0.34 and 0.38 for non-wearing and wearing course asphalt mixtures respectively.
- Many states such as AL and WS, etc. have used different methods to update and increase their layer coefficients
- Due to the improvements in mix properties and production methods, it is important to update the layer coefficients of New Hampshire pavement designs.

Objective

- To characterize the asphalt mixtures, evaluate and revise the layer coefficients for materials that are currently being used in construction of the State pavements.

Research Approach

Conduct literature review to determine different approaches for layer coefficient development

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Investigate different ongoing pavement projects to determine the most commonly used mixtures in New Hampshire

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Conduct performance testing on the mixtures

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Develop three novel performance index parameters for rutting, fatigue and transverse cracking

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Analyze International Roughness Index (IRI) measurements for the selected mixtures

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Determine the IRI based back-calculated layer coefficients using AASHTO 1993 design equation

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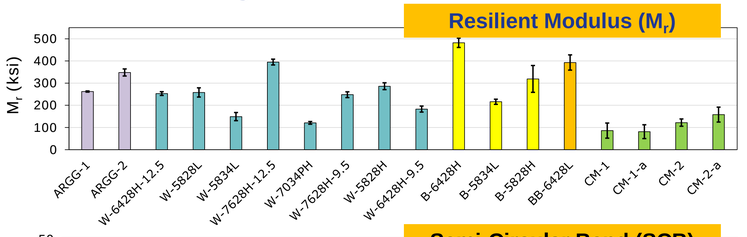
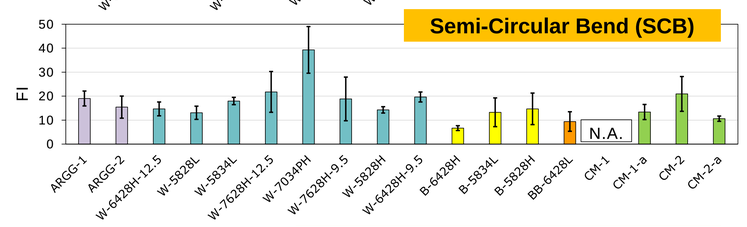
Perform statistical analysis to incorporate the three developed performance index parameters with the IRI based layer coefficients

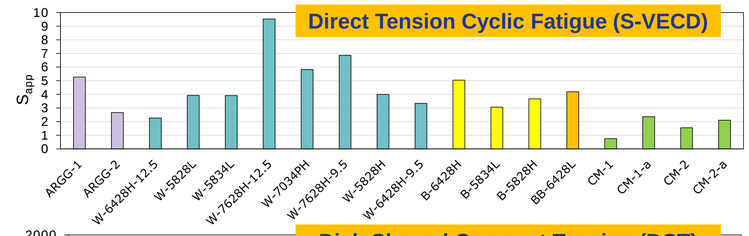
Materials

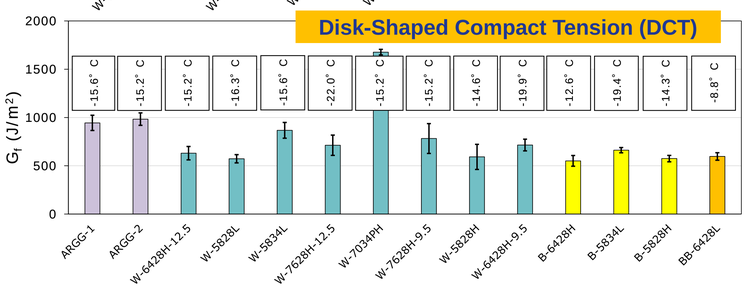
Course	Production type	Number of mixtures	NMAS (mm)
Wearing	Hot Mixed	10	12.5 and 9.5
Binder	Hot Mixed	3	19
Base	Hot Mixed	1	25
Base	Cold Mixed	4	19 and 12.5

Laboratory Performance Test Results

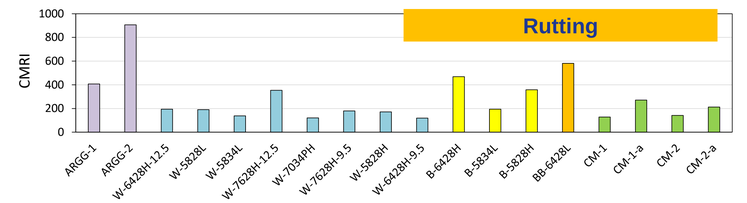


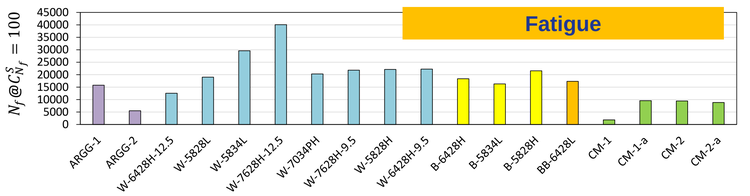


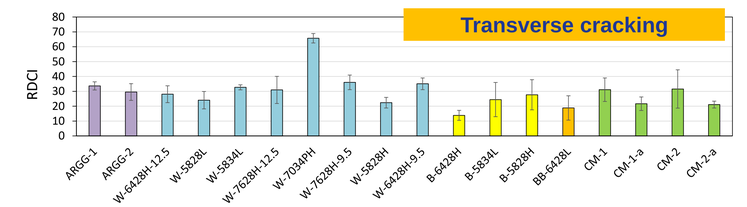




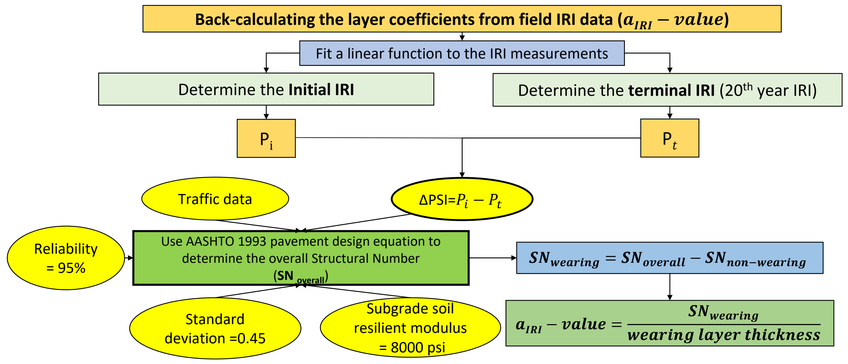
Results of Performance Index Parameters



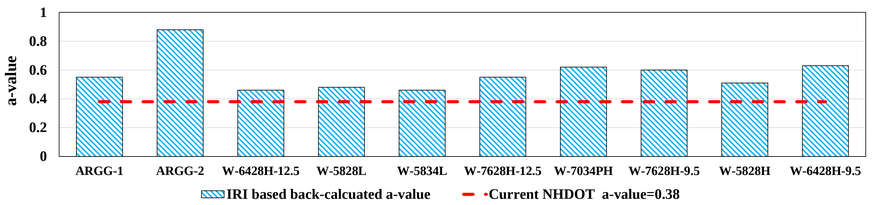




Development of Layer Coefficients



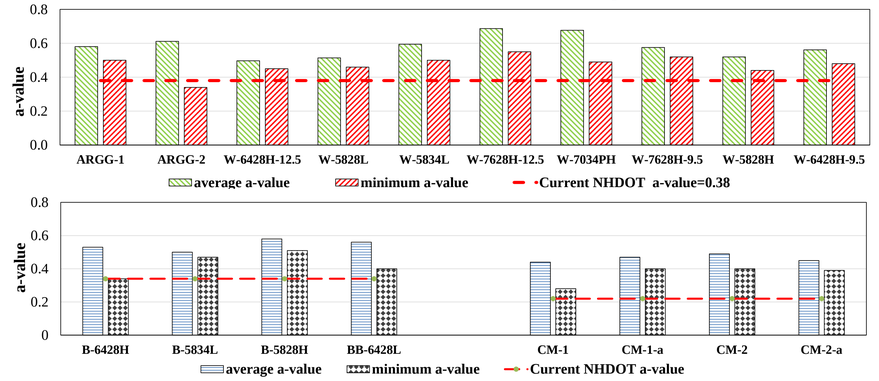
IRI based a-values



Incorporating Index Parameters in IRI-based a-values

Mixtures	Rutting a-value	Fatigue cracking a-value	Transverse Cracking a-value	(a_{ave}-value)	(a_{min}-value)
ARGG-1	0.66	**0.50**	0.58	0.58	0.50
ARGG-2	0.97	**0.34**	0.53	0.61	0.34
W-6428H-12.5	0.53	**0.45**	0.51	0.50	0.45
W-5828L	0.53	0.55	**0.46**	0.51	0.46
W-5834L	**0.50**	0.72	0.57	0.59	0.50
W-7628H-12.5	0.63	0.89	**0.55**	0.69	0.55
W-7034PH	**0.49**	0.57	0.97	0.68	0.49
W-7628H-9.5	**0.52**	0.60	0.61	0.58	0.52
W-5828H	0.52	0.60	**0.44**	0.52	0.44
W-6428H-9.5	**0.48**	0.60	0.60	0.56	0.48
Average				**0.58**	**0.47**
Standard deviation				**0.06**	**0.06**
Layer coefficients at 90% reliability				**0.50**	**0.39**

Recommended Performance Incorporated a-values



Acknowledgements

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