Factors Affecting Pavement Surface and Evaluation Rating Accuracy and Variability

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1 INTRODUCTION

The collection of sufficient, accurate, and consistent pavement condition data is essential to an effective pavement management system.

Condition data drive a variety of pavement management tasks such as:
- Predicting future pavement performance
- Identifying current and future maintenance and rehabilitation needs
- Estimating budget needs and requirements
- Reporting to decision makers
- Selecting appropriate pavement management tools

Pavement condition data are represented at either the distress level or overall condition level. Common indices representing overall pavement condition include:
- Pavement Condition Index (PCI)
- Present Serviceability Index (PSI)
- International Roughness Index (IRI)
- Pavement Surface and Evaluation Rating (PASER)

2 OBJECTIVES

The objectives of this research were to:
1. Estimate the accuracy and variability associated with PASER ratings
2. Identify factors affecting the accuracy and variability of PASER ratings

3 BACKGROUND

PASER is a manual condition survey that assigns roads a condition rating based on observed distresses.

Asphalt PASER Field Guide

	PASER 8	PASER 9	PASER 10
GOOD	Transverse cracks >40' spacing	Like new condition	New construction
	Crack width tight (hairline) or sealed	No defects	No defects
	Few if any longitudinal cracks on joints	More than 1 year old	Less than 1 year old
			Only a "10" for 1 year
	Recent seal coat or slurry seal	*Recent structural overlay*	*Recent base improvement*
	Recommended Action: little to no maintenance	*Recommended Action: none*	*Recommended Action: none*

	PASER 5	PASER 6	PASER 7
FAIR	Longitudinal cracks on the edge	Longitudinal cracks	Longitudinal crack at the paving joint
	Transverse cracks	Transverse cracks <10' spacing	Transverse cracks 10'-40' spacing
	Crack width >1/2"	Crack width 1/4"-1/2"	Crack width <1/4"
	Moderate block cracking (1'x5' blocks)	Initial block cracking (6'x10' blocks)	Little or no crack erosion
	Moderate raveling	Slight raveling	Little or no raveling
	Extensive to severe polishing or flushing	Slight to moderate polishing or flushing	No patches
	Patches in good condition	Patches in good condition	
	Sound Structural Condition	*Sound Structural Condition*	*First signs of wear*
	Recommended Action: Seal coat or thin overlay	*Recommended Action: Seal coat*	*Recommended Action: crack seal*

	PASER 2	PASER 3	PASER 4
POOR	Alligator cracking >25%	Alligator cracking <25%	Longitudinal cracks in the wheel path
	Rutting >2"	Rutting 1"-2"	Rutting 1/2"-1"
	Extensive crack erosion	Extensive crack erosion	Extensive block cracking (<1' blocks)
	Frequent potholes	Occasional potholes	Severe surface raveling
	Extensive patches in poor condition	Patches in fair/poor condition	Slight crack erosion
	Recommended Action: Reconstruction		Patches in fair condition
	Crush and shape possible		

	PASER 1		
	Loss of surface integrity		
	Extensive surface distress	*Recommended Action: Structural overlay*	*First signs of structural weakening*
		Patching & repair prior to major overlay	
	Recommended Action: Reconstruction with base	*Milling would extend overlay performance*	*Recommended Action: Structural overlay*

The PASER method, when compared to other more sophisticated and/or automated condition assessment methods, typically requires fewer resources as well as less training to obtain pavement condition data, and is therefore a practical option for budget-minded agencies.
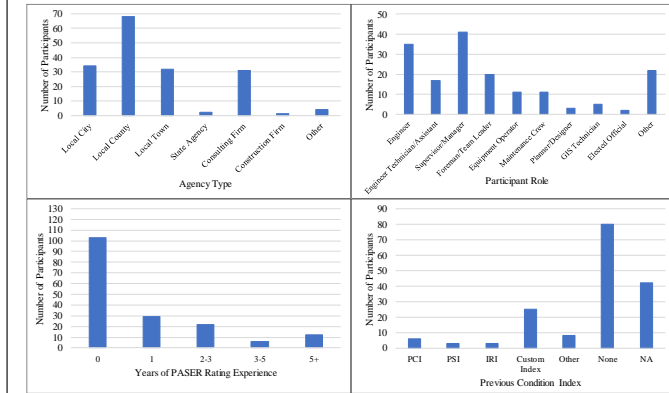
4 METHODS

In 2017, 175 attendees at six PASER workshops participated in a survey and assigned twelve PASER ratings before and after training.

Rated Pavement Segments

PASER 2 / PASER 4 / PASER 8
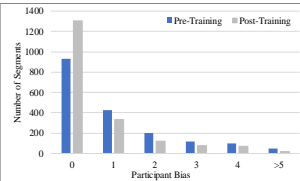
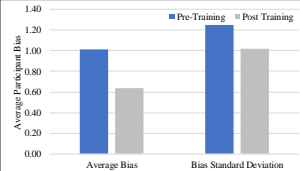### Survey Responses

5 RESULTS

Accuracy Definition 1

$$Bias = |PASER_i - PASER_t|$$

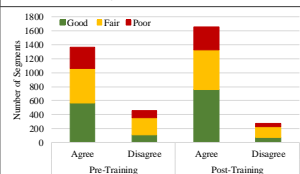Model: Ordered Probit with Random Effects

Accuracy Definition 2

Participant Average Bias
Participant Bias Standard Deviation

Model: Three Stage Least Squares

Accuracy Definition 3

Participant Good/Fair/Poor Maintenance Category Agreement

Model: Binary Probit with Random Effects

Factors Affecting Accuracy Definitions

Variable Description	Accuracy Definition 1	2	3
Training			
Training indicator; 1 if after training, 0 if before	+	+	+
Participant Characteristics			
Engineer indicator; 1 if participant role was engineer/engineer technician or assistant, 0 if not	+	+	+
Leader indicator; 1 if participant role was supervisor or manager/foreman or team leader/elected official, 0 if not	-	NS	-
Consultant indicator; 1 if agency type was consultant, 0 if not	NS	+	NS
City/Town indicator; 1 if agency type was city or town, 0 if not	NS	+	NS
Low rating experience indicator; 1 if PASER rating experience was less than 1 year, 0 if 1 year or greater	-	NS	-
No index indicator; 1 if participant's agency did not use a pavement condition index before PASER, 0 if they did	NS	+	NS
Pavement Characteristics			
Good condition indicator; 1 if pavement has a PASER rating of 8, 9, or 10; 0 if not	+	NS	+
Poor/Fair condition boundary indicator; 1 if pavement has a PASER rating of 3, 4, or 5; 0 if not	-	NS	-

NS: Not Significant

+: Factor Increases Accuracy

-: Factor Decreases Accuracy

6 CONCLUSIONS & RECOMMENDATIONS

1. The first and third accuracy definitions had all the same significant dependent variables.
2. Pavement characteristics contributed most to a participant's accuracy, with training as the next most influential, and participant background and experience characteristics as the least influential.
3. Participants that were more accurate were also more consistent, and vice versa.
4. Attendance at PASER-specific training workshops is recommended for all pavement surface evaluation raters and if possible ratings should be performed by those with engineering backgrounds.
5. Additional studies using more authentic rating situations (video footage, in-field, etc.) and incorporating additional rater (age, level of education, etc.) and agency attributes (annual budget, lane-mile responsibility, etc.) are recommended.

7 ACKNOWLEDGEMENTS