



# SPR RESEARCH PROGRAM

## SECOND-STAGE PROBLEM STATEMENT

### FY 2017

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#### I. PROBLEM NUMBER AND TITLE

17-068\_CPM Employing iRLPD Test Methods for Optimal Asphalt Mixture Performance

#### II. RESEARCH PROBLEM STATEMENT

Due to recent changes in aggregate and binder specifications and due to the increased use of additives, Recycled Asphalt Pavement (RAP), and Recycled Asphalt Shingles (RAS), asphalt mixtures are becoming significantly stiffer than before. While these changes have improved rutting resistance; they have resulted in significant reduction in the mixture durability (cracking resistance). Figure 1 shows the results of the iRLPD fatigue test on the FHWA Accelerated Loading Facility mixtures used in the recent fatigue study. The graph shows as the RAP content increases, the resistance to fatigue damage decreases. The introduction of RAS at 20% into the mixture has the largest reduction. State highway agencies need simple, practical and reliable tests for evaluating performance of asphalt mixtures.

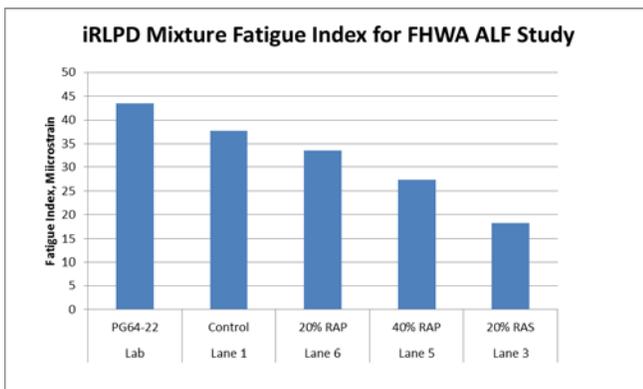


Figure 1 Results of the iRLPD fatigue test for the FHWA ALF mixtures

#### III. RESEARCH OBJECTIVES

A new testing methodology called incremental Repeated Load Permanent Deformation (iRLPD) has been developed. The optimal design concept would prevent making the mixtures too stiff. The iRLPD tests may be utilized to determine how much a mixture can be stiffened before it loses its durability and become vulnerable to cracking. The Optimal design tool may also be used to modify mix design when the quality of RAP changes during the production so that the mixture remains within the acceptable performance range.

#### IV. WORK TASKS, COST ESTIMATE AND DURATION

This research project will:

- 1- Prepare a Work Plan - The preparation of work plan for the project requires identifying three mixtures predominantly used in Oregon to be characterized. Collecting information on the mixtures and the project locations and establishing test parameters.
- 2- Characterize Oregon Materials – Test materials using the iRLPD tests to determine the resistance of the mixtures to rutting and cracking. Analyze data to determine the traffic levels for the mixtures in their environmental conditions.
- 3- Prepare Training Materials – Prepare training materials on the iRLPD test method tailored for Oregon’s environmental conditions.
- 4- Provide onsite training for ODOT Personnel
- 5- Prepare final report.

Estimated Cost for Research: \$95,000.00

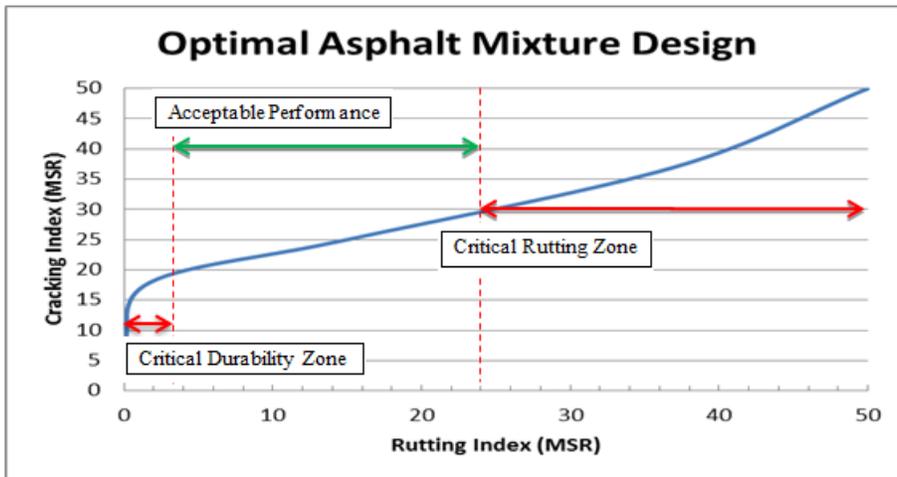
Duration: 17 months

**Table 1- Project Timeline**

Task Number	Task	Duration Months	Months																	
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Work Plan	3	█	█	█															
2	Characterize Materials	6				█	█	█	█	█	█									
3	Prepare Training Materials	3										█	█	█						
4	Provide Training	4																		
5	Prepare Report	4																		

**V. IMPLEMENTATION**

Based on the results of testing a conceptual diagram of the correlation of cracking index (iRLPD fatigue MSR) and rutting index (iRLPD rutting MSR) for optimal asphalt mixture design can developed as shown in Figure 2. The figure shows that there is an optimum range of MSR values for acceptable rutting and fatigue performance. The MSR values from fatigue test below 20 ms (y-axis) would indicate durability problem and the MSR values from rutting test above 24 ms (x-axis) would indicate rutting problem. ODOT’s Pavement Services would update the ODOT Asphalt Mix Design Guidelines with the new test procedures and requirements.



**Figure 2 Optimum range of MSR values for acceptable rutting and fatigue performance**

**VI. POTENTIAL BENEFITS**

The objective of the optimal design is to achieve mixtures with MSR values for rutting and cracking within the acceptable range. This optimal design will assist in optimizing the virgin binder grade, recycled binders and aggregate structure to increase the pavement life.

**VII. SUBMITTED BY**

<i>Stage 1 Submitter</i>	<i>Stage 2 Submitter</i>	<i>ODOT champions</i>
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