SPR RESEARCH PROGRAM SECOND-STAGE PROBLEM STATEMENT FY 2008-09

ODOT Research Unit
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I. PROBLEM NUMBER

PM-08-10

II. PROBLEM TITLE

Evaluating the Contribution to Skid Resistance of Oregon Aggregates

III. RESEARCH PROBLEM STATEMENT

Pavement skid resistance (or lack thereof) is often cited as a contributing factor to motor vehicle crashes. In the southern part of Oregon, the extent and rate of pavement friction loss on sections of the interstate located on curves and in mountainous areas has been troubling. These sections are characterized by higher fatality and injury rates. Data collected for ODOT pavements for skid resistance, as measured by the skid tester, indicates that these sections have significantly lower values as compared to regional or average values and that loss of skid resistance are occurring at much higher rates. More frequent pavement surface replacement has therefore been necessary, resulting in much higher life cycle costs. For example, on one section of I-5 in southern Oregon, ODOT has replaced pavement sections with low friction numbers three times over the last twelve years at a cost of over $1M each time. . These higher life cycle costs could be related to the aggregate properties used on these sections.

Although several factors can affect the skid resistance, such as traffic volume and mix type, aggregate properties may be a significant factor for long-term skid resistance. The current ODOT aggregate quality tests are indications of aggregate durability, which is not necessarily a measure of polish resistance or frictional contribution. Several states use methods to pre-evaluate aggregates for long-term performance of skid resistance. Methods include use of limiting criteria, such as minimum polish value, or agency pre-qualification of material sources.

In order to maximize investments in ODOT infrastructure and continue to support data-driven decision-making supporting safety, it is necessary to evaluate the impact of aggregate type, surface type, geometry, terrain, and operational conditions on safety for sections experiencing higher than usual rates of reduction in skid resistance. If the risks for low skid resistant aggregate can be quantified, better management techniques can be used to optimize the selection of aggregates for the given design criteria and best cost value.

IV. RESEARCH OBJECTIVES

The objective of the research would be to investigate relative impact of aggregate type (geologic or other), surface type, skid resistance, geometry, terrain, weather, and operational conditions on safety for sections of interstate highways located in mountainous areas, with a particular focus on conditions typical of Southern Oregon. In addition, the research will review methods used by other state agencies for aggregate testing and/or aggregate pre-qualification.

V. WORK TASKS, COST ESTIMATE AND DURATION

Task 1 – Literature Review
Review existing literatures related to pavement surface characteristics and safety; and investigate methods used by other state agencies for aggregate testing and/or aggregate pre-qualification. The tests that will be reviewed include a) tests for aggregate durability such as the Micro Deval, Nordic Abrasion, and others; and b) tests for aggregate polish such as the British Pendulum, British Wheel, and Tennessee Textural Retention Method. 6 month duration, $20,000 est.

Task 2 – Skid Resistance Data Analysis
Review existing ODOT skid resistance data for correlation with factors such as geologic origin of aggregate, method of processing aggregate, nominal maximum aggregate size, and traffic volume. 2 months duration, $10,000 est.

Task 3 –Safety Data and Analysis
Identify sites for analysis and compile available data related to safety, aggregate type (geologic or other), surface type, skid resistance, geometry, terrain, weather, and operational conditions. Compile and process the data. Quantify the relative statistical contribution (if any) of the respective factors. 6 month duration, $70,000.

Task 4 – Final Report
Prepare and submit a final report to ODOT that will summarize the findings of Tasks 1, 2, and 3. The report will include recommendations regarding a) use of pre-evaluation criteria for individual material sources (commercial or ODOT owned/controlled), and b) future direction for management of skid resistance as part of infrastructure and safety management. 3 month duration, $10,000 est.

Task 7 – Project Coordination (research)
18 month duration, $10,000

Total Duration 18 Months Cost $120,000

VI. IMPLEMENTATION

The research findings would be incorporated in current pavement management strategies which include approaches to pavement design and specific pavement specifications. The findings may support the need for new test equipment, and/or the use of new test method procedures. Any new test methods or procedures that are made requirements for contractor quality control would require additions to the QC/QA program and would require additional experimental effort prior to adoption.

VII. POTENTIAL BENEFITS

The potential benefits include a) data-driven decision making that will support improvement in safety while optimizing infrastructure investment; b) optimizing the use of non-renewable aggregate resources by specifying requirements in wearing course versus base courses, c) reduced budget costs for replacement of low skid resistance pavement sections before reaching full service life, and b) improved skid resistance in areas of current low skid resistant pavement sections.

If the research is not performed, there will continue to be additional costs to rehabilitation or maintenance budgets for the replacement of pavement sections with operational issues related to very low skid resistance, as well as the potential for accidents related to loss of friction or increased stopping distances.

VIII. SUBMITTED BY

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