MPC-468

April 1, 2014- July 31, 2017

**Project Title:**

Performance Evaluation of Highway Surface Treatments (Phase I: Short-Term Performance)

**University:**

The University of Utah

**Principal Investigators:**

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**Research Needs:**

Surface treatments are used throughout the region to provide adequate riding surfaces as well as to protect the pavement structure. Four of the most common surface treatments are Open Graded Surface Courses (OGSC), Bonded Wearing Courses (BWC), Stone Matrix Asphalt (SMA), and Dense Graded Courses (DGC). Collectively, these surface treatments are used in primary roads and thus are referred to as ‘higher costs’ surface treatments. Each of these courses has different design, different costs, and different performance. While the design process and the cost are known, very little can be said about their performance or where should each of them be used; there is a need to document their performance and understand their optimal application.

**Research Objectives:**

The objectives of this project are to:

1. Evaluate the performance of Open Graded Surface Courses (OGSC), Bonded wearing courses (BWC), Stone Matrix Asphalt (SMA), and Dense Graded courses (DGC) as surface treatments of roads
2. Confirm their differences based on short-term performance
3. Develop guidelines for their use

At the end of this project, state highway agencies should be able to select the most appropriate surface treatment to ensure longevity and the state of good repair of the infrastructure.

**Research Methods:**

The above objectives will be accomplished through field data collection and performance evaluation of the riding surface. Changes in key surface performance parameters will be tracked as a function of time. For Phase I, those treatments showing a tendency for early distresses will be identified. The information will be used in a follow up study (Phase II) with long-term monitoring of the riding surfaces.

The following tasks are anticipated for the proposed phase of this project.

Task 1- Identification of Projects

A series of meetings will be coordinated with Asset Management and the Regional Pavement Engineers to identify upcoming projects to monitor and define test sections. At least two projects will be selected for each treatment and, ideally, they would have different levels of traffic. The sections should be at least one mile long.

Task 2- Development of Data Collection Parameters

Collection parameters will include ride quality (Roughness), visual distresses (rutting, cracking, raveling, delamination), and safety measures (skid resistance). These parameters are normally obtained every other year using an ARAN van and they are available at 0.1-mile intervals (http://roadview.udot.utah.gov/). Other parameters that will be required include traffic counts and weather.

Task 3- Existing Pavement Condition

Prior to the application of any surface treatment for the sections selected in Task 1, the condition of the existing pavement will be obtained. The same database described in Task 2 will be analyzed and the conditions documented. For those sections that have been already constructed, an effort will be made to locate any pre-construction documents with the required information.

Task 4- Treatments

The treatments constructed on each section will be documented. Information will include: time of year and weather conditions during construction, constructability issues (special attention will be given to SMAs), and any deviation from the specifications. When practical, material will be collected and transported to the University of Utah for storage to allow possible testing (testing is outside the scope of this project).

Task 5- Performance Monitoring

The condition of the pavement sections will be documented after one year of traffic. This condition will include the parameters selected in Task 2 plus any other relevant information available through records. It is expected that some early failures will be identified. If that is indeed the case a special report will be issue to ensure poor performers do not continue to be used. Other changes in performance or preliminary trends will be noted.

Task 6 – Final Report

A final report will be produced based on the findings from Tasks 1 through 5.

**Expected Outcomes:**

The expected outcome will be a report with a set of recommendations for the preferred use of each treatment. It is expected that a table similar to the one shown on the next page will be used to simplify the selection of alternatives. If the data shows any specific trend it will be highlighted.

These findings will allow state highway agencies to select the appropriate surface treatment for their primary roads, thus reducing the impact caused by construction delays while improving the overall condition of the highways.

*Table 1 – Example: Possible table of alternatives for a given traffic level.*

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | Road Condition\* |  |
| Treatment | **Poor** | **Medium** | **Excellent** |
| OGSC | Not recommended | 6-year life span | 7-year life span |
| SMA | 5-year life span | Over 8-year life span | Over 8-year life span |
| Bonded | Not recommended | 5-year life span | Over 8-year life span |
| Dense Graded | 3-year life span | 6-year life span | Over 8-year life span |

\* Road condition will be defined based on most adequate parameter (e.g., PCI, IRI)

\* Table might include traffic levels

\* Early failures will be identified

**Relevance to Strategic Goals:**

State of Good Repair is the first strategic goal of this program. It is one that is directly linked to this project. By selecting the appropriate surface treatment, state agencies can prevent premature failures of their road surfaces thus better serving the traveling public and maintain their economic competitiveness that comes with fewer and less often surface repairs and better access to goods and services.

**Educational Benefits:**

This project will allow funding for at least one undergraduate student and one graduate student. These students will benefit not only from the funding but from the hands-on research in the transportation area.

**Work Plan:**

A description of the proposed tasks is shown on the Research Methods section. The following timeline is expected for this project. Field data will be collected during the construction season that usually runs from April to October (depending on weather).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Quarter | | | | |
|  | 1 | 2\* | 3\* | 4 | 5 |
| Task 1 |  |  |  |  |  |
| Task 2 |  |  |  |  |  |
| Task 3 |  |  |  |  |  |
| Task 4 |  |  |  |  |  |
| Task 5 |  |  |  |  |  |
| Final Report |  |  |  |  |  |

\* Data collection must correspond to construction season

At the end of this project, a report will be issue describing the short-term performance of the different surface treatments evaluated. Recommendations will be made to continue the monitoring the sections to determine their long-term performance.

**Project Cost:**

Total Project Costs: $83,960

MPC Funds Requested: $25,000

Matching Funds: $58,960

Source of Matching Funds: Utah Department of Transportation.

These funds have already been allocated for this project

MPC funding will allow expanding the scope of the project by allowing for one graduate student and half a month of summer salary for the PI. It will also allow a trip to the Transportation Research Board Meeting (TRB) or similar to allow for data dissemination.

**TRB Keywords:** SMA, Surface Treatments, Pavement Maintenance