RTI
Research Project Statement

<table>
<thead>
<tr>
<th>RMC:</th>
<th>1</th>
<th>OPR: (for RTI use)</th>
<th>CST</th>
<th>Project #: (for RTI use)</th>
<th>0-6741</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date:</td>
<td>August 8, 2011</td>
<td>Research Program Year:</td>
<td>2013</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Project Title:** Longer Lasting Permeable Friction Courses (PFCs)

**Project Constraints:** Proposals with project durations exceeding 2 years will not be accepted.

**Project Description:**

What is the problem?

Permeable Friction Course (PFC) has proven to provide several benefits to the traveling public. This hot mix asphalt exhibits a number of desirable characteristics, such as resistance to rutting, reduced wet-weather splash/spray, reduction of tire noise, and increased visibility during heavy rain. TxDOT pays premium prices for these benefits which are sometimes short-lived as documented in project 0-5836, “Permeable Friction Courses Pavements Over Time”.

Some recent issues and concerns with PFCs are described below:

a) Rapidly decreasing water flow was found on several AR PFC projects placed in the Houston District. They reported that the voids in the mixes appeared to “fuse” and lose their splash spray characteristics within 2 to 3 years. This also has been observed with other PFCs placed throughout the state.

b) The Austin District noted rutting problems with PFC containing blended aggregate where the Class “A” aggregate may be crushing the softer Class B aggregate.

c) The Lubbock and Pharr Districts have reported excessive raveling. The premature failures in the Pharr District were AR PFC mixes produced with gravel aggregates and the binder was visibly stripping from the aggregate.

Recent concerns have become widespread and three districts (Pharr, Corpus and Lubbock) do not plan to use PFC in the future.

Hot mix asphalt produced for TxDOT are required to meet some form of performance testing requirements during the laboratory mixture design which is related to field performance. This is primarily the Hamburg Wheel tracking test for stability and susceptibility to stripping and moisture damage. However, PFC mixture designs are primarily based on volumetric properties with Cantabro and drain down tests. While the Cantabro test is supposed to be an indicator of potential raveling, it has not been correlated to field performance. Also, it is performed in a dry condition; whereas, much of the raveling experienced in PFC may be indicative of a stripping failure (which typically occurs in the presence of moisture).

An investigation is needed to explore the potential for improving the laboratory mixture design procedure of PFC to include but not limited to the following:

a) Evaluate the feasibility of requiring current HMA laboratory performance tests (such as Hamburg and a laboratory test for evaluating the potential susceptibility to cracking);

b) Developing new tests to minimize the risk of premature raveling and stripping;

c) Developing guidelines on the conditions of where and when blended aggregates can be permitted.

d) Evaluate permeability and affects from gradation changes. Determine the actual size of the air voids and how changes in size may increase the reduction of splash/spray during precipitation.

In this study, a laboratory investigation is needed to measure the engineering properties of PFC mixtures as affected by the following mixture variables:

- Current design air voids (18 to 22% in Item 342) versus higher air voids (22 to 26%);
- PG versus AR binders;
- 100% Class A versus blending of Class A and B aggregate.

Additional variables which may be investigated to reduce the wet-weather splash/spray of AR PFC mixtures may include:
- Current binder contents for AR mixes (8-10%) vs. lower binder contents.
- Current gradation vs. the more open PG gradation.
- Influence of Crumb rubber grade; coarser Grade B grind vs. finer Grade C grind (which is used in the Odessa district where AR PFCs have performed well; retaining their drain ability properties without any raveling).
- What is the variability of these mixes in the field in respect to water or air permeability?
- What is the difference and variability of splash and spray characteristics for PG and AR binder mixes? This may require the measurement of splash and spray in the field.

In addition to conducting a lab test program the researchers will attempt to implement the findings on upcoming PFC projects. Once a contractor proposes a PFC mix design, it will rapidly be evaluated for modifications to the proposed design in an attempt to improve the permeability and durability. Recommendations will be made to construct experimental test sections in the upcoming project for those mixes where major improvements are identified in the laboratory.

It is anticipated that field performance results can be obtained in a relatively short period; – less than 2 years.

Who is impacted by the problem?
Districts that have experienced performance problems with PFC using the current mixture design procedure.

What is the significance / scope of the problem?
PFC remains functional and in-service between 4 and 8 years. With improved mixture design procedures it is anticipated that the life expectancy of these surfaces may be doubled. The following should be included as minimum:
- 1. Recommended performance related tests (such as, possible inclusion of criteria for HWTT and a laboratory test for measuring cracking susceptibility) that can be incorporated into PFC designs;
- 2. Recommend and evaluate new laboratory tests to identify PFC which may be susceptible to raveling;
- 3. Identification of parameters which need to be strengthened in the PFC specification to improve performance and increase serviceability life;
- 4. Guidelines regarding aggregate blending to enhance performance; and;
- 5. Guidelines regarding aggregate gradation to enhance performance.
- 6. Test procedures to control the quality of these materials in the field such as permeability to water or air.

What are the technical objectives of this project?
Longer lasting PFC.

What benefits would this project deliver, and how would the results be used within TxDOT?
The goal is to be able to place PFC which can perform for a minimum of 10 years retaining all of the essential performance characteristics (i.e., reduced splash/spray and noise reduction).
### Minimum Deliverables:

- **Stand-alone Products:** Products as deemed appropriate by the researchers.
- **Reports:**
  - Complete documentation of work performed, methods used, and results achieved. Report will include revised laboratory mixture design procedure and specifications for PFC.
  - Project Summary Report

### Proposal Requirements:

1. Proposals will be considered non-responsive and will not be accepted for technical evaluation if they are not received by the deadline or do not meet the requirements stated in Chapters 3 and 4 of RTI’s *University Handbook*.
2. Proposals should be submitted in PDF format, 1 PDF file per proposal. File name should include project number and university abbreviation.
3. All proposals should be submitted through the university’s Research Liaison to RTI, as instructed in the RFP announcement.

### Pre-proposal Meeting:

- **Friday, February 3, 2012, 11:00am – 11:30am**
- **Austin Riverside Campus**
- **118 E. Riverside Dr**
- **RTI Conference Room, 1st Floor**
- **Austin, Texas 78704**

**WebEx Information Below:**

1. Link to join the online meeting: [https://txdot.webex.com/txdot/j.php?ED=23238013&UID=490951252&PW=NMWQ4MmM3ZWJh&RT=MiM3](https://txdot.webex.com/txdot/j.php?ED=23238013&UID=490951252&PW=NMWQ4MmM3ZWJh&RT=MiM3)
2. First time users of WebEx click on the yellow bar at top of your screen to run "Active X-Control".
3. When you join the meeting select either “Call me at a new number” or “I will call in”. The phone number and code below can be used for either internet or without internet access.
   - Dial toll free: 1-877-668-4493
   - Meeting Code: 317 855 135

### Notifying RTI of Intent to Propose:

In order to be notified if additional project information is distributed by TxDOT, you must contact Frank Espinosa, Jr., at (512) 416-4741 or frank.espinosa@txdot.gov by January 25, 2012, if you plan to propose.

### Proposal Deadline:

Proposals are due to RTI by **4:00 p.m. Central Time, March 22, 2012**. Email submissions should be sent to rtimain@txdot.gov.