**TRANSPORTATION POOLED FUND PROGRAM**

**QUARTERLY PROGRESS REPORT**

Lead Agency (FHWA or State DOT): Minnesota Department of Transportation

**INSTRUCTIONS:**

*Project Managers and/or research project investigators should complete a quarterly progress report for each calendar quarter during which the projects are active. Please provide a project schedule status of the research activities tied to each task that is defined in the proposal; a percentage completion of each task; a concise discussion (2 or 3 sentences) of the current status, including accomplishments and problems encountered, if any. List all tasks, even if no work was done during this period.*

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| **Transportation Pooled Fund Program Project #***(i.e, SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX)*TPF-5(149) | **Transportation Pooled Fund Program - Report Period:**□Quarter 1 (January 1 – March 31)□Quarter 2 (April 1 – June 30)C:\Program Files\Microsoft Office\MEDIA\OFFICE14\Bullets\BD21301_.gif□Quarter 3 (July 1 – September 30)□Quarter 4 (October 1 – December 31) |
| **Project Title:**Design and Construction Guidelines for Thermally Insulated Concrete Pavements |
| **Name of Project Manager(s):**Tim Clyne | **Phone Number:**651-366-5473 | **E-Mail**tim.clyne@state.mn.us  |
| **Lead Agency Project ID:**Contract 89261 | **Other Project ID (i.e., contract #):**WO # 90 | **Project Start Date:**1/30/08 |
| **Original Project End Date:**1/31/11 | **Current Project End Date:**1/31/13 | **Number of Extensions:**3 |

Project schedule status:

□ On schedule □ On revised schedule □ Ahead of schedule □ Behind schedule

Overall Project Statistics:

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|  **Total Project Budget** |  **Total Cost to Date for Project** |  **Percentage of Work**  **Completed to Date** |
| $455,000 ($439k research, $16k admin) | $410,446 (+ 4 TAP meetings)Tasks 1-8 are complete | ~95% |

***Quarterly*** Project Statistics:

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|  **Total Project Expenses**  **and Percentage This Quarter** |  **Total Amount of Funds**  **Expended This Quarter** |  **Total Percentage of**  **Time Used to Date** |
| 0 | $43,459 | 93% |

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| **Project Description**:The research proposed in this pooled fund study aims to develop effective design and construction guidelines for TICPs. The study will focus on the initial questions of life cycle analysis, the effects performance of climate region, pavement design (interaction of concrete and asphalt thicknesses), materials properties for the asphalt and concrete materials and design details such as joint spacing, dowels and joint support. This investigation will determine an initial set of pavement structures that provide the best performance with respect to performance, constructability and cost-efficiency. The investigation will use a review of the literature, extensive mechanistic analysis combined with measured field properties and available information from field and accelerated pavement testing performance to determine the optimized set of pavement structures.  The main objective of the proposed research is to perform life cycle cost analysis comparisons and develop design and construction guidelines for TICPs (i.e. composite thin HMA overlays of new or structurally sound existing PCC pavements). The study also has the following secondary objectives:  1. Validation of the structural and climatic models of the Mechanistic-Empirical Pavement Design Guide (MEPDG) for asphalt overlays of concrete pavements.
2. Investigation of applicability of the MEPDG for design of TICPs.
3. Investigation of applicability of reflection cracking and asphalt rutting models developed in California.
4. Development of recommendations for feasibility analysis of newly constructed TICPs or thin overlays of the existing concrete pavements.

 These objectives will be accomplished by collecting field performance data and evaluating the influence of design, material properties and construction on the performance of TICPs. |

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| **Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):**Task 7 (Composite Pavement Synthesis) was completed and submitted to the TAP for review. The synthesis includes chapters on Existing Concrete Pavement Evaluation, Pre-Overlay Concrete Pavement Repair and Preparation, Asphalt Concrete Overlay Mix Design, Asphalt Concrete Overlay Structural Design, Asphalt Concrete Overlay Construction, Pavement Performance Evaluation, and Case Studies in the Use of AC-over-PCC. This task report fulfills the FHWA’s objectives when they joined the pooled fund study.Task 8 (Draft Final Report) was also completed and submitted to the TAP for review. The draft final report brought together all of the previous tasks from this study into chapters including MEPDG and Climate Modeling Validation and Analysis, Response Model for Combined Thermal and Traffic Loading, Design and Analysis of TICP, Construction Practices for HMA-PCC Composite Pavements, and Life Cycle Cost Analysis Case Studies. A significant amount of work went into this project by the research team, over and above what was required in the contract.  |
| **Anticipated work next quarter**:The TAP will provide comments on the Synthesis and Draft Final Report to the research team. The research team will incorporate the comments as appropriate and submit the final versions of the Synthesis and Final Report. |

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| **Significant Results:**A number of important observations have been made on functionality of the Mechanistic Empirical Pavement Design Guide (MEPDG), and several improvements have been developed. These include: * Improvements to the Enhanced Integrated Climate Model (EICM), mainly due to climate input files
* Development of 2-moduli approach for asphalt material response
* Updates to the concrete fatigue cracking model
* Identification of parameters that would make composite pavements competitive with conventional pavements from the standpoints of cost-competitiveness and pavement performance
* Synthesis provides comprehensive information on the design and construction of AC/PCC composite pavements, both new and rehabilitated pavements.

Several student theses and publications have resulted from the project work – two of these publications received awards from TRB.  |
| **Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that** **might affect the completion of the project within the time, scope and fiscal constraints set forth in the** **agreement, along with recommended solutions to those problems).** |

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| **Potential Implementation:** MnDOT, participating states, and FHWA will have a tool at their disposal to both design and construct composite pavements, which are a potential long-life, low-maintenance pavement for our road networks.  The Synthesis, as well as other portions of the project, will provide guidelines for: * reducing reflective cracking in the asphalt overlay
* considering traffic control during TICP construction
* ways to lower the costs of composite pavements through staged construction, material selection, and preventive maintenance
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