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[Home](#) > [Research](#) > [For CTS Researchers](#) > [Quarterly Reporting](#) > [View/Print Report](#)

View/Print Report

CTS Project Number: 2008036

Project Title: TPF-5(149) Composite Pavements

Reporting Period: Apr 1 - Jun 30 (2009)

Update 1: Tasks

Task Number 1

Title: Development of Information on Composite Pavements

Description: The project team will assess the state of practice and knowledge for the design and construction of composite pavement systems. The literature review will include projects and studies within the U.S. and foreign countries. The review of the state of practice will focus on two main issues: summarizing design and construction guidelines and identifying test sections or field projects to determine performance histories. It will include the design and construction of AC overlays of old PCC pavements and new composite pavement systems. The team will start with a review of the procedures that have been used to design composite pavement systems. The design/analysis procedures for composite pavements will be reviewed to determine those that are believed to have application and those that are considered inappropriate for use on further subtask activities. The other focus of the literature review will be to develop a database of pavement sections to be used for validation/verification of the design guidelines developed in this study. Although the main focus of this study will be new composite pavements, the literature review will cover asphalt overlays of old concrete pavements as well. Based on the literature review, the research team will identify where the design and construction guidelines can be improved.

More Information

Contact

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Deliverables: A task report summarizing the literature review for new composite pavements and asphalt overlays of old concrete pavements.

Due Date: 06/30/2009

Date Approved: 07/24/2009

Date Delivered: 07/07/2009

Progress: The research team submitted a draft of the task report, received the TAP comments, addressed the comments, and re-submitted the report.

Date: 07/21/2009

% Complete: 99%

Task Number 2

Title: Perform Initial Life-Cycle Analysis

Description: In this task a life cycle analysis will be performed, taking into account agency and user costs as well as environmental and sustainability aspects. This analysis will compare several hypothetical TICPs and overlays with conventional asphalt and concrete pavements to determine economically viable solutions and relative environmental costs. The research team will collect the most recent information on construction cost of individual design features for California, Washington and Minnesota conditions. After that, a life cycle analysis will be performed to determine under what conditions use of composite pavement may be viable. This life cycle analysis will include a life cycle cost analysis and an PaLATE (Pavement Life Cycle Assessment Tool for Environmental and Economic Effects). The results of this task will be a thorough understanding and documentation of the absolute and relative costs of designing and constructing TICPs versus conventional pavements.

Deliverables: Letter-report containing detailed description of the analysis and a summary of the economically viable design solution and corresponding required design lives.

Due Date: 12/31/2009

Date Approved:

Date Delivered:

Progress: This task will be initiated shortly.

Date: 07/21/2009

Task Number 3

Title: EICM Validation and Analysis

Description: Although the construction of new composite pavements is relatively rare, over the past 35 years there exists a useful body of knowledge and experience for both AC/PCC and

PCC/PCC materials, designs and construction. The MEPDG also provides useful prediction models, analysis methodologies, and a design procedure that, with further improvements and calibrations can be made to provide reasonable capabilities for new composite pavements. In this task, the research team will conduct extensive validation of the EICM. An extensive sensitivity analysis will be conducted to ensure that the predicted temperature distributions are reasonable for a wide range of the input parameters that might be expected for composite pavements. The temperature distributions predicted with the EICM will be carefully evaluated. After that, the comparison of the predicted and measured temperatures distributions will be made. This will be followed by an extensive analytical investigation of the effect of various TICP designs on the reduction of PCC slab curling and joint movements due to presence of the HMA layer.

Deliverables: A letter-report summarizing validation of the EICM model and analytical investigation of the effect of various TICP designs on the reduction of PCC slab curling and joint movements.

Due Date: 12/31/2009

Date Approved:

Date Delivered:

Progress: The research team conducted a comprehensive sensitivity study of the EICM model. A self-consistent data quality check procedure has been developed. This task is 85% complete.

Date: 07/21/2009

% Complete: 85%

Task Number 4

Title: Evaluation of Pavement Response Models

Description: In this task, the research team will use the information collected at the MnROAD test sections to evaluate and adapt available computer models capable of predicting pavement response to load and environmental effects. The responses of the MEPDG structural models, ISLAB2000, will be compared with the measured responses from the test sections. In addition to the analysis of the responses from the composite pavement section, the responses from the adjacent pavement sections will be compared with the correspondent responses of the composite sections.

Deliverables: A letter-report and a PowerPoint presentation.

Due Date: 01/31/2010

Date Approved

Date Delivered:

Progress: No progress reported for this quarterly report.

Task Number 5

Title: Develop Design Guidelines

Description: In this task, the research team will develop guidelines for the design of composite pavements. The main focus of this task will be adaptation of the MEPDG procedure for the JPCP cracking model and supplementing it by the CalME procedure for AC rutting. It is anticipated that the information obtained in Tasks 4 and 5 will enable the research team to validate and adopt the PCC cracking model for design of AC/PCC pavements. A comprehensive sensitivity analysis using the MEPDG software will be conducted to evaluate the effect of various design features on the predicted cracking of the PCC layer. Most attention will be paid to the combination of the design features identified in Task 2 as economically feasible to check if those combinations can provide acceptable performance.

Deliverables: A letter-report documenting adaptation of the MEPDG procedure for the JPCP cracking model and supplementing it by the CalME procedure for AC rutting.

Due Date: 04/30/2010

Date Approved

Date Delivered:

Progress: The research team began incorporation of the CalME rutting and reflective cracking models into the MEPDG framework. This task is 10% complete.

Date: 07/21/2009

Task Number 6

Title: Develop Construction Guidelines

Description: Once the general ideas of composite pavement design have been solidified, a group of experts in materials and construction will be convened to determine constructibility of composite pavements. This panel will evaluate materials, methods, sequencing and value engineering. The use of CA4PRS pavement construction schedule estimating software for TICP alternatives will be investigated. The software will be used to develop estimated construction schedules for construction of alternative structures. Recommendations for any updates to the software to handle this type of construction will be developed based on the experience of this part of the investigation.

Deliverables: A letter-report documenting development of the construction guidelines.

Due Date: 04/30/2010

Date Approved

Date Delivered:

Progress: No progress reported for this quarterly report.

Task Number 7

Title: Develop Synthesis

Description: A synthesis will be prepared.

Deliverables: Synthesis of practices.

Due Date: 07/31/2010

Date Approved

Date Delivered:

Progress: No progress reported for this quarterly report.

Task Number 8

Title: Draft Final Report

Description: The research team will prepare a final report that contains the following: 1) Summary of experience to date based on the literature review 2) A description of the MnROAD test sections 3) A detailed description of the data that has been collected, where the data is stored, and how it can be accessed 4) A detailed description of the environment, structural, and performance model and their predictive capabilities 5) Summary of the pavement designs considered, the expected performance based on the sensitivity analyzes, expected construction schedule, and approximate life cycle cost over a common analysis period. This will provide a recommendation for the best structures for the different conditions considered in the analysis 6) Recommendations for best practices for each condition considered in the sensitivity analysis factorial 7) Identification of issues that need further research and development to further improve this technology 8) Address relevant issues to advise the participating state departments of transportation on possible changes in the design and construction specification to accelerate the implementation of the results of this study

Deliverables: Draft final report.

Due Date: 07/31/2010

Date Approved

Date Delivered:

Progress: No progress reported for this quarterly report.

Task Number 9

Title: Final Report

Description: The research team will address the panel's comments on the final report.

Deliverables: Final written report.

Due Date: 11/30/2010

Date Approved

Date Delivered:

Progress: No progress reported for this quarterly report.

Future plans (note any unexpected changes to the work plan or schedule):

Problems encountered/actions taken (note any unexpected budget issues):

The research team has submitted a request for the contract amendment. It is expected that the amendment will be approved in July of 2009. Shortly after that the UC Davis team members will begin work on the project as consultants, especially on task 2.

Update 2: Abstract

Permanent abstract for this quarterly report:

Although the construction of new composite pavements is relatively rare, over the past 35 years there exists a useful body of knowledge and experience for design and construction of composite pavements. Those agencies that envisioned composite pavements as a viable design strategy recognized the benefits of using AC as the insulating material and PCC as the load-carrying material in areas with heavy trucks and problem soils to increase the service life and minimize maintenance. The main objective of the proposed research is to develop design and construction guidelines for thermally insulated concrete pavements (TICP), i.e., composite thin HMA overlays of new or structurally sound existing PCC pavements. Specific objectives of the proposed study include determining behavior of the layers of the TICP system, understanding life-cycle costs and the feasibility of TICPs, incorporating the results into design and construction guidelines. These objectives would be accomplished by collecting field performance data and evaluating the influence of design, material properties, and construction on the performance of TICP test sections at the Minnesota Road Research project (MnROAD).

Abstract currently on file for this project:

Last revised on: 04/07/2009

Although the construction of new composite pavements is relatively rare, over the past 35 years there exists a useful body of knowledge and experience for design and construction of composite pavements. Those agencies that envisioned composite pavements as a viable design strategy recognized the benefits of using AC as the insulating material and PCC as the load-carrying material in areas with heavy trucks and problem soils to increase

the service life and minimize maintenance. The main objective of the proposed research is to develop design and construction guidelines for thermally insulated concrete pavements (TICP), i.e., composite thin HMA overlays of new or structurally sound existing PCC pavements. Specific objectives of the proposed study include determining behavior of the layers of the TICP system, understanding life-cycle costs and the feasibility of TICPs, incorporating the results into design and construction guidelines. These objectives would be accomplished by collecting field performance data and evaluating the influence of design, material properties, and construction on the performance of TICP test sections at the Minnesota Road Research project (MnROAD).

Update 3: Publications and Presentations

Publications

No publication records found for this quarterly report.

Presentations

No presentations found for this quarterly report.

Update 4: Students

No student records found for this quarterly report.

Update 5: Media Coverage

No media stories found for this quarterly report.

Update 6: Patents or Licensing Agreements

Patents

No products or patents found for this quarterly report.

Licensing Agreement

No licensing agreement records found for this quarterly report.

Update 7: Policies, Standards, or Design Practices

No policies, standards, or design practices found for this

quarterly report.

Update 8: Courses

No course records found for this quarterly report.

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