

Progress Report 7

For the project entitled:

Feasibility of Reclaimed Asphalt Pavement as Aggregate in Portland Cement Concrete Pavements

*Reporting Period: July 1 - September 30, 2011
(First Quarter of State fiscal year 2012)*

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Submitted to:

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October, 2011

PROJECT STATUS

Task 0: Project Management

Weekly meetings are held between the PI and the research team.

Task 1: Literature Review

Prior to awarding the project, researchers at MSU and MDT conducted a literature review on the topic, and this review has been revisited and expanded since the kickoff meeting. The results of the literature review will be summarized and provided to the technical panel upon completion of the project.

Task 2: Mix Design and Validation of Key Properties

The Design of Experiments (DoE) methodology was used to complete this task. This methodology produced a mathematical model suitable for predicting the global behavior of concrete mixtures containing RAP aggregates. This model was used to develop and evaluate several potential mix design scenarios that met MDT specifications for PCCP. These mix scenarios were presented to the MDT technical panel, and two mix scenarios were selected for further evaluation in Task 3: a high RAP replacement mix and high strength mix. In the process of developing/refining mix designs for these two scenarios, the research team conducted a smaller, more focused DOE study. This more focused DOE study was successful, and two final mix designs were determined for further evaluation. This work will be described in detail in the final report.

Mix parameters and preliminary properties of the two mixes to be evaluated in Task 3 are presented in Table 1. As can be seen in this table, the High RAP mix has fine and course RAP replacement rates of 50 and 100 percent, respectively. The slump and air content are within MDT specifications for concrete pavements, while the 28-day strength is just outside the minimum specification of 3,000 psi. The High Strength mix is identical to the High RAP mix with the exception that the High Strength mix uses RAP replacement rates that are one-half of those used in the High RAP mix. That is, the High Strength uses fine and course replacement rates of 25 and 50 percent, respectively. This reduction in RAP results in a strength increase of 37 percent (to 4,000 psi), while keeping the slump and air content within reasonable limits.

Table 1: Mix Parameters and Preliminary Properties

Property	High RAP	High Strength
W/C	0.385	0.385
Air Dosage Rate (mL/100# of cement)	182.9	182.9
Paste Content (percent)	34.7	34.7
Fly Ash Replacement Rate (percent)	15	15
Coarse to Fine Ratio	1.36	1.36
Fine RAP Replacement Rate (percent by vol)	50	25
Coarse RAP Replacement Rate (percent by volume)	100	50
Slump (in)	1.00	0.38
Air (percent)	5.0	5.6
7-day Strength (psi)	2489	3869
28-day Strength (psi)	2949	4060

Task 3: Comprehensive Determination of Material Properties

Although testing has yet to begin, the research team has been preparing for the tests to be performed during this task. This preparation has included the design and construction of two creep-testing load frames. Task 3 is expected to begin in October 2011, and is expected to take approximately five months to complete, excluding the creep test, which will take approximately one year to complete.

Task 4: Analysis of Results

The results of Task 2 are currently being analyzed. The results of Task 3 will be analyzed upon completion.

Task 5: Final Report and Dissemination of Results

Although this task cannot be completed until all concrete mixtures and specimens have been tested and analyzed, the research team has been documenting all aspects of the project for inclusion in this final report. Further, Bethany Bermel has completed her Master's Thesis, which will provide a basis for the final report.

BUDGET AND SCHEDULE

A summary of the MDT budget and expenditures for this quarter is provided in Table 2.

Table 2: Budget Summary

Budget Category	Budgeted Funds	Spent This Period	Total Spent	Total Remaining
Salaries	\$58,517	\$4,063	\$40,304	\$18,213
Benefits	\$15,810	\$894	\$8,892	\$6,918
In-State Travel	\$200	\$31	\$357	-\$157
Contracted Services	\$0	\$0	\$995	-\$400
Expendable Supplies	\$12,050	\$346	\$8,213	\$3,837
Direct Costs	\$86,577	\$5,334	\$58,761	\$27,816
Indirect Costs	\$17,315	\$1,067	\$11,752	\$5,563
Total	\$103,892	\$6,401	\$70,514	\$33,379

A summary of the project status is shown in Figure 1. Progress associated with the project is shown as percent completed within individual tasks. Although a significant amount of progress has been made on this project, it is behind the original projected schedule, and has an amended end date of July 31st, 2012.

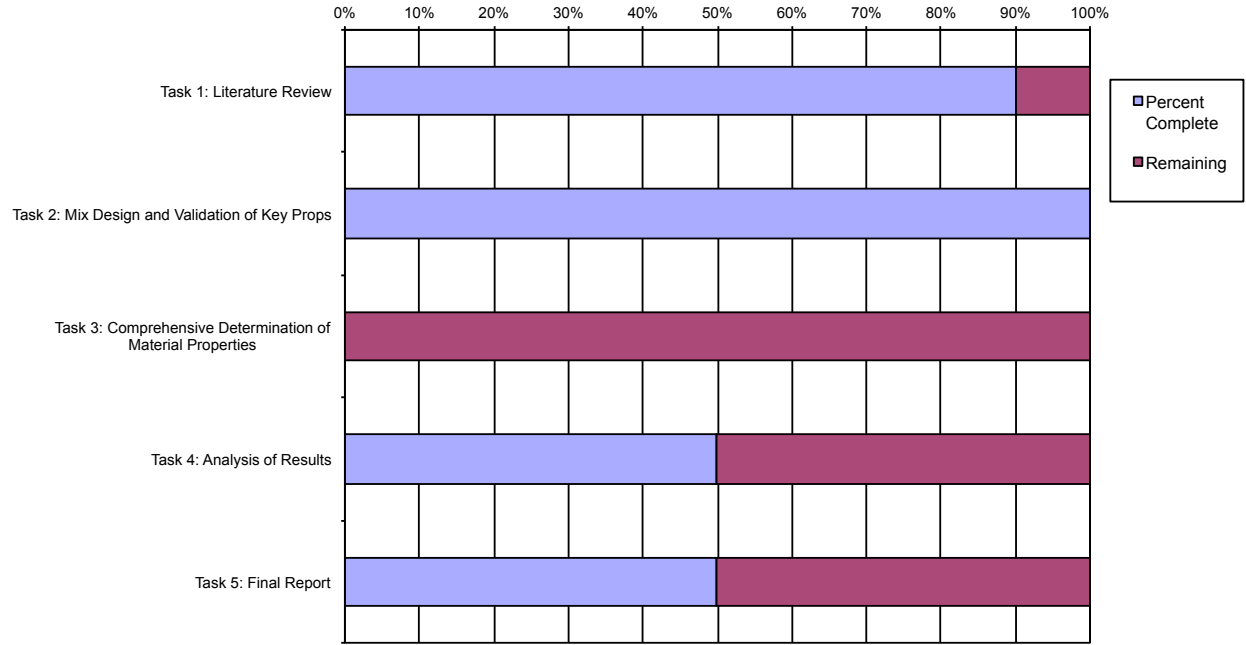


Figure 1: Task Progress