

State of Wisconsin/Department of Transportation
RESEARCH PROGRESS REPORT FOR THE QUARTER ENDING: December 31, 2005

Program: SPR-0010(36) FFY99	Part: II Research and Development
Project Title: Investigation of Concrete Properties to Support Implementation of the New AASHTO Pavement Design Guide	Project ID: 0092-06-03
Administrative Contact: Nina McLawhorn	Sponsor: WHRP
WisDOT Technical Contact: Jim Parry	Approved Starting Date: 10/01/05
Approved by COR/Steering Committee: \$60,000	Approved Ending Date: 9/30/06
Project Investigator (agency & contact): Tarun R. Naik	

Percent Complete: 10%

Project Description:

The overall objective of this project is to provide material properties to be used for input into a mechanistic-empirical design procedure for concrete pavements. The use of the mechanistic-empirical design basis for design of concrete pavements is expected to provide increased reliability of pavement structures and to provide a basis for the prediction of service life, and how the pavement design parameters will affect various pavement failure modes including cracking, faulting, and IRI (International Roughness Index). In order to provide the input required for the new mechanistic-empirical design, this project has the following minimum objectives.

- (1) Collect existing literature.
- (2) Develop a work plan for testing splitting tensile strength and CTE of concrete.
- (3) Evaluate the effect of portland cement, slag, and fly ash sources on splitting tensile strength and CTE of concrete.
- (4) Evaluate the effect of source change of glacial gravel on and splitting tensile strength and CTE of concrete.
- (5) Evaluate the effect of source change of crushed stone on splitting tensile strength and CTE of concrete.
- (6) Generate test results for compressive strength in addition to the splitting tensile strength and CTE of concrete.
- (7) Submit a final report to WHRP that contains all test results regarding splitting tensile strength, compressive strength, and CTE of concrete and recommendations for future work.

Progress This Quarter:

(Includes project committee mtgs, work plan status, contract status, significant progress, etc.)

The coefficient of thermal expansion (CTE) and splitting tensile strength will be evaluated using 4 x 8 in. cylinders. Based on comments received by the WisDOT, the concrete mixtures to be used for the project will use a blend of coarse aggregate sizes (60% No. 1 stone (AASHTO 67), and 40% No. 2 stone (AASHTO No. 4)). Wis-DOT specified that the 4 x 8 in. cylinders should be cast using the aggregate blend. Fifteen sources of coarse aggregate were identified by WisDOT for the project. The use of the blended coarse aggregate was the only comment to the work plan outlined in the proposal. The following Table contains a summary of the coarse aggregate sources collected in consultation with Wis-DOT. Evaluation of the physical properties of the aggregate were also started during this quarter.

Aggregate Source	Aggregate Type*	Source Name	County
1	Baraboo Quartzite	Williams Quarry	Columbia
2	Prarie Du Chien Dolomite – SW Wisconsin	Slama Quarry	Crawford
3	Galena Dolomite	Haverland Quarry	Grant
4	Glacial Gravel – S End Green Bay Lobe	Janesville, Sand & Gravel	Rock
5	Glacial Gravel – Lake Michigan Lobe	JW Peters	Racine
6	Niagara Dolomite	Franklin Quarry - Vulcan	Milwaukee
7	Galena Platteville Dolomite	Carew Concrete	Outagamie
8	Glacial Gravel – Lake Michigan/ Green Bay Trans	Evanson Quarry	Manitowoc
9	Prairie Du Chien Dolomite – NE Wisconsin	Faulk Bros. Quarry	Waupaca
10	Granite	Haske Quarry	Wood
11	Diabase	RME- Athens	Marathon
12	Glacial Gravel – Central Green Bay Lobe	Wimme Pit	Portage
13	Glacial Gravel – Wisconsin Valley Lobe	Crass Road Pit	Lincoln
14	Chippewa River Gravel	Todds Ready-Mix	Barron
15	Basalt Traprock	Dresser Quarry**	Polk

* Aggregate types are in accordance with Wis-DOOT description

** Aggregate gradation was according to Spec. Product 822 for 1-1/2 in. stone, and CA 50, Product 827 for ¾ in. stone.

A detailed literature survey was conducted and completed on the CTE of concrete. Included in this literature survey, sources were identified and compiled related to experience with the AASHTO TP60 test procedure. A number of issues were noted regarding the use of this test procedure. Based on the literature study, and experience of the UWM Center for By-Products Utilization in previous projects, modifications to the TP60 were recommended to the WHRP. The Wis-DOT response to the recommendations was that despite these potential shortfalls and problems with the existing test procedure, the AASHTO TP 60 should be followed.

Work Next Quarter:

Continue to monitor new information related to the new AASHTO mechanistic-empirical design procedure, in particular, technical papers to be published during the Transportation Research Board (TRB) meeting scheduled for January 2006.

Continue to evaluate aggregate properties required for concrete mixtures. Obtain admixtures needed for the concrete to be produced. Test the performance of AASHTO TP 60 CTE apparatus, and begin lab production of concrete mixtures. Begin testing of CTE and splitting tensile strength of concrete.

Circumstances Affecting Progress/Budget:

None

