



**MICHIGAN  
STATEWIDE PLANNING AND RESEARCH,  
PART II, PROGRAM**

**FISCAL YEAR 2008  
ANNUAL REPORT**

October 1, 2007 – September 30, 2008



**OFFICE OF RESEARCH & BEST PRACTICES  
MICHIGAN DEPARTMENT OF TRANSPORTATION**

**TABLE OF CONTENTS**

**The SPR, Part II, FY 2008 Annual Report**

Letter of Introduction .....	ii
Executive Overview .....	iii
Research Program Highlights .....	iv
FY 2008 Project Budget Summaries .....	v

**FY 2008 SPR, Part II, Project Progress Reports (as of September 30, 2008)**

Administrative Items (Active) .....	2
In-House Research Studies (Active) .....	7
Contract Research Studies (Active) .....	15
Contract Research Studies (Proposed) .....	61
Pooled Fund Studies .....	81

## STATEWIDE PLANNING AND RESEARCH, PART II, PROGRAM 2008 ANNUAL REPORT

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### INTRODUCTION

The Statewide Planning and Research (SPR), Part II, Program is a multi-modal program where the highest priorities are given to research in the areas of Congestion Management, Traffic and Safety, Intelligent Transportation Systems (ITS), and Infrastructure (Bridges and Highways).

This annual report is for the Michigan Department of Transportation (MDOT) SPR, Part II, Program for Fiscal Year (FY) 2008. The purpose of this program is to conduct research that concurs with MDOT's mission of "providing the highest quality integrated and transportation services for economic benefit and improved quality of life." The report covers the period from October 1, 2007, through September 30, 2008. The main components of this report are:

- Executive Overview
- Research Program Highlights
- Project Budget Summaries
- Project Progress Reports

During FY 2008, 28 projects were completed at a total cost of \$5,107,762.35. The project areas include Administration, Bridges and Structures, Pavement Performance, Planning, Pooled Fund Studies, Safety, and Technology Transfer.

The Office of Research and Best Practices (ORBP) is responsible for managing MDOT's research, development, and technology activities within the SPR, Part II, Program. Yearly, MDOT submits a proposed SPR, Part II, Program project template to the Federal Highway Administration (FHWA) for review and approval. Upon FHWA's approval, the research projects are funded. Work may proceed after October 1 of the new fiscal year.

Approved research projects are contracted to various Michigan universities, researchers within MDOT (In-House), and consulting firms. Implementation of research results is important and emphasized by ORBP throughout all levels of program management.

This annual report provides an overview of active and completed projects during the current fiscal year. If you need any further information regarding a specific project listed in the document, please contact the ORBP University Research Administrator, at (517) 322-5670.

Special recognition to MDOT project managers for providing project-related information and to ORBP staff members Nancy Crider, Annette Nealey, Angela Nelson, Andre' Clover, Sudhakar Kulkarni, and Homer Sprague for assisting in compiling the contents of this report.



Calvin Roberts, P.E.  
Engineer of Research and Best Practices

## FISCAL YEAR 2008 EXECUTIVE SUMMARY

### **FY 2008 Program**

The FY 2008 SPR, Part II, Program consists of 80 projects with a total budget of \$10,051,414.14. The program areas include: Administration, In-House, Bridges and Structures, Pavement and Construction, Concrete and Materials, Hot-Mix Asphalt, ITS Safety and Operations, Special Projects, and Pooled Fund Studies. During FY 2008, 28 projects were completed, 31 continue into FY 2009, 7 projects were canceled, and 14 remain as proposed projects. All the research projects, with the exception of the Administration and In-House Studies, are contracted to consulting firms and universities within Michigan.

### **SPR, Part II Annual Report Tables**

The tables on pages v through xii list the projects by categories of Administrative, In-House Studies, Active Contract Research Studies, Proposed Contract Research Studies, and Pooled Fund Studies. The tables provide details such as project number, financial information, research agency, principal investigator, and project title, in addition to the project start and end dates.

### **Quarterly/Annual SPR, Part II Project Progress Reports**

The Progress Reports on pages 2 through 97 are provided by the project managers (PMs). The report lists expenditures and activity from the start of the project through the final quarter of FY 2008. The financial information for each project lists the total expenditures, expenditures to date, and the budget as authorized by the Michigan State Administrative Board.

### **FY 2008 Program Milestones:**

- Completed 28 projects with a total current and previous year's expenditure of \$5,107,762.35.
- Updated office name to Office of Research and Best Practices.
- Hosted a peer review of the research program in December 2007.
- Submitted the proposed FY 2009 SPR, Part II, Program for review and approval to FHWA on August 6, 2008.
- Received FHWA approval of the FY 2009 SPR, Part II, Program on September 15, 2008.
- Distributed the new Research and Implementation Manual (RIM) to university and other research partners, project managers, and to various offices and staff within MDOT.
- Published a quarterly ORBP newsletter, which provides a means for communication and technology transfer with stakeholders.
- Completed preparations for the Research Summit. The collective effort of MDOT experts and other stakeholders will produce a document prioritizing research topics including multi-modal and integrated transportation systems under MDOT's jurisdiction.

### **FY 2009 Program Goals**

- Implement the RIM, which includes PM training. The training will cover required project management compliance for invoicing, reporting, final reports, and implementation of research results.
- Commence development of the FY 2010/2011 biennial research program.
- Reduce or eliminate the backlog of proposed projects.
- Host the Research Summit on October 1, 2008. The summit brings together MDOT experts and other stakeholders to discuss and prioritize research topics including multi-modal and integrated transportation systems under MDOT's jurisdiction. The results will be instrumental in directing the focus of the next biennium program.
- Propose the FY 2010/2011 biennial program in July 2009, with final FHWA approval in September 2009.

**RESEARCH PROGRAM HIGHLIGHTS**

**FY 2008**

During fiscal year 2008, the MDOT SPR, Part II, Program finished 28 projects at a cost of \$5,107,762.35. Projects are classified in the following areas:

TYPE	NUMBER OF PROJECTS/CONTRACTS	TOTAL EXPENDITURES FOR PROJECTS/ CONTRACTS	TOTAL EXPENDITURES IN PERCENT
Administration	5	\$666,360.52	13.05%
Bridges	7	\$1,093,697.49	21.41%
Construction	0	\$0.00	0.00%
Economic Planning	0	\$0.00	0.00%
Environment	0	\$0.00	0.00%
Materials	1	\$159,870.12	3.13%
Miscellaneous	0	\$0.00	0.00%
Pavement Design	0	\$0.00	0.00%
Pavement Performance	5	\$702,403.49	13.75%
Planning	1	\$100,000.00	1.96%
Pooled Fund Studies	6	\$1,717,056.00	33.62%
Safety	1	\$64,206.40	1.26%
Technology Transfer	2	\$604,168.33	11.83%
Traffic	0	\$0.00	0.00%
<b>TOTAL</b>	<b>28</b>	<b>\$5,107,762.35</b>	<b>100.00%</b>

**MDOT ANNUAL RESEARCH PROGRAM  
FISCAL YEAR 2008**

Funding	Project No.	FY 2008 Expenditures	Expenditures to Date	Total Budget	Agency	Principal Investigator	Title	Start Date	End Date	End Date(rev)	Pg#
SPR, Part II	*101668	\$403,340.00	\$604,821.00	\$604,821.00	MDOT	C. Roberts	Transportation Research Board (TRB) Research Correlation Service	10/1/2005	9/30/2008		2
SPR, Part II	*101671	\$44,734.21	\$44,734.21	\$58,022.86	MTU	T. McNinch	Publication of Research and Best Practices News A Quarterly Publication	10/1/2007	9/30/2008		3
SPR, Part II	*101713	\$14,994.31	\$14,994.31	\$15,000.00	MDOT	C. Roberts	MDOT Research Peer Exchange	10/1/2006	9/30/2008		4
SPR, Part II	*103766	\$211.00	\$211.00	\$211.00	MDOT	S. Kulkarni	Audit Report #2003-287	10/1/2007	9/30/2008		5
SPR, Part II	*104227	\$1,600.00	\$1,600.00	\$2,000.00	MDOT	C. Roberts	2008 Research Summit Support	10/1/2007	9/30/2008		6
		<b>\$479,279.57</b>	<b>\$666,360.52</b>	<b>\$680,054.86</b>	<b>TOTAL ADMINISTRATIVE ITEM BUDGET</b>						

\*Project closed in FY 2008

**MDOT ANNUAL RESEARCH PROGRAM  
FISCAL YEAR 2008**

Funding	Project No.	FY 2008 Expenditures	Expenditures to Date	Total Budget	Agency	MDOT Project Manager	Title	Start Date	End Date	End Date(rev)	Pg#
SPR, Part II	101669	\$1,167.84	\$7,766.00	\$32,950.00	MDOT	Kahl	Stainless Reinforcement in Bridge Decks	10/1/2006	9/30/2007	9/30/2009	7
SPR, Part II	101673	\$5,082.00	\$19,153.00	\$30,000.00	MDOT	Kahl	Stainless-Clad Reinforcement in Bridge Decks	10/1/2006	9/30/2008	9/30/2009	8
SPR, Part II	102026	\$12,460.58	\$12,460.58	\$44,806.00	MDOT	Palmer	Electronic Frost Tube	9/5/2003	9/30/2005	12/31/2008	9
SPR, Part II	*102028	\$7,500.00	\$100,000.00	\$100,000.00	MDOT	Croze	Winter Maintenance Level of Service	10/1/2004	9/30/2007	9/30/2008	10
SPR, Part II	102052	\$0.00	\$0.00	\$60,000.00	MDOT	Krueger	High Occupancy Vehicle (HOV) Research	Project Canceled			11
SPR, Part II	102086	\$178,672.00	\$264,780.00	\$800,000.00	MDOT	Krueger	ITS Hardware laboratory and Equipment	10/1/2005	9/30/2010		12
		<b>\$204,882.42</b>	<b>\$404,159.58</b>	<b>\$1,067,756.00</b>	<b>TOTAL ACTIVE IN-HOUSE STUDIES BUDGET</b>						

\*Project closed in FY 2008

**MDOT ANNUAL RESEARCH PROGRAM  
FISCAL YEAR 2008**

Funding	Project No.	FY 2008 Expenditure	Expenditures to Date	Project Total Budget	Agency	Principal Investigator	Title	Start Date	End Date	End Date(rev)	Pg#
SPR, Part II	*101674	\$12,261.71	\$87,845.91	\$87,900.87	UM	Li	Link Slabs for Jointless Bridge Decks Based on Strain-Hardening Cementitious Composites – Phase 3: Shrinkage Control	7/25/2006	7/24/2007	1/31/2008	15
SPR, Part II	*101675	\$121,685.39	\$150,245.00	\$150,245.00	WSU	Fu	Enhancement of Michigan's Bridge Management System (BMS) Using Pontis Software and Michigan Specific Elements	8/8/2005	8/8/2007	9/30/2008	16
SPR, Part II	*101686	\$23,977.90	\$211,889.59	\$239,383.00	MSU	Burgueno	Repair Strategies for Relieving Structural Distress in Bridge Abutments	12/27/2004	12/27/2006	12/31/2007	17
SPR, Part II	101688	\$73,068.68	\$141,059.74	\$224,523.00	WMU	Yehia	Monitoring and Evaluation of Rapid Bridge Deck Technique at Parkview Bridge, Kalamazoo, MI	11/30/2005	11/20/2008		19
SPR, Part II	*101689	\$87,506.31	\$161,604.80	\$161,604.80	MTU	Ahlborn	Condition Assessment and Methods of Abatement of Prestressed Concrete Box-Beam Deterioration: Phase II	9/20/2006	8/20/2008		20
SPR, Part II	*101691	\$160,799.25	\$191,457.76	\$193,821.80	WMU	Aktan	Condition Assessment and Methods of Abatement of Prestressed Concrete Box-Beam Deterioration: Phase II	3/23/2007	9/30/2008		21
SPR, Part II	101698	\$79,147.77	\$167,545.33	\$334,908.00	MSU	Harichandran	ECR Bridge Decks: Damage and Assessment of Remaining Service Life for Various Overlay Repair Options	9/29/2006	3/29/2009	9/29/2009	22
SPR, Part II	*101699	\$105,153.69	\$122,654.44	\$123,069.77	WMU	Aktan	Combining Link-Slab, Deck Sliding Over Back-Wall and Revising Bearings	3/23/2007	7/23/2008		24
SPR, Part II	101701	\$38,783.60	\$63,251.41	\$118,514.72	WSU	Miller	A Critical Evaluation of Bridge Scour for Michigan Specific Conditions	3/12/2007	3/12/2010		25
SPR, Part II	101702	\$38,057.29	\$55,165.60	\$165,689.05	LTU	Carpenter	A Critical Evaluation of Bridge Scour for Michigan Specific Conditions	6/19/2007	6/19/2010		27
SPR, Part II	*101708	\$29,579.75	\$167,999.99	\$168,000.00	LTU	Grace	Transverse Post Tensioning of Side-by-Side Box Beam Bridges	8/12/2006	9/12/2008		29
SPR, Part II	101714	\$39,189.36	\$39,189.36	\$199,740.00	MSU	Burgueno	Effects of Debonded Strands on the Production and Performance of Prestressed Concrete Beams	8/2/2007	8/2/2009		31
SPR, Part II	101716	\$4,811.27	\$4,811.27	\$214,975.71	WSU	Fu	Skewed Bridges	7/12/2007	10/12/2009		33
SPR, Part II	*101719	\$64,206.40	\$64,206.40	\$64,206.40	URS	Tarazi	Feasibility Study of GPS Based Bridge Monitoring System on Mackinaw Bridge	8/22/2007	3/31/2008		34
SPR, Part II	*101737	\$4,020.00	\$159,870.12	\$160,095.00	MSU	Harichandran	Improved Shallow Depth Patches for Concrete Structures	10/13/2004	10/15/2006	10/13/2007	35
SPR, Part II	*101738	\$111,798.95	\$164,259.54	\$164,674.55	SME	Kohn	Performance of Michigan's Jointed Portland Cement Concrete (PCC) Pavements – Phase I and II	3/8/2007	9/30/2008		36

\*Project closed in FY 2008

**MDOT ANNUAL RESEARCH PROGRAM - CONTINUED**  
**FISCAL YEAR 2008**

Funding	Project No.	FY 2008 Expenditure	Expenditures to Date	Total Budget	Agency	Principal Investigator	Title	Start Date	End Date	End Date(rev)	Pg#
SPR, Part II	101739	\$123,133.23	\$205,377.99	\$228,922.92	UM	Hansen	Durability Study of US-23 Aggregate Test Road and Recent JPCP Projects with Premature Joint Deterioration	12/21/2006	3/21/2009		37
SPR, Part II	101743	\$83,465.64	\$94,720.90	\$181,925.24	MTU	You	Development of New Test Procedures for Measuring Fine and Coarse Aggregate Specific Gravities	4/9/2007	4/9/2009		38
SPR, Part II	101745	\$151,327.34	\$153,807.89	\$304,826.44	MTU	Sutter	Impact of Hydrated Cement Paste Quality and Entrained Air-Void System on the Durability of Concrete	7/31/2007	7/31/2010		39
SPR, Part II	101746	\$12,490.87	\$13,132.31	\$180,181.61	MTU	Hiller	Efficient Use of Recycled Concrete in Transportation Infrastructure	9/10/2007	8/31/2009		41
SPR, Part II	101997	\$8,000.96	\$184,654.97	\$350,062.36	MTU	Sutter	Evaluation of Concrete Pavements with Material-Related Distress	12/5/2005	12/5/2008		42
SPR, Part II	*101999	\$49,951.36	\$49,951.36	\$50,000.00	MSU	Baladi	Value Effect of Construction Incentive Payments on Pavement Performance	10/1/2007	9/30/2008		43
SPR, Part II	102001	\$93,971.98	\$149,490.07	\$220,090.00	MSU	Chatti	Assessment of Pavement Acceptance Criteria and Quantifying its As-Constructed Material and Structural Properties	1/4/2007	3/4/2009		44
SPR, Part II	*102008	\$42,552.38	\$178,724.01	\$189,538.00	MSU	Buch	Evaluation of the I-37A Design Process for New and Rehabilitated JPCP and HMA Pavements	11/26/2005	5/29/2008		45
SPR, Part II	*102009	\$5,874.13	\$80,076.58	\$101,227.00	MSU	Buch	Quantifying Coefficient of Thermal Expansion Values	11/29/2005	11/26/2007		46
SPR, Part II	*102016	\$5,472.09	\$229,392.00	\$229,392.00	MTU	Hodek	Resilient Modulus at the Limits of Gradation and Varying Degrees of Saturation	9/8/2004	9/12/2006	5/31/2007	47
SPR, Part II	102017	\$43,022.79	\$94,083.71	\$180,001.09	MTU	You	Development of Specifications for the SuperPave Simple Performance Tests	10/18/2006	10/18/2008	5/16/2009	48
SPR, Part II	102018	\$48,070.99	\$113,386.08	\$265,908.00	MSU	Baladi	Pavement Subgrade MR Design Values for Michigan's Seasonal Changes	1/4/2007	1/4/2009		49
SPR, Part II	*102043	\$58,965.35	\$178,789.33	\$178,937.00	MSU	Rajendra	Evaluation of Economic Impacts of VII Program in Michigan	9/8/2006	3/8/2007	3/8/2008	50
SPR, Part II	102044	\$242,463.68	\$330,755.50	\$800,000.00	UM	Sweatman	MDOT Vehicle Infrastructure Integration Data Analysis Documentation and Research Support Program	8/30/2006	12/30/2008	9/30/2009	51
SPR, Part II	102045	\$1,404,876.56	\$2,013,769.75	\$3,500,000.00	Mixon-Hill	Mixon	Evaluation of the Usage and Impact of the Michigan Vehicle Infrastructure Integration Program	2/15/2007	12/31/2008		52
SPR, Part II	102047	\$51,971.31	\$51,971.31	\$66,144.00	MSU	Lyles	An Evaluation of Right-Turn-In/Right-Turn-Out Restrictions in Access Management	8/24/2007	9/30/2008	12/31/2008	54

\*Project closed in FY 2008

**MDOT ANNUAL RESEARCH PROGRAM - CONTINUED**  
**FISCAL YEAR 2008**

Funding	Project No.	FY 2008 Expenditure	Expenditures to Date	Project Total Budget	Agency	Principal Investigator	Title	Start Date	End Date	End Date(rev)	Pg#
SPR, Part II	102078	\$49,768.14	\$49,768.14	\$140,039.00	MSU	Buch	Characterization of Traffic for the New ME Design Guide (I-37A) for Michigan	10/1/2007	9/30/2009		55
SPR, Part II	*102103	\$425,379.00	\$425,379.00	\$435,000.00	Coleman Eng.	Moore	Height Modernization Phase III and IV	4/7/2008	8/31/2008		56
SPR, Part II	102016	\$377,081.70	\$458,471.86	\$498,434.00	UDM	Hanifin	Michigan-Ohio University Transportation Center (MIOH UTC)	5/1/2007	9/30/2009		57
		<b>\$4,271,886.82</b>	<b>\$7,008,759.02</b>	<b>\$10,871,980.33</b>	<b>TOTAL ACTIVE CONTRACT RESEARCH STUDIES BUDGET</b>						

\*Project closed in FY 2008

**MDOT ANNUAL RESEARCH PROGRAM  
FISCAL YEAR 2008**

Funding	Project No.	FY 2007 Expenditures	Expenditures to Date	Total Budget	Agency	Principal Investigator	Title	Start Date	End Date	End Date(rev)	Pg#
SPR, Part II	101718	\$0.00	\$0.00	\$117,500.00	MTU	Ahlborn	Rapid Construction Solutions Using Prefabricated Prestressed Concrete Systems – Phase II	Project Canceled			61
SPR, Part II	101729	\$0.00	\$0.00	\$195,000.00	MTU	TBD	Scour Countermeasures for Michigan	TBD	TBD		62
SPR, Part II	101731	\$0.00	\$0.00	\$170,000.00	MTU	TBD	Causes and Solution Strategies for Deck Cracking in Jointless Bridges	Project Canceled			63
SPR, Part II	101732	\$0.00	\$0.00	\$265,022.63	WMU	Aktan	High Skew Link Slab Bridge System with Deck Sliding over Backwall or Backwall Sliding over Abutments	10/21/2008	9/30/2010		64
SPR, Part II	101733	\$0.00	\$0.00	\$210,000.00	MTU	Kahl	Causes and Cures for Deterioration of Box-Beam Bridges – Phase II	TBD	TBD		65
SPR, Part II	101734	\$0.00	\$0.00	\$280,000.00	LTU	TBD	Investigate Causes and Develop Methods for Preventing Concrete from Bridge Decks or Falling Deck Concrete Hazards: Reasons, Detection and Mitigation	TBD	TBD		66
SPR, Part II	101735	\$0.00	\$0.00	\$120,000.00	WSU	TBD	Reliability Based Evaluation of Loading Configuration for Long Span Bridges or Reliability Based Load Configurations for Rating of Long-Span Bridges in Michigan	TBD	TBD		67
SPR, Part II	102031	\$0.00	\$0.00	\$150,000.00	TBD	TBD	Pavement Management System Pilot for Automated Distress Recognition	TBD	TBD		68
SPR, Part II	102053	\$0.00	\$0.00	\$7,000.00	MSU	Buch	Investigating New Technologies to Detect Dowel Alignment Errors in Jointed Concrete Pavement	Project Canceled			69
SPR, Part II	102055	\$0.00	\$0.00	\$80,000.00	TBD	TBD	Assessment of Modified Asphalt Binders	Project Canceled			70
SPR, Part II	102057	\$0.00	\$0.00	\$145,000.00	MTU	TBD	Develop a Trial Specification Criteria for Mineral Fines Used in Hot Mix Asphalt for Michigan	Project Canceled			71
SPR, Part II	102058	\$0.00	\$0.00	\$190,007.08	MTU	You	Laboratory Evaluation of Warm Asphalt Mix (MTU)	11/3/2008	12/3/2010		72
SPR, Part II	102077	\$0.00	\$0.00	\$300,000.00	UM	Hansen	A New Generation of High-Performance JPCP for Michigan High-Volume Truck Routes Such as I-75 and I-94	TBD	TBD		73
SPR, Part II	102079	\$0.00	\$0.00	\$157,746.00	MSU	Baladi	Backcalculation of Resilient Modulus Values for Unbound Pavement Materials	TBD	TBD		74
SPR, Part II	102084	\$0.00	\$0.00	\$180,000.00	TBD	TBD	Investigation of Pavement Distress Due to Logging Trucks in the Superior Region	Project Canceled			75
SPR, Part II	102085	\$0.00	\$0.00	\$267,914.09	UM	TBD	Major Factors Controlling Dowel Bar Looseness in JPCP	TBD	TBD		76
SPR, Part II	102104	\$0.00	\$0.00	\$300,000.00	TBD	TBD	Guidelines for Applying Traffic Microsimulation Modeling	TBD	TBD		77
SPR, Part II	104849	\$0.00	\$0.00	\$150,000.00	TBD	TBD	Before and After Analysis-Affect of All Red Phase at Signalized Intersections on State Trunkline Roadways	TBD	TBD		78

**MDOT ANNUAL RESEARCH PROGRAM - CONTINUED**  
**FISCAL YEAR 2008**

Funding	Project No.	FY 2007 Expenditures	Expenditures to Date	Total Budget	Agency	Principal Investigator	Title	Start Date	End Date	End Date(rev)	Pg#
SPR, Part II	104852	\$0.00	\$0.00	\$55,000.00	MTU	Hodek	A Study of Port and Waterways: Their Integration into the Rail and Highway Networks of Michigan	TBD	TBD		79
SPR, Part II	104853	\$0.00	\$0.00	\$60,000.00	MTU	Sproule	Our Aging Population and Its Impact on Michigan Transit	TBD	TBD		80
		<b>\$0.00</b>	<b>\$0.00</b>	<b>\$3,400,189.80</b>	<b>TOTAL PROPOSED CONTRACT RESEARCH STUDIES BUDGET</b>						

\*Project closed in FY 2008

**MDOT ANNUAL RESEARCH PROGRAM  
FISCAL YEAR 2008**

Funding	Project No.	FY 2008 Expenditure	Expenditures to Date	Project Total Budget	Agency	MDOT Project Manager	Title	Start Date	End Date	End Date (rev)	Pg#
SPR, Part II	*47897	\$40,000.00	\$120,000.00	\$120,000.00	OH DOT	Clover	Evaluation of CTCLS Series Traffic Signal Load Switches in Field, Bulb Life Determinations and Development of a Group Relamping Model, SPR-3(068)	1/1/1998	9/30/2008		81
SPR, Part II	*86556	\$12,475.51	\$25,000.00	\$25,000.00	MI DOT	Kennedy	Midwest Pavement Preservation Partnership (MPPP) TPF-5(112)	8/24/2005	8/24/2008	9/30/2008	82
SPR, Part II	*86737	\$50,000.00	\$100,000.00	\$125,000.00	IN DOT	Barak	Base Funding for North Central SuperPave Center TPF-5(021)	10/1/2005	9/30/2009		83
SPR, Part II	88921	\$15,000.00	\$15,000.00	\$75,000.00	MN DOT	Eacker	Recycled Unbound Pavement Materials (MNROAD Study) TPF-5(129)	5/1/2007	5/1/2012		84
SPR, Part II	102032	\$25,000.00	\$75,000.00	\$100,000.00	WI DOT	Croze.	Clear Roads Pooled Fund Study TPF-5(092)	10/1/2005	9/30/2009		85
SPR, Part II	102034	\$7,000.00	\$7,000.00	\$29,000.00	IA DOT	Larson	Technology Transfer Concrete Consortium (TTCC) TPF-5(159)	10/1/2008	9/30/2012		87
SPR, Part II	102035	\$20,000.00	\$100,000.00	\$120,000.00	IA DOT	Till	Long Term Maintenance of Load and Resistance Factor Design Specs TPF-5(068) (2003, 2005, 2008, & 2010)	10/1/2002	9/30/2006	9/30/2010	88
SPR, Part II	102036	\$25,000.00	\$25,000.00	\$75,000.00	IA DOT	Gustafson	Aurora Pooled Fund Project SPR-3(042)	10/1/2007	9/30/2010		89
SPR, Part II	*102039	\$1,064,856.00	\$1,064,856.00	\$1,064,856.00	FHWA	Roberts	NCHRP for FY2008 TPF-5(408)	10/1/2007	9/30/2008		90
SPR, Part II	*102509	\$7,200.00	\$327,200.00	\$327,200.00	WI DOT	Reincke	National Transportation Asset Management Research Program TPF-5(036)	2/2/2002	9/30/2008		91
SPR, Part II	103162	\$5,000.00	\$5,000.00	\$10,000.00	WI DOT	Briseno	Transportation Library Connectivity Pooled Fund Study TPF-5(105)	10/1/2007	9/30/2009		92
SPR, Part II	104228	\$25,000.00	\$25,000.00	\$87,000.00	IN DOT	Staton	Evaluation of Test Methods for Permeability (Transport) and Development of Performance Guidelines for Durability TPF-5 (179)	10/1/2008	9/30/2011		94
SPR, Part II	104229	\$13,000.00	\$13,000.00	\$26,000.00	WA DOT	Nelson	Transportation Research Program Management Database TPF-5(181)	10/1/2007	9/30/2009		95
SPR, Part II	*104231	\$80,000.00	\$80,000.00	\$80,000.00	VA DOT	Eacker	Performance Guidelines for the Selection of Hot-Pour Crack Sealants TPF-5(045)	10/1/2007	9/30/2008		97
		<b>\$1,389,531.51</b>	<b>\$1,982,056.00</b>	<b>\$2,264,056.00</b>	<b>TOTAL ACTIVE POOLED FUND STUDIES BUDGET</b>						

\*Project closed in FY 2008

# SPR, PART II FUNDED PROGRAM

Administrative Items

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Transportation Research Board (TRB) Research Correlation Service

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Calvin Roberts

CONTRACT/AUTHORIZATION #		PROJECT START DATE	10/1/2005
SPR NUMBER	101668	COMPLETION DATE (Original)	9/30/2008
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	N/A		
PRINCIPAL INVESTIGATOR	N/A		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$604,821.00	TOTAL		N/A
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$604,821.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$201,670.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****	\$403,340.00	TRAVEL		
FY EXPENDITURE		\$403,340.00	OTHER		
% PERCENT COMPLETE (By Budget)		100%	PERCENT COMPLETE (By Work)		100%

**PURPOSE AND SCOPE**

To provide a mechanism for State Transportation departments to support the TRB's core program and services.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

To fulfill MDOT's obligations for FY07 and FY08.

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Publications of Research and Best Practices (formerly Research Record)

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Sudhakar Kulkarni

CONTRACT/AUTHORIZATION #	2006-0414 / A15	PROJECT START DATE	10/1/2007
SPR NUMBER	101671	COMPLETION DATE (Original)	9/30/2008
ORBP NUMBER	OR00027	COMPLETION DATE (Revised)	
RESEARCH AGENCY	Michigan Technological University		
PRINCIPAL INVESTIGATOR	Terry McNinch and Technical Editor: John Ryyanen		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$58,022.86	TOTAL		N/A
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$44,734.21	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$58,022.66	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$44,734.21	OTHER		
% PERCENT COMPLETE (By Budget)		77%	PERCENT COMPLETE (By Work)		75%

**PURPOSE AND SCOPE**

To communicate research findings and implementation of research results to stakeholders. Michigan Local Technical Assistance program (LTAP) assists MDOT in publication and circulation of the newsletter. The contents of the publication are determine and reviewed by ORBP. There are four quarterly newsletters.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Not applicable

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Paperwork has been submitted to Contracts. We are waiting for an Ad Board date in February to obtain an authorization. Work has already begun. The authorization will be retroactive to October 1, 2007.

Issue #1 was published in January 2008. This issue contained an overview of ORBP's team building session and peep exchange efforts. The Research Adoption Process map was printed and explained in the newsletter. Emphasizing this piece of the research cycle helps readers understand adopting results can maximum the return on our research investment.

Issue #2 was published in May 2008. This issue is titled "Change Enhance Collaboration Within Michigan's Transportation Community." This issue contains topics such as Refining the Operation, Library Improvements, Technology Upgrades, Research Administration Manual, and New Management Plan. John Ryyanen is the technical writer.

Issue #3 was published in September 2008. The topic covered was " Implementation a Top Consideration in MDOT's New Strategy for Managing SPR, Part II Program Research." The original plan was to publish four quarterly newsletters. ORBP staff was working on arranging the Research Summit; therefore, the fourth issue was not completed. These three issues complete the work plan for this fiscal year. The remaining publication will be a part of next fiscal year's work items.

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

This publication provides means of research communication with the stakeholders, as well as a tool of technology transfer by short write-ups on highly visible research projects, such as the Vehicle Infrastructure Integration (VII) project.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Continue to publish this quarterly newsletter under new authorization.

**OFFICE OF RESEARCH & BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: MDOT Research Peer Exchange

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Calvin Roberts

CONTRACT/AUTHORIZATION #		PROJECT START DATE	10/1/2006
SPR NUMBER	101713	COMPLETION DATE (Original)	9/30/2007
ORBP NUMBER		COMPLETION DATE (Revised)	12/6/2007
RESEARCH AGENCY	MDOT		
PRINCIPAL INVESTIGATOR	N/A		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$15,000.00	TOTAL		
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$14,994.00	SALARIES		
<b>FY 2008 Budget</b>			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$15,000.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$14,994.00	OTHER		
% PERCENT COMPLETE (By Budget)		99.9%	PERCENT COMPLETE (By Work)		100%

**PURPOSE AND SCOPE**

The Michigan Department of Transportation, in compliance with the Federal Highway Administration (FHWA), requires that each state has a peer exchange periodically to review its research program. Peer exchanges as required under 23 CFR, Section 420.207 (b) are a practical and effective tool to foster excellence in Statewide Planning and Research (SPR), Part II, research program management. They provide an opportunity for participants to share best practices and management innovations through an open exchange of ideas, knowledge, and brainstorming. The goal of the peer exchange is for participants from various state research programs, the FHWA, the host state and others as deemed appropriate, to share information and to identify the strength and opportunities for improving the host state's SPR, Part II, programs. At the end of the two to four day exchange, the participants, known as the Peer Exchange Team, develops a report which the host state refers to for program improvements.

The cost of hosting a peer exchange is included in the Research Work Program for the fiscal year in which it will be held. In accordance with 23 CFR 420.209 (a)(7), expenses for hosting peer exchanges are eligible for 100% federal funding.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

The Office of Research and Best Practices (ORBP) hosted MDOT's Research Peer Exchange entitled, "Transforming a State DOT Research Program" on December 3 - 6, 2007. ORBP printed a final report of the exchange and posted it electronically to the FHWA Web site in May 2008. ORBP held had a follow-up teleconference with the out-of-state participants on June 4, 2008. Many take-aways from the exchange were incorporated into MDOT's new management structure for research projects as detailed in the Research and Implementation Manual that was published in September 2008 and went into effect October 1, 2008.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Project completed in fiscal year 2008.

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

Continue to reference the final report from the exchange as the Research and Implementation Manual is incorporated into the management and administration of research projects for MDOT.

\*The original authorized total budget amount of the project

\*\*The authorized total budget amount as revised, if applicable

\*\*\* The project life to date expenditure

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: MDOT - Audit Report No. 2003-287

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Sudhakar Kulkarni

CONTRACT/AUTHORIZATION #		PROJECT START DATE	10/1/2007
SPR NUMBER	103766	COMPLETION DATE (Original)	9/30/2008
ORBP NUMBER	OR00077	COMPLETION DATE (Revised)	
RESEARCH AGENCY			
PRINCIPAL INVESTIGATOR			

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$211.00	TOTAL		N/A
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$211.00	SALARIES		
<b>FY 2008 Budget</b>			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$211.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$211.00	OTHER		
% PERCENT COMPLETE (By Budget)		100%	PERCENT COMPLETE (By Work)		100%

**PURPOSE AND SCOPE**

Job was created to request funds to pay an amount owed on a research project's Auditor's Report (#2003-287). Original project title was ITS Investment Impacts on Freight and Tourism. Original authorized dates were: 3/20/00 to 2/28/01. Original contract and authorization number was: 1994-0271/Z7.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

NA

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Amount (\$211) was paid to vendor (University of Michigan) by direct voucher (591W9202054) per Auditor's Report 2003-287.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

NA

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

NA

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH & BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: 2008 Research Summit Support

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Calvin Roberts

CONTRACT/AUTHORIZATION #		PROJECT START DATE	8/22/2008
SPR NUMBER	104227	COMPLETION DATE (Original)	11/14/2008
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	MDOT		
PRINCIPAL INVESTIGATOR	N/A		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$2,000.00	TOTAL		\$400.00
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$1,600.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$1,600.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$1,600.00	OTHER		\$400.00
% PERCENT COMPLETE (By Budget)		80%	PERCENT COMPLETE (By Work)		80%

**PURPOSE AND SCOPE**

The Michigan Department of Transportation (MDOT) is working on the fiscal year 2010-2011 biennial program for the Statewide Planning and Research (SPR), Part II, Program. The research summit allowed the inclusion of Michigan transportation research stakeholder in the formation of problem statement to address MDOT's critical research needs. The approximate 125 attendees included an array of MDOT staff, numerous representatives from research universities across Michigan, participants from the Federal Highway Administration, private contracting firms, and University Transportation Centers.

As described in the Research and Implementation Manual, in December 2008, the Office of Research and Best Practices (ORBP) will issue a call for problem statements. MDOT will focus on the summarized research idea capsules developed during the research summit.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

The summit preparations, invitations, and logistics were successfully completed.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Held MDOT's first biennial research summit on October 1, 2008, at the Lansing Center, Lansing, Michigan. Summarized the research ideas derived from the summit into capsulized statements. MDOT executives ranked and revised the statements according to department priorities. ORBP developed the call for research problem statements around the approved and ranked capsulized research ideas from the summit. MDOT will select complete and appropriate problem statements developed to meet the goals set in the call statements, prioritizing them according to the established department priorities. ORBP will finalize the fiscal year 2010-2011, SPR, Part II, Program from these problem statements and submit it to FHWA for approval.

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

The derived research ideas from the summit will be summarized, ranked, revised, and issued as part of the call for research projects for the SPR, Part II, Program. The problem statements developed from these ideas will become part of MDOT's fiscal year 2010-2011 SPR, Part II, Program.

\*The original authorized total budget amount of the project

# SPR, PART II FUNDED PROGRAM

In-House Research Studies  
(Active)

**OFFICE OF RESEARCH and BEST PRACTICES  
STATEWIDE PLANNING AND RESEARCH (SPR), PART II  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Stainless Reinforcement in Bridge Decks

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Steve Kahl

CONTRACT/AUTHORIZATION #	In-House	PROJECT START DATE	10/1/2006
SPR NUMBER	101669	COMPLETION DATE (Original)	09/30/2007
ORBP NUMBER		COMPLETION DATE (Revised)	09/30/2009
RESEARCH AGENCY	MDOT		
PRINCIPLE INVESTIGATOR	N/A		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$32,950.00	TOTAL		\$25,184.00
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$7,766.00	SALARIES		
<b>FY 2008 Budget</b>			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$15,000.00	EQUIPMENT	(Non-expandable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$1,167.84	OTHER		
PERCENT COMPLETE (By Budget)		73%	PERCENT COMPLETE (By Work)		85%

**PURPOSE AND SCOPE**

Evaluate performance of stainless reinforcement in new and existing bridge decks. The bridge S02 of 63103 (I-696 over Lenox Rd., Ferndale; built in 1984 with stainless type 304 rebar) will be visually inspected and crack mapped. Construction methods, type of stainless steel rebar used, and actual cost of the deck systems will be reviewed. The performance of the deck systems will be monitored by visual inspection, and crack mapping. The frequently used special provision will be updated as necessary. A final report will provide conclusions and provide recommendations for policy and future direction.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Draft interim report includes life cycle cost analysis. Total stainless decks in Michigan number eleven. Stainless deck R01-3 of 33045 I-496 and service rd inspected late October 2007. Corrosion probe readings were taken from the epoxy coated reinforced deck. Specification for stainless steel reinforcement on frequently used special provision (FUSP) list. The isolation requirement language was removed, due to two reports indicating that isolation wasn't needed.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

As costs decrease, it is anticipated that more decks will be built using stainless. The first ss deck S02 of 63102 was inspected in april 2008. Newer types of austenitic stainless were introduced and come with a potential cost savings of 40% as compared to the traditional stainless reinforcements. At this time another project is being turned in that calls for the newer stainless reinforcement as cited above. A special provision was prepared for the project. A bridge project that was let in march 2008 uses some solid stainless reinforcement and was inspected in August 2008 (progress schedule indicated reinforcement placement at that time).

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Another bridge project, I-94 over Riverside Dr (JN 75047) will utilize the newer type of stainless steel - to be let in October 2008. The project requires a special provision to modify the FUSP for stainless reinforcement. The project plans will be reviewed, and the bids evaluated for the unit pricing. During 2009 construction the reinforcement will be inspected and sampled.

**JUSTIFICATION(S) FOR REVISION(S) (Date justification(s) for revision(s))**

project extension requested due to need for more sampling data as no bridge decks were constructed in 2005-06 that incorporated stainless reinforcement, and there are innovative newer, less costly stainless materials that will be incorporated and should be studied.

\*The original authorized total budget amount of the project

\*\*The authorized total budget amount as revised, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
STATEWIDE PLANNING AND RESEARCH (SPR), PART II  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Stainless - Clad Reinforcement in Bridge Decks

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Steve Kahl

CONTRACT/AUTHORIZATION #	In-House	PROJECT START DATE	10/1/2006
SPR NUMBER	101673	COMPLETION DATE (Original)	09/30/2008
ORBP NUMBER		COMPLETION DATE (Revised)	09/30/2009
RESEARCH AGENCY	MDOT		
PRINCIPLE INVESTIGATOR	N/A		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)       2<sup>nd</sup> (Jan 1 – Mar 31)       3<sup>rd</sup> (Apr 1 – Jun 30)       4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$30,000.00	TOTAL		\$5,765.00
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$19,153.00	SALARIES		
<b>FY 2008 Budget</b>			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$10,000.00	EQUIPMENT	(Non-expandable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$5,082.00	OTHER		
PERCENT COMPLETE (By Budget)		81%	PERCENT COMPLETE (By Work)		85%

**PURPOSE AND SCOPE**

Evaluate performance of stainless-clad steel reinforcement in new bridge decks. Construction methods, type of stainless-clad steel reinforcement used, and actual cost of the deck systems will be reviewed. The performance of the deck systems will be monitored by visual inspection, and crack mapping. The special provision will be updated as necessary. A final report will provide conclusions and provide recommendations for policy and future direction.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

A project specific special provision was prepared for a bridge project using stainless-clad reinforcement let in February 2008. The construction cost, supply issues, and other related factors were documented.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Monitor construction of stainless-clad deck B01 of 11015 in March 2008. the bridge westbound I-94 span was inspected for placement and lap lengths. the stainless clad end caps were removed due to a misunderstanding to the purpose as a shipping protection versus permanent corrosion protection for the cut ends. The clad bars were visually inspected and no problems noted. the testing was conducted on samples from the jobsite and they met specification requirements. The buy American waiver was processed in time for the project, as the material was produced in the U.K.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

The stainless clad manufacturer will be producing the material from a facility in Ohio, thus removing the buy American restrictions. The stainless clad reinforcement will be specified in a number of bridge projects and rehabilitation. the special provision will be updated to reflect new information, and the contract bid prices evaluated for conformance to estimates.

**JUSTIFICATION(S) FOR REVISION(S) (Date justification(s) for revision(s))**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
STATEWIDE PLANNING AND RESEARCH (SPR), PART II  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Electronic Frost Tube

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Gregory B Palmer

CONTRACT/AUTHORIZATION #	In-House	PROJECT START DATE	09/5/2003
SPR NUMBER	102026	COMPLETION DATE (Original)	09/30/2005
ORBP NUMBER		COMPLETION DATE (Revised)	12/31/2009
RESEARCH AGENCY	MDOT		
PRINCIPLE INVESTIGATOR	N/A		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$44,806.00	TOTAL		\$22,119.07
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$22,686.93	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$20,000.00	EQUIPMENT	(Non-expandable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$12,460.58	OTHER		
PERCENT COMPLETE (By Budget)		51%	PERCENT COMPLETE (By Work)		50%

**PURPOSE AND SCOPE**

Design and test an Electronic Frost Sensor. During the evaluation state it was determined that a standard off the shelf data acquisition system is not the best way to monitor the Electronic Frost Sensor. The Electronic Frost Sensor project has expanded into a four-step process:

1. Design and test electronic frost sensor.
2. Design and test data acquisition system.
3. Research and test data transmission systems.
4. Determine the best software for remote monitoring.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Design and test data acquisition system, test frost sensor.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Researched and tested data transmission systems, determined the best software for remote monitoring, modified frost sensor design. Compiled and analyzed data from winter monitoring. Frost is a seasonal thing, in the last quarter only 10 hrs was charged to the project. The reason for the time spent was to load the software in a new computer.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Continue winter field testing and evaluation.

**JUSTIFICATION(S) FOR REVISION(S) (Date justification(s) for revision(s))**

The project started as just a frost depth sensor and then expanded into a four step process. The process is listed above in purpose and scope.

\*The original authorized total budget amount of the project

\*\*The authorized total budget amount as revised, if applicable

\*\*\* The project life to date expenditure

\*\*\*\*The current fiscal year's original budget amount

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Winter Maintenance Level of Service Evaluation

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Tim Croze

CONTRACT/AUTHORIZATION #	In-House	PROJECT START DATE	10/01/2004
SPR NUMBER	102028	COMPLETION DATE (Original)	09/30/2007
ORBP NUMBER		COMPLETION DATE (Revised)	09/30/2008
RESEARCH AGENCY	MDOT		
PRINCIPAL INVESTIGATOR	N/A		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$100,000.00	TOTAL		N/A
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$100,000.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$7,500.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$7,500.00	OTHER		
% PERCENT COMPLETE (By Budget)		100%	PERCENT COMPLETE (By Work)		100%

**PURPOSE AND SCOPE**

One of the general public's biggest complaints with winter maintenance in the State of Michigan is the inconsistent level of service experienced along a corridor especially at jurisdictional boundaries. This project will allow for MDOT to observe these inconsistencies and the information gathered will assist MDOT in developing a new approach to winter maintenance.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Winter road condition data was collected and analysed throughout the winter on several corridors in the state. A new approach to assigning winter maintenance levels of service was developed and was implemented before the 2007-2008 winter.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

The new approach to defining winter level of service was implemented before winter. Winter road condition data was collected throughout the winter. The data is being mapped using GIS software and analyzed.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

A new LOS for winter maintenance will be implemented based on information from the 2007-2008 winter.

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: High Occupancy Vehicle (HOV) Research

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER:

CONTRACT/AUTHORIZATION #	In-House	PROJECT START DATE	Project Canceled
SPR NUMBER	102052	COMPLETION DATE (Original)	
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	MDOT		
PRINCIPAL INVESTIGATOR			

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$60,000.00	TOTAL		
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$0.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****		EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE			OTHER		
% PERCENT COMPLETE (By Budget)		0%	PERCENT COMPLETE (By Work)		
					0%

**PURPOSE AND SCOPE**

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

No activity to date.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Project deleted from program.

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: ITS Hardware Laboratory and Equipment

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Greg Krueger

CONTRACT/AUTHORIZATION #	In-House	PROJECT START DATE	10/01/2006
SPR NUMBER	102086	COMPLETION DATE (Original)	09/30/2010
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	MDOT		
PRINCIPAL INVESTIGATOR			

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$800,000.00	TOTAL		\$185,219.78
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$264,780.22	SALARIES		
<b>FY 2008 Budget</b>			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$253,758.30	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$178,672.00	OTHER		
% PERCENT COMPLETE (By Budget)		59%	PERCENT COMPLETE (By Work)		59%

**PURPOSE AND SCOPE**

-This is a multiple phased project that will start with the deployment of multiple video cameras in and around the MDOT Construction and Technology (CandT) building, digital video transmission equipment, video switching and processing equipment and central system equipment. Later phases will include video transmission equipment between the CandT building, City of Lansing, MDOT Headquarters (Van Wagoner Building), and other MDOT facilities. These phases will permit the evaluation of more complex communications methodologies and technologies - the work at then MDOT secondary complex can be performed using low-power, short-haul, "low" bandwidth communications equipment, while the connections between CandT and downtown Lansing (or other locations in Michigan) will be used to evaluate the longer range communications technologies available. The first step in this process, which is the gist of the first phases of the Lansing ITS Laboratory, is the evaluation of the manufacturer claims of their use of standards, and the evaluation of the effectiveness of multiple communications paths. The current video compression standard is MPEG-4 and there are multiple vendors who are claiming that they are MPEG-4 compliant/compatible. The first phase of the ITS laboratory will give MDOT the ability and infrastructure needed to evaluate these claims through an open invitation / Request for Interest (RFI). MDOT will use university support to set up the design of the system and the testing/evaluation of components used, as well as internal staff from MDOT Construction and Technology. The estimated equipment that may be procured for this project includes: 19" EIA Equipment Racks (6), Video Switch and Video Controllers, MPEG-4 Video Compression and Decompression devices (2-4 pair), Video monitors / projectors. All hardware procured will be used specifically for the purposes of the ITS laboratory and not for general MDOT use. MDOT will maintain ownership of all of the hardware/software needed for this project and document the purchase/disposal as required. An inventory of all of this equipment will be kept, pursuant to OPM regulations on equipment procurement, management and disposal.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

-The lab staff became familiar with the equipment purchased for the basic testing infrastructure. Equipment has been configured and installed in and around MDOT CandT for display and testing purposes. Some of the equipment installed in and around CandT include; CCTV cameras, wireless antennas, video switch and controllers.

-Equipment needed to test the interoperability of codecs were installed locally as well as at the Michigan State Police (MSP) driving facility. The high speed wireless link between the two facilities will allow the lab to not only test high speed wireless connection equipment, but also test the interoperability of different manufacturers of video compression devices. Included in this testing will be MPEG4 compression using different configurations in bandwidth, frame rate, and resolution. Testing of MPEG4 codecs purchased and supplied at no cost has begun.

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-A DSL line and CCTV camera were installed at the MDOT Radio Shop to test the feasibility of viewing streaming video and controlling a camera over a low speed internet connection via a remote location. This application will allow MDOT to test and evaluate the usage of a low speed internet connection for different ITS technologies including video servers and compression devices.

-Two field deployments were designed and will be populated with ITS equipment in the coming year including; a traffic detection test bed on I-69 near Lansing CandT and a RWIS test bed which will be located in Escanaba, MI.

-The traffic detection test bed consists of two 40 ft strain poles located 250 ft apart. Each pole will consist of a CCTV camera, cabinet and multiple traffic detection devices. This application will allow MDOT to test different manufacturers and types of traffic detection devices for accuracy in vehicle volume, occupancy, speed and class information. Currently, the foundations, conduit and poles have been installed.

-The RWIS test bed will consist of a 40 ft. collapsable tower. The tower will contain RWIS related ITS technologies. This test bed will give MDOT a hands on look at RWIS technology manufacturers and will be helpful when the final design and deployment of RWIS in the State of Michigan begins.

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### FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE

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#### -I-69 Traffic Detector Test Bed

(Quarters 1 + 2) - Completed procurement of devices needed to begin testing at the I-69 traffic detection test bed. Devices that have been procured and delivered to the ITS Lab have begun bench testing before installation. Traffic detection technologies that have been procured and will be tested include; microwave vehicle detection, video vehicle detection, and point vehicle detection. ITS cabinets that will house the equipment have been delivered to the statewide signals shop and will be installed.

(Quarters 3 + 4) - The ITS Cabinets that will house the equipment for the I-69 Traffic Detector Test bed have been delivered, installed and are functioning properly. Detection and communications devices have been bench tested, configured and will now begin to be installed in the field. The test bed currently has one microwave vehicle detector installed, and the remaining equipment will be installed as weather permits bucket truck usage.

#### -Cut River Bridge Monitoring System

(Quarters 1 + 2) - Identified infrastructure for a bridge monitoring system at the Cut River Bridge in the Upper Peninsula. The ITS Lab worked with MDOT bridge personnel to identify the proper strain gauges needed to monitor strain at the bridge. The strain gauges and data acquisition units have been identified and will be procured in the next quarter. Upon completion of the Cut River bridge deck replacement project, the strain gauges will be installed and monitored. Also, included in this project is a long range communications infrastructure that has been designed and will be installed by Motorola. This separate design effort will allow the ITS Lab to study more examples of long range wireless communications.

(Quarters 3 + 4) - The layout and design of the Cut River Bridge system was completed during the last two quarters of the year. Included in this design was; determination of structures needed to support the solar power and communications requirements of the site, conduit and foundation design for the solar power and RWIS structures, and site preparation of an area near the bridge where the installation will take place. Fiber optic strain gauges and point vehicle detectors were procured during this timeframe as well. The ITS Lab staff installed an fixed IP camera at a WIM station near the Cut River Bridge. This camera will be triggered by an overweight vehicle crossing the WIM and take a snapshot of the vehicle with a timestamp. This image and WIM data will be then wirelessly transmitted back to the Mackinac Bridge where it may be used in the future to visually verify and enforce violators of seasonal weight restrictions by the Motor Carrier division. Data usage and management of this system is currently being discussed.

#### -Escanaba RWIS Test Bed

(Quarters 1 + 2) - Installation of the RWIS test bed infrastructure was completed. Included in the installation was a 40' collapsable tower and large double door ITS cabinet to house devices. Multiple vendors were identified in the previous FY and expressed interest in allowing MDOT to test the equipment free of charge. Vendors that expressed interest have identified equipment to be installed and will be completed next quarter. The last portion of the installation is the communications infrastructure needed to bring the RWIS information back to the MDOT Superior Region Office and the MDOT ITS Lab for testing and evaluation. The ITS Lab and a Superior Region electrician completed field testing and identified the communications design needs. This equipment has been procured and will be installed by the ITS Lab and Superior Region personnel upon delivery.

(Quarters 3 + 4) - Multiple vendors equipment has been installed at the RWIS test bed as well as the wireless communications infrastructure needed to display this data at the Superior Region Office. RWIS Data is currently being viewed at a local workstation at the region office. To allow viewing of RWIS data by the ITS Lab, vendors monitoring the performance of their devices, and other MDOT personnel, an internet connection is being installed at the Superior Region Office. The ITS Lab has not been authorized to install any devices from this project on the State of Michigan network, so the separate internet connection if necessary for dissemination of RWIS data to the proper stakeholders via a secured website.

#### -Bay City Bascule Bridge Management System Test deployment

(Quarters 1 + 2) - The Bay City Bascule Bridge Management Test deployment was identified in the MDOT Bay Region ITS Architecture. This deployment will be used as a pilot to identify the feasibility of bridge management throughout the state. The deployment was identified by Bay Region ITS stakeholders as a need to provide better information of bridge status to 911, MDOT, Fire and EMS agencies. The system will include video compression as well as wireless communications technologies that have

been tested previously in the lab. This deployment will not only test the interoperability of multiple ITS technologies such as; wireless communications, video compression device interoperability and low speed internet connection (DSL), but will also provide a means of testing this new ITS system. The system and equipment needed have been designed and will be procured in the next quarter.

(Quarters 3 + 4) - Equipment for the Bay City Bascule Bridge Management Test deployment was procured. Included in this procurement were multiple ITS technologies needed for functioning of the system including; 5.2 GHz wireless communications and MPEG4 video compression. The equipment was then bench tested and configured for proper functioning in the field. During the bench testing procedures, ITS Lab staff met with Bay Region electricians to discuss the layout and plans for installation. The Bay Region electricians then installed the infrastructure needed for the system including; mounting poles for additional height needed for wireless communication links as well as CCTV viewing capabilities, wiring and CCTV camera installation. After the physical infrastructure was in place, the ITS Lab staff, in coordination with the Bay Region electricians completed the installation of system components including wireless communication and MPEG4 compression devices. The next step in the system is to complete a wireless link installation between the Veteran's Memorial Bridge (the system's communication hub) and the Bay City - City Hall, which is the location for our internet service provider to disseminate bridge images to multiple stakeholders. The internet service is necessary because the system has not been authorized for deployment on the State of Michigan network at this time.

#### -MPEG4 Video Compression Device (Codec) Interoperability Testing

(Quarters 1 + 2) - Upon testing multiple manufacturers of MPEG4 video compression devices (codecs), the ITS Lab identified non-interoperability and non-standards conformance issues between manufacturers. The purpose of this testing is to identify what manufacturers are not using standards based MPEG4 compression techniques. This is important to MDOT in developing a standards based statewide ITS, which will work seamlessly with the soon to come statewide advanced traffic management software (ATMS). Developing a standards based system will protect MDOT from being stuck with devices using proprietary compression techniques.

(Quarters 3 + 4) - The Lab is currently working with three manufacturers to verify interoperability and conformance with MPEG4 compression standards. Non-interoperability and non-standards based conformance issues were identified, documented, and addressed with each equipment manufacturer. These issues are currently being worked out between devices manufacturers and MDOT plays a key role in the transmission of information and data between them. Current testing has provided MDOT with hands on experience and will also be crucial when developing specification for future deployments of MPEG4 compression devices. This will include required compatibility with future universal decoding methods that will be deployed such as; 360 surveillance software (MITSC), Delcan ATMS (statewide) and video walls (MITSC and West MI TMC).

#### -VII Model Deployment Test Bed

(Quarters 3 + 4) - Equipment was procured for the VII Model Deployment demonstration at the 2008 ITS MI Show at Rock Financial Showplace in Novi, MI. ITS Devices procured for the test bed included; microwave vehicle detectors, ITS cabinets and solar power equipment. The equipment procured was installed in collaboration with the Road Commission for Oakland County (RCOC). This equipment is currently deployed and will be used for future demonstrations of VII in the State of Michigan.

### **FISCAL YEAR 2009 PROPOSED ACTIVITIES**

-Complete installation and testing of systems designed and deployed in FY07 and FY08.

-Deploy wireless point-to-point (PTP) communications infrastructure. Possible considerations include; the City of Lansing, MDOT Headquarters (Van Wagoner), and other MDOT facilities. This phase will allow the lab to test more complex communications methodologies and technologies.

-Work with multiple agencies throughout the State of Michigan to consolidate video of critical infrastructure in the ITS Lab. This video has been requested by the Michigan Intelligent Operations Center for Homeland Security (MIOC) for homeland security and safety purposes. Multiple video locations have been identified, such as international border crossings and key infrastructure, that the MIOC has been interesting in receiving live video feeds. The lab will work with multiple agencies to determine the technology needed to disseminate this video. Included in this will be utilizing existing infrastructure at locations to deploy CCTV cameras for monitoring purposes if needed.

-Continue to test new and emerging technologies in the ITS market. Part of the ITS lab's goal is to identify technologies that have not been currently investigated and deployed, and determine their feasibility of usage in future ITS projects throughout the state. The ITS Lab will continue to contact and meet with various ITS device manufacturers to identify the newest and best devices being developed.

-Development of test plans for various ITS technologies tested in the lab. Included in the test plans will be video compression devices, CCTV cameras, wireless communications devices, and other ITS technologies.

### **JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

### **SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project

# SPR, PART II FUNDED PROGRAM

Contract Research Studies  
(Active)

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Link Slabs for Jointless Bridge Decks Based on Strain-Hardening Cementitious Composites – Phase 3: Shrinkage Control

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Roger Till

CONTRACT/AUTHORIZATION #	2003-0026 / A10	PROJECT START DATE	07/25/2006
SPR NUMBER	101674	COMPLETION DATE (Original)	07/24/2007
ORBP NUMBER		COMPLETION DATE (Revised)	01/31/2008
RESEARCH AGENCY	University of Michigan		
PRINCIPAL INVESTIGATOR	Dr. Victor C. Li		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$87,900.87	TOTAL		N/A
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$87,845.91	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$12,316.67	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$12,261.71	OTHER		
% PERCENT COMPLETE (By Budget)		100%	PERCENT COMPLETE (By Work)		100%

**PURPOSE AND SCOPE**

The research is on the development of durable link slabs for jointless bridge decks based on strain-hardening cementitious composite-engineered cementitious composite (ECC). Specifically the superior ductility of ECC was utilized to accommodate bridge deck deformations imposed by girder deflection, concrete shrinkage, and temperature variations, providing a cost-effective solution to a number of deterioration problems associated with bridge deck joints.

In Phase 3, research was initiated at developing a solution for early age cracking observed on the Grove Street Bridge ECC link-slab. Although these cracks are small, about half the size allowable by AASHTO, and they are bridged by fibers, with load carrying capability, it is desirable to as much as possible eliminate such early age cracking.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

In this fiscal year, focus has been placed on identifying factors which cause early age cracking, replicating early age cracking behavior observed in the field, developing new ECC materials solution to prevent early age cracking, and documenting new ECC fresh and hardened properties. These research activities corresponds to Task 2 ( Identification and Replication of Early Age Cracking), Task 3 (Development and Verification of New ECC Materials Solution), and Task 4 (ECC Composite Fresh and Mechanical Testing). Task 1 (literature review) and Task 6 (Monitoring of Grove Street ECC Link Slab) were also carried out in this year.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

During this fiscal year and up to Dec 31, 2007, research has been focused on verifying the performance of the new low-shrinkage ECC by means of the large frame restrained shrinkage test corresponding to Task 3 (Development and Verification of New ECC Materials Solution). Grove Street Bridge monitoring has been continued (Task 6) throughout this project period. Revision of the special provision of ECC link slab corresponding to Task 5 (Revision of Special Provision for ECC Bridge Deck Link Slab) will be completed in Jan., 2008.

Final report has been received, reviewed and accepted. Published as Research Report RC-1506.

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

A revised ECC link slab special provision was developed. Major revisions include limiting the skew angle to no more than 25 degree, replacing ECC M45 with LS-ECC material in future construction of ECC link slab, recommending nighttime casting, enforcing water curing for at least 7 days, and measuring free drying shrinkage and crack width when conducting quality assurance tests.

A demonstration project using the revised ECC link slab special provision is being pursued.

\*The original authorized total budget amount of the project

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Enhancement of Michigan's Bridge Management System (BMS) using Pontis Software and Michigan Specific Elements

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Robert Kelley

CONTRACT/AUTHORIZATION #	2002-0546 / A6	PROJECT START DATE	08/08/2005
SPR NUMBER	101675	COMPLETION DATE (Original)	08/08/2007
ORBP NUMBER		COMPLETION DATE (Revised)	09/30/2008
RESEARCH AGENCY	Wayne State University		
PRINCIPAL INVESTIGATOR	Dr. Gongkang Fu		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$150,245.00	TOTAL		N/A
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$150,245.00	SALARIES		
<b>FY 2008 Budget</b>			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$121,685.39	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$121,685.39	OTHER		
% PERCENT COMPLETE (By Budget)		100%	PERCENT COMPLETE (By Work)		100%

**PURPOSE AND SCOPE**

Develop procedures for calibrating Pontis deterioration models to meet the needs of Michigan. Develop an alternative method of computing transition probabilities.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Final report is completed and accepted.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

MDOT will disseminate the report within the national bridge management community for review, comment, and possible inclusion in future versions of Pontis. MDOT will use the knowledge gained from the report in the calibration of both Pontis and the Michigan Bridge Forecasting System (MBFS).

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Repair Strategies for Relieving Structural Distress in Bridge Abutments

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Roger Till

CONTRACT/AUTHORIZATION #	2002-0532 / A10	PROJECT START DATE	12/27/2004
SPR NUMBER	101686	COMPLETION DATE (Original)	12/27/2006
ORBP NUMBER		COMPLETION DATE (Revised)	12/31/2007
RESEARCH AGENCY	Michigan State University		
PRINCIPAL INVESTIGATOR	Dr. Rigoberto Burgueño		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$239,383.00	TOTAL	N/A	
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$211,889.59	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$51,471.31	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$23,977.90	OTHER		
% PERCENT COMPLETE (By Budget)		89%	PERCENT COMPLETE (By Work)	100%	

**PURPOSE AND SCOPE**

The objectives of the proposed research are to identify the causes behind structural distress in bridge abutments and piers, establish their relative importance, and identify strategies for relieving such distress. The project is organized in tasks as follows:

Task 1. Information Database: Identify the mechanisms that lead to abutment and pier structural distress and the relevant input parameters (e.g., bridge type, bearing/expansion joint corrosion, pavement growth, etc.) by creating an information database. The database will be assembled by state DOT surveys, by reviewing MDOT field inspection reports and by field visits to typical bridges with distress.

Task II. Field Monitoring: Develop and implement an effective one-year field monitoring plan for 2-4 typical bridges with and without signs of substructure distress to quantify the relative contribution of the identified key parameters, and to assist the execution and calibration of the analytical studies.

Task III. Parameter Analysis and Diagnosis Model: Use regression modeling and artificial neural networks to identify the relative importance of the causes for substructure distress and to develop diagnosis tools for predicting, and thus managing and avoiding, such distress. The diagnosis model will be based on a combined database populated with field observations and a suite of global/local finite element analyses.

Task IV. Distress Relieving Strategies: Develop and recommend effective strategies for relieving the structural distress in abutments by directly addressing the causes leading to distress with due consideration of their relative importance.

Task V. Final Reporting: Prepare a final report documenting the complete research effort and the identified recommendations in accordance with MDOT requirements.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

The survey of state DOTs on abutment damage distress was completed. Twenty-six (26) states responded with only three (New Jersey, New Mexico, and Oklahoma) having similar problems to Michigan. Other states reported minor vertical cracking, commonly attributed to temperature effects.

Multivariate linear regression model considering quadratic and cross interaction terms of explanatory variables were developed. The model is not adequate. Factorial analysis and hypothesis tests are also applied to evaluate the influence of design parameters to the condition of bridge abutments.

An innovative scheme using an ensemble of neural networks to improve the prediction of bridge abutments rating and degradation was developed and implemented. The ensemble of neural networks identified the damage in the bridge abutments with an accuracy of 81% - 85%, which was 13% - 18% higher than the best individual neural network in the ensemble.

FE simulations were finished for all bridges in the case matrix. Three potential causes of abutment damage were considered: pavement growth, summer time temperature increase and gradient, winter time temperature drop and gradient. Two structural conditions were simulated: fine pin and hanger assembly and locked pin and hanger assembly. The interpretation of results and the integration of virtual data and evidential data for damage identification and degradation models is in progress.

Three rounds of field measurements on four selected bridges were finished in this quarter. Analyses and interpretation of monitoring data are in progress.

#### **FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Measurements on the four instrumented bridges was completed in December 2007. The data has been interpreted by evaluating strains along the abutment wall and the girder backwall. Movements of the girder ends with respect to the abutment wall were also measured. While the data is not very clean, the plots of strains and girder movements indicate higher strains long the connection of girders to the abutment wall, which is consistent with the locations of distress in the abutment walls.

Results from the finite element (FE) analysis simulations were evaluating by assessing the variation in maximum strains in the abutment wall as a function of the different parameters in the model test matrix. The results were used to assess the relative importance of pavement growth or temperature on rusted bearing/joints in producing abutment distress. The results indicate that pavement growth seems to play a more relevant role in creating damage to the abutment wall. The influence of other design parameters, such as span length, deck width, and skew angle were also evaluated.

The combination of virtual and evidential databases for use in improved prediction models was not possible by the end of the project. While efforts were in different stages of implementation, no good results were obtained. Thus, the results from the simulation were used as supporting evidence to the trained neural network models to determine the most likely cause of the damage.

A stand-alone executable program to predict the structural condition over the service life of bridge abutments was developed. The program was based on an assembly of artificial neural networks using a modified majority voting scheme. The program can be used for assessing the abutment rating of existing or new bridges. For existing bridges, the bridge ID is provided and the program would return (based on user definition) the current abutment rating or a plot with the predicted abutment rating over the service life of the bridge (a plot of abutment rating as a function of bridge age). For existing bridges, current ratings in the database are plotted with the life degradation curve. For new designs, the geometric, service and environmental parameters for the bridge are provided and the program provides the service life abutment rating curve.

Based on the knowledge gained from this project, strategies to relieve the damage to bridge abutments were conceived. These include, the use of flexible approach pavement; the use of pressure relief joints in approach pavements for existing bridges with rigid approach pavement; improve the sealing of pavement expansion joints; use of expansion bearings at the abutment wall; distribute control joints in the bridge abutment wall at more frequent intervals; use small skew angle for new bridges; avoid using of pin and hanger assemblies or keep them in good condition if used.

A draft of the final report has been reviewed and the final revision is in process.

The final report has been reviewed, accepted and distributed. Published as Research Report RC-1508. Project is 100% complete.

#### **FISCAL YEAR 2009 PROPOSED ACTIVITIES**

#### **JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

#### **SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

Findings that will be included in the Bridge Design Manual: Use flexible approach pavement; Add pressure relief joints in approach pavement for existing bridges with rigid approach pavement; Improve the sealing of expansion joints on approach pavement; Use expansion bearings at the abutment wall; Distribute control joints in the bridge abutment wall at frequent intervals; Use small skew angle for new bridges; Avoid using of pin and hanger assembly or keep them in good condition if used.

- \*The original authorized total budget amount of the project
- \*\*The authorized total budget amount as revised, if applicable
- \*\*\* The project life to date expenditure
- \*\*\*\*The current fiscal year's original budget amount
- \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
STATEWIDE PLANNING AND RESEARCH (SPR), PART II  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Monitoring and Evaluation of the Rapid Bridge Deck Replacement Technique at Parkview Bridge, Kalamazoo, MI

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Steve Kahl

CONTRACT/AUTHORIZATION #	2004-0090 / A3	PROJECT START DATE	11/30/2005
SPR NUMBER	101688	COMPLETION DATE (Original)	11/20/2008
ORBP NUMBER		COMPLETION DATE (Revised)	1/31/2010 (pending approval)
RESEARCH AGENCY	Western Michigan University		
PRINCIPLE INVESTIGATOR	Dr. Sherif Yehia		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$224,523.00	TOTAL		\$83,463.26
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$141,059.74	SALARIES		
<b>FY 2008 Budget</b>			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$102,800.94	EQUIPMENT	(Non-expandable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$73,068.68	OTHER		
PERCENT COMPLETE (By Budget)		63%	PERCENT COMPLETE (By Work)		60%

**PURPOSE AND SCOPE**

Rehabilitation of deteriorated bridge decks cause public inconveniences, travel delays, and economic hardships. It is desirable to adopt techniques for bridge replacement that allow repair work to be completed rapidly at night, weekend, or during other periods of low traffic volume, thereby minimizing travel inconveniences, financial losses, and environmental impact. Rapid bridge deck with full depth precast deck panels is an innovative technique for replacement, which is expected to save construction time. However, this technique needs to be evaluated and performance of the bridge needs to be monitored. This research proposal focuses on the constructability and performance of the innovative technique of rapid bridge replacement using full depth precast deck panels at the Parkview Bridge in Kalamazoo, Michigan.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Selection of sensors, instrumentation locations, and parameters to include in the study was completed. Detailed plans, special provision, and sensors' specification were provided. In addition, a detailed CPM (critical path method) construction schedule of the Parkview Bridge was developed and compared to construction schedule of a bridge of similar geometry and location.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

The research team installed the sensors during construction of the deck panels at the precast producer plant in Midland, MI. After the first round of panels construction was rejected MDOT engineers due to construction errors, the research team re-install new sensors during the second round of panels construction. This caused a two-month delay in completing the Parkview bridge construction and in opening the bridge to traffic. We completed the installation of data loggers and multiplexers along with the wiring in the control panels and are waiting for installation of the two telephone lines and power. We have also completed the field load testing of the bridge. Additionally, we are finalizing the analysis of the construction schedule to compare between conventional and rapid bridge construction techniques for the Parkview bridge.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

We will be collecting sensor data to monitor the behavior of the bridge under traffic loading. We will also be performing calculation for the pre-opening load testing of the bridge. In addition, we will conduct a second load testing of the bridge after it have been subjected to approximately one year of traffic loading.

**JUSTIFICATION(S) FOR REVISION(S) (Date justification(s) for revision(s))**

\*The original authorized total budget amount of the project

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Condition Assessment and Methods of Abatement of Prestressed Concrete Box-Beam Deterioration: Phase II

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Steve Kahl

CONTRACT/AUTHORIZATION #	2006-0414 / A1	PROJECT START DATE	09/20/2006
SPR NUMBER	101689	COMPLETION DATE (Original)	09/20/2008
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Michigan Technological University		
PRINCIPAL INVESTIGATOR	Dr. Tess Ahlborn		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$161,604.80	TOTAL	N/A	
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$161,604.80	SALARIES		
<b>FY 2008 Budget</b>			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$87,506.31	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$87,506.31	OTHER		
% PERCENT COMPLETE (By Budget)		100%	PERCENT COMPLETE (By Work)	100%	

**PURPOSE AND SCOPE**

Deterioration of box-beam bridges is a concern of our aging infrastructure. This comprehensive research program will verify mechanical properties of materials utilized in finite element modeling of box-beam structures, and to determine the appropriateness of recommended guidelines for repair of previously identified forms of deterioration. Specifically, mechanical and durability characteristics of shear key grout and repair materials are being determined. The project will provide guidance on determining the proper materials for long-lasting field repairs which improve the structural integrity of the distressed box-beams. Recommendations may include changes or modifications to the design procedures, and maintenance and repair of side-by-side box beam bridge systems.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

A literature reivew focussing on the grout and repair materials included mechanical and durability properties, and field performance. Shear key grout materials and repair materials were selected for experimental evaluation and received from suppliers. Several tests began including compressive strength testing, modulus of elasticity, poission's ratio, slump, air content, and free shrinkage. The project panel met with the research team (including collaborators from Western Michigan University) in May 2007 to review and approve project direction and status.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Fresh and hardened property evaluation (including air-content, slump, compressive strength at various ages, and free shrinkage) of the selected shear key grouts and repair materials has been completed. The durability caharacteristics of the selected materials that are currently being evaluated are resistance to freezing and thawing, restrained shrinkage, chloride permeability, slant shear bond strength, and coefficient of thermal expansion. Final testing is underway and the draft final report has been outlined.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

none

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

Repair materials and shear key grout materials with the best performance (strength and durability) will be recommended for use in box-beam bridge repair applications.

\*The original authorized total budget amount of the project

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Condition Assessment and Methods of Abatement of Prestressed Concrete Box-Beam Deterioration: Phase II

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Steve Kahl

CONTRACT/AUTHORIZATION #	2006-0415 / A2	PROJECT START DATE	03/23/2007
SPR NUMBER	101691	COMPLETION DATE (Original)	09/30/2008
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Western Michigan University		
PRINCIPAL INVESTIGATOR	Dr. Haluk Aktan, P.E.		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$193,821.80	TOTAL	N/A	
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$191,457.76	SALARIES		
<b>FY 2008 Budget</b>			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$163,163.29	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$160,799.25	OTHER		
% PERCENT COMPLETE (By Budget)		99%	PERCENT COMPLETE (By Work)	100%	

**PURPOSE AND SCOPE**

Deterioration of box-beam bridges is a concern of our aging infrastructure. This comprehensive research program will verify mechanical properties of materials utilized in finite element modeling of box-beam structures, and to determine the appropriateness of recommended guidelines for repair of previously identified forms of deterioration. Specifically, mechanical and durability characteristics of shear key grout and repair materials are being determined. The project will provide guidance on determining the proper materials for long-lasting field repairs which improve the structural integrity of the distressed box-beams. Further, simulations of construction process and load capacity assessment of a bridge with distressed box-beams are being conducted using finite element techniques. Load testing of a decommissioned box-beam and capacity evaluation. Recommendations for changes or modifications to the design procedures, and maintenance and repair of side-by-side box beam bridge systems will be developed.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Experimental evaluation of type R-2 grout materials sampled from the field and in the lab was performed. Analytical modeling of shear key assemblies were performed investigating the significance of design parameters on box-beam bridge behavior. Monitoring of a new box-beam bridge construction. Submittal of a progress report.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Construction process simulation using finite element analysis method. Development of a rational design procedure. The grout and repair material testing for strength, elasticity modulus, and other mechanical properties has been completed. The final report is being prepared for combining with the MTU portion, and has been completed.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

Repair materials and shear key grout materials with the best performance (strength and durability) will be recommended for use in box-beam bridge repair applications. Design changes will be recommended to account for skew structure stresses.

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: ECR Bridge Decks: Damage Detection and Assessment of Remaining Service Life for Various Overlay Repair Options

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Steve Kahl

CONTRACT/AUTHORIZATION #	2002-0532 / A19	PROJECT START DATE	09/29/2006
SPR NUMBER	101698	COMPLETION DATE (Original)	03/29/2009
ORBP NUMBER		COMPLETION DATE (Revised)	09/30/2009
RESEARCH AGENCY	Michigan State University		
PRINCIPAL INVESTIGATOR	Dr. Ronald S. Harichandran		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$334,908.00	TOTAL		\$167,362.67
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$167,545.33	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$107,919.44	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$79,147.77	OTHER		
% PERCENT COMPLETE (By Budget)		50%	PERCENT COMPLETE (By Work)		40%

**PURPOSE AND SCOPE**

The main objective of the proposed research is to improve understanding of the degradation and failure mechanisms and improve the determination of repair strategies for epoxy coated rein-forced (ECR) concrete bridge decks without overlays, as well as those repaired with shallow and deep overlays. Achieving this objective requires two distinct issues to be addressed. First, the condition of ECR decks with and without overlay repairs needs to be assessed. Second, the remaining service life and failure mechanisms of ECR decks with and without overlay repairs need to be determined. This knowledge should then be integrated to define appropriate repair strategies for ECR decks.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Inspection methods consisting of the chain drag, bar tapping, and hammer tapping were investigated. The bar/hammer tapping method was deemed to be superior to the chain drag method. Recording and signal processing methods are being developed. An automated inspection system is being constructed. Initial set of concrete specimens for experimental testing were cast and subjected to freeze-thaw cycling. However, due to poor concrete quality, these specimens were severely damaged. A second set of specimen are being cast.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

An automated bar tapping device was developed and fabricated. Recording and signal processing methods are being customized for this device. A second set of specimens to replace the poor specimens prepared in FY 2007 were cast and subjected to freeze-thaw tests. These specimens survived 300 cycles of freeze-thaw and are now being subjected to accelerated corrosion. A loading fixture to test three specimens simultaneously under fatigue loaded was designed and will soon be fabricated.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Signal processing and acoustic damage identification process will be complete. Pre-aged specimens will be damaged and repaired. Specimens will be exposed to combined mechanical, freeze-thaw, and corrosion loading to assess service life. Damage detection diagnostics will be linked to service life and failure mode. Final report will be written.

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

A no-cost extension of 6 months is requested to recover from the delay associated with the poor concrete used to cast the first set of specimens and the need to recast all the specimens following freeze-thaw testing. The project will still be completed within FY 2009.

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

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The research results will be used by MDOT's bridge maintenance crews to better estimate the service life and maintenance schedule of ECR decks. The prototype of the enhanced chain drag device can be used immediately at the conclusion of the project, and additional units of the device can be produced as needed. The Bridge Deck Preservation Repair Matrix appropriate for ECR concrete decks can be used to set subsequent evaluation schedules for repaired bridges. The research team will assist MDOT personnel to become familiar with the use and interpretation of the enhanced chain-drag device through a field demonstration prior to the conclusion of the project.

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\*The original authorized total budget amount of the project

\*\*The authorized total budget amount as revised, if applicable

\*\*\* The project life to date expenditure

\*\*\*\*The current fiscal year's original budget amount

\*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Combining Link-Slab, Deck Sliding over Back-Wall and Revising Bearing

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Roger Till

CONTRACT/AUTHORIZATION #	2006-0415 / A1	PROJECT START DATE	03/23/2007
SPR NUMBER	101699	COMPLETION DATE (Original)	07/23/2008
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Western Michigan University		
PRINCIPAL INVESTIGATOR	Dr. Haluk Aktan		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$123,069.77	TOTAL	N/A	
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$122,654.44	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$105,569.02	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$105,153.69	OTHER		
% PERCENT COMPLETE (By Budget)		100%	PERCENT COMPLETE (By Work)	100%	

**PURPOSE AND SCOPE**

The purpose of this research is to provide field evaluation and analytical modeling of multi-span continuous for live load (CLL) bridge-deck systems. The research results will include design recommendations for the link-slab, sleeper-slab and the approach slab. There will also be an assessment of additional issues due to bridge skew.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Field performance inspection of eight link-slab bridges as well as the associated data analysis has been completed. Single girder model analysis for the Link-slab moments and axial loads has been completed. Subassemblage analysis models have been developed for dependent Independent abutment integrated with the approach slab. Preliminary analysis and reality checks have been completed.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Link-slab full bridge finite element (FE) modelling and analysis has been completed. Integral and semi integral abutment subassemblage FE models for straight bridges with limited skew inclusive of the sleeper slab and the approach slab has been developed and verified.

The final report has been reviewed and accepted. Will be published as Research Report RC-1514. Project is 99% complete.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

Findings and recommendations in Research Report RC-1514 will be included in the Bridge Design Manual and Bridge Design Guides.

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
STATEWIDE PLANNING AND RESEARCH (SPR), PART II  
FISCAL YEARS 2008-2009**

PROJECT TITLE: A Critical Evaluation of Bridge Scour for Michigan Specific Conditions

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: David Juntunen

CONTRACT/AUTHORIZATION #	2006-0413 / A3	PROJECT START DATE	03/12/2007
SPR NUMBER	101701	COMPLETION DATE (Original)	03/12/2010
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Wayne State University		
PRINCIPLE INVESTIGATOR	Dr. Carol Miller		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$118,514.72	TOTAL		\$55,263.31
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$63,251.41	SALARIES		
<b>FY 2008 Budget</b>			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$70,209.23	EQUIPMENT	(Non-expandable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$38,783.60	OTHER		
PERCENT COMPLETE (By Budget)		53%	PERCENT COMPLETE (By Work)		74%

**PURPOSE AND SCOPE**

The purpose of this research is to improve the MDOT bridge scour prediction capability. This will be accomplished by performing the following four tasks.

Task 1: An extensive literature review including existing USGS, FHWA, and ASCE reports and a detailed review of electronic databases. Other state DOTs to identify research not included in the other sources.

Task 2: Evaluate MDOT's current scour evaluation procedures.

Task 3: Review scour evaluation methods used by other states.

Task 4: Calibrate Level 2 (HEC-18) scour prediction equations for Michigan specific conditions.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

The primary tasks that were completed during the 1st project quarter (4th quarter of FY 07) were:

- Reviewed and summarized existing USGS, FHWA, and ASCE reports. (LTU and WSU)
- Performed detailed literature review of electronic databases. (LTU and WSU)
- Reviewed existing MDOT methodologies for scour evaluation. (LTU and WSU)

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

The following tasks were initiated and/or completed during the 4<sup>th</sup> project quarter (3<sup>rd</sup> quarter of FY 2008):

- Contact state DOTs to identify non peer reviewed publications (LTU)
- Review and evaluate pre-existing engineering data for bridge scour evaluation (LTU and WSU)
- Review and evaluate existing databases and database management techniques (LTU and WSU)
- Review, summarize, and critique other state DOT methodologies for scour evaluation (LTU)
- Contact appropriate departments within each DOT for bridge scour information (LTU)
- Determine bridge scour information available through public accessible websites (LTU)
- Visit scour critical bridges throughout the lower peninsula of Michigan as identified through meetings with MDOT (LTU and WSU)
- Select scour critical bridges across the lower peninsula for episodic monitoring (LTU and WSU)
- Select scour critical bridges for continuous monitoring of scour (LTU and WSU)

- Collect field data and soil samples for all selected scour critical bridges (LTU and WSU)
- Perform Level 2 Analysis for selected bridges.
- Perform jet device testing at all selected scour critical bridges to determine in-situ soil erodibility (LTU)
- Conduct geotechnical laboratory investigation of soil samples to evaluate geotechnical properties of all selected sites (LTU)
- \* Collect Level 2 field data at selected bridges (WSU and LTU)
- \*Install continuous meters at a selected bridge (WSU and LTU)
- \*Collect continuous data at the selected bridge (WSU)
- \*Acquire two additional continuous monitoring systems (LTU)
- \*Collect episodic data at selected bridges (WSU and LTU)
- \*Conduct geotechnical testing of bed samples at the selected bridges (LTU)
- \*Conduct HEC-RAS steady state simulation for selected bridges (WSU)
- \*Conduct HEC-RAS scour simulation for selected bridges (WSU)

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**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

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The following tasks are scheduled for initiation and/or completion during the 2009 FY:

- Conduct HEC-RAS computer simulations for 14 selected sites as necessary (WSU)
- Conduct a parametric evaluation of HEC-18 Scour Prediction Equations for Michigan specific conditions based on existing and project collected scour data (LTU)
- Calibrate the Level 2 (HEC-18) Scour Prediction Equations for Michigan specific conditions based on field monitoring of scour, jet device correlations, and parametric evaluation (LTU and WSU)

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**JUSTIFICATION(S) FOR REVISION(S) (Date justification(s) for revision(s))**

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- \*The original authorized total budget amount of the project
- \*\*The authorized total budget amount as revised, if applicable
- \*\*\* The project life to date expenditure
- \*\*\*\*The current fiscal year's original budget amount
- \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
STATEWIDE PLANNING AND RESEARCH (SPR), PART II  
FISCAL YEARS 2008-2009**

PROJECT TITLE: A Critical Evaluation of Bridge Scour for Michigan Specific Conditions

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: David Juntunen

CONTRACT/AUTHORIZATION #	2007-0436 / A1	PROJECT START DATE	06/10/2007
SPR NUMBER	101702	COMPLETION DATE (Original)	06/09/2010
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Lawrence Technological University		
PRINCIPLE INVESTIGATOR	Dr. Donald Carpenter		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$165,689.05	TOTAL		\$110,523.45
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$55,165.60	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$100,954.64	EQUIPMENT	(Non-expandable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$38,057.29	OTHER		
PERCENT COMPLETE (By Budget)		33%	PERCENT COMPLETE (By Work)		35%

**PURPOSE AND SCOPE**

The purpose of this research is to improve the MDOT bridge scour prediction capability. This will be accomplished by performing the following four tasks.

Task 1: An extensive literature review including existing USGS, FHWA, and ASCE reports and a detailed review of electronic databases. Other state DOTs to identify research not included in the other sources.

Task 2: Evaluate MDOT's current scour evaluation procedures.

Task 3: Review scour evaluation methods used by other states.

Task 4: Calibrate Level 2 (HEC-18) scour prediction equations for Michigan specific conditions.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

- Reviewed and summarized existing USGS, FHWA, and ASCE reports. (LTU and WSU)
- Performed detailed literature review of electronic databases. (LTU and WSU)
- Reviewed existing MDOT methodologies for scour evaluation. (LTU and WSU)

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

The following tasks were initiated and/or completed through the 5<sup>th</sup> project quarter (4th quarter of FY 2008):

- Contact state DOTs to identify non peer reviewed publications (LTU)
- Review and evaluate pre-existing engineering data for bridge scour evaluation (LTU and WSU)
- Review and evaluate existing databases and database management techniques (LTU and WSU)
- Review, summarize, and critique other state DOT methodologies for scour evaluation (LTU)
- Contact appropriate departments within each DOT for bridge scour information (LTU)
- Determine bridge scour information available through public accessible websites (LTU)
- Visit scour critical bridges throughout the lower peninsula of Michigan as identified through meetings with MDOT (LTU and WSU)
- Preliminary selection of scour critical bridges across the lower peninsula for episodic monitoring (LTU and WSU)
- Preliminary selection scour critical bridges for continuous monitoring of scour (LTU and WSU)
- Collect field data and soil samples at several selected scour critical bridges (LTUandWSU)
- Collect Level 2 field data at several selected bridges (LTUandWSU)
- Install continuous meters at the Flint River site to pilot test equipment capabilities (LTUand WSU)

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- Collect continuous data at Flint River site (WSU)
  - Order equipment for additional continuous meter intallation at selected sites (LTU)
  - Collect episodic data at several selected scour critical bridges (LTU and WSU)
  - Perform jet device testing at appropriate selected scour critical bridges (LTU and WSU)
  - Conduct geotechnical testing of bed samples at several selected bridge sites to evaluate geotechnical properties (LTU)
  - Conduct HEC-RAS steady state simulation and scour prediction for several selected bridge sites (WSU)
  - Perform jet device testing at several scour critical bridges to determine in-situ soil erodibility (LTU)
  - Conduct geotechnical laboratory investigation of soil samples to evaluate geotechnical properties at several sites (LTU)

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**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

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The following tasks are scheduled for initiation and/or completion during the 2009 FY:

- Conduct HEC-RAS computer simulations for 14 selected sites as necessary (WSU)
- Install continuous monitoring equipment at three more bridge locations (LTU and WSU).
- Collect episodic scour data (LTU and WSU).
- Conduct a parametric evaluation of HEC-18 Scour Prediction Equations for Michigan specific conditions based on existing and, if available, project collected scour data (LTU)
- Perform jet device testing at appropriate selected scour critical bridges and attempt to correlate results with observed scour (LTU).

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**JUSTIFICATION(S) FOR REVISION(S) (Date justification(s) for revision(s))**

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- \*The original authorized total budget amount of the project
- \*\*The authorized total budget amount as revised, if applicable
- \*\*\* The project life to date expenditure
- \*\*\*\*The current fiscal year's original budget amount
- \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Transverse Post Tensioning of Side-by-Side Box Beam Bridges

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Roger Till

CONTRACT/AUTHORIZATION #	2004-0105 / A1	PROJECT START DATE	08/12/2006
SPR NUMBER	101708	COMPLETION DATE (Original)	09/12/2008
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Lawrence Technological University		
PRINCIPAL INVESTIGATOR	Dr. Nabil Grace		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$157,000.00	TOTAL	N/A	
	(Revised)**	\$168,000.00			
EXPENDED FUNDS TO DATE***		\$167,999.99	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$29,579.76	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$29,579.75	OTHER		
% PERCENT COMPLETE (By Budget)		100%	PERCENT COMPLETE (By Work)	100%	

**PURPOSE AND SCOPE**

The purpose of this study is to investigate transverse post-tensioning of side-by-side box beams on a bridge with a 30 degree skew. A research investigation comprised of an experimental program and a theoretical analysis will be done. The tasks involved in are given below.

Task 1: an extensive literature review will be done.

Task 2: Develop a finite element mathematical model to simulate the components of a pre-stressed concrete box beam bridge with a number of transverse diaphragms post-tensioned using un-bonded CFRP strands.

Task 3: A laboratory investigation involving the design, instrumentation, testing, and analysis of a one-half scale bridge model, with a 30 degree skew.

Task 4: Produce a comprehensive final report for MDOT.

Change of Scope (Additional services approved 2/27/07): Needed to allow the research team to purchase 10 CFCC strands 1x7 17.2 mm with a guaranteed breaking load of 350 kN. The effective cross section area is 151.1 mm<sup>2</sup> and nominal mass density of 289 g/m. This will increase the project from \$157,000 to \$168,000.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

1. Literature review on the behavior of post-tensioned transverse diaphragms in box-beam bridges was completed. A chapter was completed and submitted to MDOT project manager August 2007.

2. Summary charts for the number of diaphragms versus bridge span and TPT force level versus bridge width have been developed for a wide range of side-by-side box beam bridges. The bridge variables were bridge spans ranging from 50, 62, 100, and 124 ft as well as bridge widths ranging from 24, 45, 58, 70, to 78 or 84 ft. The width of the individual box beams was kept constant at either 36 in. or 48 in. throughout each bridge model. The beam depth increased with beam span and was determined by the flexural design requirements. Results were obtained for concrete compressive strengths of 3000, 4000, and 5,000 psi. for the 36 in. wide box-beam bridge, results were obtained for 4000 psi concrete only. Critical load combinations (truck and thermal loads) were jointly determined by the LTU research team and the MDOT technical advisory team. A chapter summarizing the numerical investigation was submitted to MDOT project manager August 2007.

3. The experimental testing program is completed. Testing of the one-half scale 30 degree skewed bridge model was conducted in the

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Structural Testing Center (STC) at LTU. The following tasks were completed: load distribution and strain distribution tests on un-cracked and cracked bridge deck, replacement of fascia beam including load and strain distribution tests, and ultimate load test.

i) The experimental results of the strain distribution tests evaluating the effect of the number of diaphragms and the TPT force level showed:

a. Increasing the TPT force caused an increase in the transverse strain on the top surface of the concrete deck slab at the locations of the transverse diaphragms.

b. The effect of the TPT arrangement on the transverse strain between diaphragms was low. Typically these strains remained at about zero.

c. None of the TPT arrangements appeared to be able to maintain a pre-stressing level in the entire deck slab equivalent to 250 psi.

ii). The experimental results of the load distribution tests performed on the bridge model prior to and after inducing longitudinal deck cracks (with crack width of 0.005") showed:

a. When the deck slab remains un-cracked, the effect of the TPT force level as well as the number of transverse diaphragms on the load distribution is low.

b. In case of longitudinal deck cracks over the location of the shear keys, the effect of the TPT force level on the load distribution is high (even at TPT levels of 20 kip).

c. The distance between active diaphragms significantly affect the load distribution in the case of longitudinal deck cracks.

d. As a result of TPT force, the load distribution factor was significantly improved when loading exterior beams compared to loading interior beams of a bridge model with longitudinal deck cracks.

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#### **FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

The preparation of the project report is under way and all theoretical and experimental project findings have been presented to the MDOT advisory team. During the Oct. 1 - Dec 31, 2007 quarter progress has been made on the following items:

a. The completion of Chapter 3 Test Methodology has been completed and submitted for review on 11/30/07

b. A progress meeting was held at CandT Lansing to present the final experimental findings to the MDOT advisory panel.

c. The Chapter 2 Literature Review and Chapter 4 Numerical Investigations has been updated as per MDOT advisory panel's review comments.

d. Chapter 5 Results and Discussion of Experimental Investigation is being prepared and will be submitted for review in January 2008

e. Laboratory testing facility was cleared for project specific debris and items.

Final report has been received, reviewed and accepted. Published as Research Report RC-1509.

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#### **FISCAL YEAR 2009 PROPOSED ACTIVITIES**

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#### **JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

The change in scope entails revising the post-tensioning scheme. Changing the transverse post-tensioning strands from the CFRP to CFCC will allow investigation of the effects of larger transverse post-tensioning forces on the bridge model, which is closer to a full-scale bridge. With the use of the available 10 mm diameter CFRP Leadline rods, the maximum post-tensioning force will be about 20 kips per rod. Using the CFCC tendons, the maximum post-tensioning force will be about 40 kips per tendon.

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#### **SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

Findings and recommendations in Research Report RC-1509 will be included in the Bridge Design Manual and Bridge Design Guides.

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\*The original authorized total budget amount of the project

\*\*The authorized total budget amount as revised, if applicable

\*\*\* The project life to date expenditure

\*\*\*\*The current fiscal year's original budget amount

\*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Effects of Debonded Strands on the Production and Performance of Prestressed Concrete Beams

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Steve Kahl

CONTRACT/AUTHORIZATION #	2006-0411 / A7	PROJECT START DATE	08/02/2007
SPR NUMBER	101714	COMPLETION DATE (Original)	08/02/2009
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Michigan State University		
PRINCIPAL INVESTIGATOR	Dr. Rigoberto Burgueno		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$199,740.00	TOTAL		\$160,550.64
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$39,189.36	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$53,118.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$39,189.36	OTHER		
% PERCENT COMPLETE (By Budget)		20%	PERCENT COMPLETE (By Work)		20%

**PURPOSE AND SCOPE**

The objective of this project is to investigate the effects of debonded strands on the production and performance of pretensioned concrete beams through experimentally calibrated analytical models and to identify and/or develop manufacturing and design recommendations to solve any detrimental effects that this technique may cause. The objectives will be met by completing the five tasks outlined below:

- Task 1: State of Knowledge Assessment. Perform a literature review and a survey of other state's recommendations and practice.
- Task 2: Strand Bond Behavior and Simulation. Determine the fundamental behavior of bond stress transfer between strand in concrete under primary end conditions of bond, release, and transverse reinforcement. Three-dimensional nonlinear finite element models will be developed to simulate basic bond behavior and calibrated with the experimental results.
- Task 3: Simulation Studies on Pretensioned Anchorage Zones. Study the stress state of the anchorage zones of pretensioned beams through numerical simulations using nonlinear 3D finite element models. The effect, contribution and relative importance of design/manufacturing issues will be studied.
- Task 4: Design and production Recommendations. Identify and propose design and production recommendations that rationally take into account the effects of debonded strands and strand release patterns in pretensioned girders.
- Task 5: Reporting. Preparation of quarterly progress reports and a final project report. The research project will lead to the development of manufacturing and design recommendations on the implementation of debonded strands in pretensioned girders. The recommendations will be based on sound rational understanding of the effects of debonded strands during production, e.e. transfer, and service. The knowledge gained will be of immediate value to MDOT, precast producers, and bridge engineers.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Project started in August, some work was accomplished on literature review.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Task 1: Perform a literature review and survey of other state's recommendations and practices to determine the current state of knowledge on debonded strands in production, design guidelines, and research. This task will be subdivided in tow sub-tasks as follows:

- Subtask 1.1: Literature Review. Review of archived literature in the form of journal articles and research reports.
- Subtask 1.2: State DOT surveys. A survey of state's practices and recommendations will be prepared and distributed to representatives of all state DOTs through AASHTO's bridge listserv.

Begin work on Task 2, Subtask 2.1: Experimental investigation on Strand Bond Transfer. Bond stress transfer behavior under

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bonded/unbonded end conditions, release conditions, and transverse (or confinement) reinforcement will be determined through experimentally validated three-dimensional finite element models.

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**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Work will continue on Experimental Investigation of Strand Bond Transfer and Finite Element Models for Strand Bond Simulation . The final report will be completed.

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**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

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**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

The final report will document the primary causes leading to cracking at the ends of pretensioned beams as well as solutions to minimize or eliminate this problem. Design and production recommendations will be developed to assist design engineers as well as prestressed concrete fabricators. The report will be summarized and proposed as updates to the design manual as appropriate. It is expected that by identifying the primary causes leading to cracking at beam ends and the role of strand debonding and strand release, MDOT and the precast concrete industry will benefit by obtaining better quality and better performing structural elements as well as reducing costs incurred by repairs or unit disposals.

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- \*The original authorized total budget amount of the project
  - \*\*The authorized total budget amount as revised, if applicable
  - \*\*\* The project life to date expenditure
  - \*\*\*\*The current fiscal year's original budget amount
  - \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Skewed Bridges

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Peter Jansson

CONTRACT/AUTHORIZATION #	2006-0413 / A4	PROJECT START DATE	07/12/2007
SPR NUMBER	101716	COMPLETION DATE (Original)	10/12/2009
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Wayne State University		
PRINCIPAL INVESTIGATOR	Dr. Gongkang Fu		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$214,975.71	TOTAL		\$196,427.21
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$4,811.27	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$102,125.97	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$4,811.27	OTHER		
% PERCENT COMPLETE (By Budget)		2%	PERCENT COMPLETE (By Work)		6%

**PURPOSE AND SCOPE**

The objective of this research project is to simplify the design for skewed bridges that are commonly used in Michigan, by developing design tools. The simplified design methods should maximize the durability of skewed bridges in Michigan.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Performed literature review.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Documented literature review completed so far. Identified candidates for physical testing. Continued progress on finite element modeling of the two candidate test bridges. Construction delays have prevented any field testing to date.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Instrument two bridges and take readings for dead load. Perform load testing of the selected bridges once construction is complete. Use the results to calibrate finite element models of general bridge structures typical in Michigan.

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Feasibility Study for Mackinac Bridge Monitoring

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Andrew Semenchuk

CONTRACT/AUTHORIZATION #	2007-0665	PROJECT START DATE	08/22/2007
SPR NUMBER	101719	COMPLETION DATE (Original)	03/31/2008
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	URS Corporation		
PRINCIPAL INVESTIGATOR	Mike Tarazi		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$64,206.40	TOTAL		N/A
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$64,206.40	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$64,206.40	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$64,206.40	OTHER		
% PERCENT COMPLETE (By Budget)		100%	PERCENT COMPLETE (By Work)		100%

**PURPOSE AND SCOPE**

Perform Study and plan for the monitoring of the Mackinac bridge

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Researcher/Consultant was placed under contract, will commence investigation activities. Preliminary report to be submitted around Jan 2008

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Research is ongoing, preliminary report was submitted on schedule; however MDOT was not happy with one section of the preliminary, so MDOT had the section of the report re-done. The revised report has been submitted and is being reviewed.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

N/A feasibility study will be complete. Funding may be requested to implement the results of the study.

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

Once the

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Improved Shallow Depth Patches for Concrete Structures

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Steve Kahl

CONTRACT/AUTHORIZATION #	2002-0532 / A7	PROJECT START DATE	10/13/2004
SPR NUMBER	101737	COMPLETION DATE (Original)	10/15/2006
ORBP NUMBER		COMPLETION DATE (Revised)	10/13/2007
RESEARCH AGENCY	Michigan State University		
PRINCIPAL INVESTIGATOR	Dr. Ronald S. Harichandran		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$160,095.00	TOTAL	N/A	
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$159,870.12	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$4,244.93	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$4,020.00	OTHER		
% PERCENT COMPLETE (By Budget)		100%	PERCENT COMPLETE (By Work)	100%	

**PURPOSE AND SCOPE**

This project will investigate several patching materials for repair of concrete surfaces subjected to deterioration. Performance criteria will include shrinkage and adhesion. Additional criteria for selecting materials will be ease of installation and availability of materials.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

New specimens with larger patches were fabricated. These included 20 specimens with two different patching materials, 10 of them having an FRP overlay and 10 without an FRP overlay. The specimens were subjected to 1000 cycles of flexural loading to induce cracking, then to 300 cycles of freeze-thaw exposure, and finally to 500,000 cycles of flexural loading. A pull-out test was devised to measure the bond strength between the patches and the concrete substrate. The results indicated the superiority of the proposed patch system with the FRP overlay. Due to improved durability, considerable cost savings can be achieved by using the FRP overlay.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Final report published and accepted. Final invoice paid. Project closed out.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

The final report will include recommendations and guidelines that will assist MDOT engineers to select materials for shallow-depth repairs on concrete structures. It also will contain de-tailed specifications that contractors can use to install the patches. MDOT will therefore be able to rapidly implement the results of the research.

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
STATEWIDE PLANNING AND RESEARCH (SPR), PART II  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Performance of Michigan's Jointed Portland Cement Concrete (PCC) Pavements -- Phase II

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Alan Robords

CONTRACT/AUTHORIZATION #	06-0181 / A7	PROJECT START DATE	03/08/2007
SPR NUMBER	101738	COMPLETION DATE (Original)	09/30/2008
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Soils and Materials Engineers		
PRINCIPLE INVESTIGATOR	Starr Kohn		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)       2<sup>nd</sup> (Jan 1 – Mar 31)       3<sup>rd</sup> (Apr 1 – Jun 30)       4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$164,674.55	TOTAL		N/A
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$164,259.54	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$112,213.96	EQUIPMENT	(Non-expandable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$111,798.95	OTHER		
PERCENT COMPLETE (By Budget)		100%	PERCENT COMPLETE (By Work)		100%

**PURPOSE AND SCOPE**

Analyze collected data on 130 PCC pavements constructed between 1980 and 2000. Run multi-variant statistical analyses on collected data. Determine which components exert the most influence on pavement performance. Identify the best performing pavements and the factors contributing to the superior performance.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Completed the separation and re-tabulation of data into usable spreadsheet.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Identified portions of collected data with sufficient populations to complete multi-variant statistical analyses. Tried to isolate components influential on pavement performance.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Complete before 2009.

**JUSTIFICATION(S) FOR REVISION(S) (Date justification(s) for revision(s))**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Durability Study of the US-23 Aggregate Test Road and Recent JPCP Projects with Premature Joint Deterioration

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: David Smiley

CONTRACT/AUTHORIZATION #	2006-0412 / A1	PROJECT START DATE	12/21/2006
SPR NUMBER	101739	COMPLETION DATE (Original)	03/21/2009
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	University of Michigan		
PRINCIPAL INVESTIGATOR	Dr. Will Hansen		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$228,922.92	TOTAL		\$23,544.93
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$205,377.99	SALARIES		
<b>FY 2008 Budget</b>			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$146,678.16	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$123,133.23	OTHER		
% PERCENT COMPLETE (By Budget)		90%	PERCENT COMPLETE (By Work)		80%

**PURPOSE AND SCOPE**

To investigate the durability properties of selected concrete pavements to determine if visible deterioration is related to freeze-thaw action. These pavements are recently constructed JPCP, which are exhibiting premature, F/T like joint deterioration (dark staining w/spalling). Also, the study includes a durability assessment of MDOT's Aggregate Test Road on SB US-23, which is 15 years old.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Some JPCP sites were cored for laboratory analysis, which continued as year ended. Testing includes normal F/T testing and the effects of contact with chloride de-icing materials. Preliminary results show there is a correlation with the concrete's air-void system as to the exhibited damage from lab F/T testing.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Note: Costs include September 2008. Original Fy 2009 budget is shown, which requires revision, as only limited funds remain.  
 1<sup>st</sup> - Only lab work has continued for JPCP sites. Lab testing procedures for measuring air-void system characteristics were verified with MDOT's protocol. Lab samples were prepared from concrete removed from active I-69 rehabilitation project to study concrete without JPCP exhibited deterioration.  
 2<sup>nd</sup> - Laboratory F/T testing with quantification of air-system properties continued on samples from projects previously cored in 2007. Some test samples were prepared from virgin materials to isolate the effects of specific concrete mixture materials.  
 3<sup>rd</sup> - Additional field samples (primarily US-23) were tested to determine air system properties, F-T resistance, and susceptibility to salt scaling.  
 4<sup>th</sup> - Laboratory testing continued to confirm previously suspected causes for concrete deterioration. Testing included pavement samples from projects exhibiting both visible and no visible deterioration, Testing also being done on prepared samples with varying cementitious content (type/quantity) and fine aggregate type to find a preventive solution to deterioration initiation.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Complete testing. Prepare final report, including its review and acceptance by RAP. Note: Tasks, other than the report have changed in scope, as the RAP and PI are trying to achieve the most benefit with limited study time remaining, as project is behind schedule.

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

There are about six months remaining for project. Conclusions are incomplete at this time to support an implementation plan.

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Development of New Test Procedure for Measuring Fine and Course Aggregate Specific Gravity

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: John Barak

CONTRACT/AUTHORIZATION #	2006-0414 / A8	PROJECT START DATE	04/09/2007
SPR NUMBER	101743	COMPLETION DATE (Original)	04/09/2009
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Michigan Technological University		
PRINCIPAL INVESTIGATOR	Dr. Zhanping You		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$181,925.24	TOTAL		\$84,415.12
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$94,720.90	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$170,669.98	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$83,465.64	OTHER		
% PERCENT COMPLETE (By Budget)		52%	PERCENT COMPLETE (By Work)		50%

**PURPOSE AND SCOPE**

The first objective of this study is to use the SSDetect to evaluate the specific gravity and evaluate the feasibility of varying gradation of aggregate in Michigan. The second objective is to determine if vacuum saturating coarse aggregate in lieu of a 24 hour soak period for AASHTO T85 (Specific Gravity and Absorption of Coarse Aggregate) can provide similar specific gravity values.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Applied the SSDetect to evaluate the specific gravity and the feasibility of varying gradation of aggregate in Michigan. Also investigated if vacuum saturating coarse aggregate in lieu of a 24 hour soak period for AASHTO T85 (Specific Gravity and Absorption of Coarse Aggregate) can provide similar specific gravity values. The research team has tested a small number of various aggregate samples (fine and coarse aggregates) from different locations of the State.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Collected more samples such as sand/gravels, limestone, crushed concrete, steel slag to evaluate the fine and coarse aggregate specific gravity and absorption. The research team tested a large number number of the steel slag and crushed concrete coarse aggregates using the AASHTO T85 (Specific Gravity and Absorption of Coarse Aggregate) and the new method (modified Rice test) and compared with the vacuum saturated method. It was found that the steel slag is very porous and traditional AASHTO method is not proving good results. \$87,204.34 has been added to the FY 2009 estimated budget of \$0.00. These funds were the unused portion of the FY 2008 budget. There was no invoice submitted by MTU for the month of September 2008.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Successfully complete the new procedure to significantly reduce testing time.

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project  
\*\*The authorized total budget amount as revised, if applicable  
\*\*\* The project life to date expenditure

**OFFICE OF RESEARCH and BEST PRACTICES  
STATEWIDE PLANNING AND RESEARCH (SPR),  
PART II  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Impact of Hydrated Cement Paste Quality and Entrained Air-Void System on the Durability of Concrete

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: John Staton

CONTRACT/AUTHORIZATION #	2006-0414 / A10	PROJECT START DATE	07/31/2007
SPR NUMBER	101745	COMPLETION DATE (Original)	07/31/2010
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Michigan Technological University		
PRINCIPLE INVESTIGATOR	Dr. Larry Sutter		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)       2<sup>nd</sup> (Jan 1 – Mar 31)       3<sup>rd</sup> (Apr 1 – Jun 30)       4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$304,826.44	TOTAL		\$83,325.32
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$153,807.89	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$144,890.42	EQUIPMENT	(Non-expandable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$151,327.34	OTHER		
PERCENT COMPLETE (By Budget)		50%	PERCENT COMPLETE (By Work)		50%

**PURPOSE AND SCOPE**

This study will use a rigorous statistically-based experiment to establish a relationship between F-T durability and the characteristics of the hydrated cement paste and air-void system. The study will evaluate different cement types, SCMs, and AEAs that would typically be used in Michigan highway concrete mixtures.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

- Equipment and Materials Procurement
- Literature Review
- Refine experimental design

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

**Progress This Quarter:**

During the last quarter the mixing schedule of the project was completed. The project continues on with the testing portion of the work and will also see an increase in the amount of committed to data collection and organization. There is still a significant amount of time being spent on testing.

The goal of the project was to complete all fresh concrete testing by the beginning of the academic year. Having done each mix twice, all 68 mixes were completed by September 16. This should result in the long term testing being concluded sometime in January of 2009. The current testing progress for each mix can be seen on the attached spreadsheet. The remaining percentages refer to the long term testing that is being worked through currently. Each listed mix design was done twice to ensure reproducibility.

The next quarter should result in a thesis draft and a large amount of data organization that can begin the report process of the project. Once the data is analyzed a possible next experimental phase of the project can be discussed and areas of continued interest in the project can be determined. All new updates and changes will be included in the next quarterly report.

Terminology Key
OPC: Ordinary portland cement
GBFS: Ground Granulated Blast Furnace Slag
0.45/0.55: water to cement ratio

NA: Natural Air - Vinsol Resin  
 SA: Synthetic Air - MicroAir  
 3%/6%: Percent Air Entrainment

Optimized Gradation Mixes	Percentage Completed
OPC-0.45-NA-3%	85
OPC-0.45-NA-6%	85
OPC-0.45-SA-3%	85
OPC-0.45-SA-6%	75
GBFS-0.45-NA-3%	85
GBFS-0.45-NA-6%	75
GBFS-0.45-SA-3%	70
GBFS-0.45-SA-6%	70

Gap Gradation Mixes	Percentage Completed
OPC-0.45-NA-3%	95
OPC-0.45-NA-6%	95
OPC-0.50-NA-3%	95
OPC-0.50-NA-6%	95
OPC-0.52-NA-3%	95
OPC-0.52-NA-6%	95
OPC-0.45-SA-3%	95
OPC-0.45-SA-6%	95
OPC-0.50-SA-3%	95
OPC-0.50-SA-6%	95
OPC-0.52-SA-3%	95
OPC-0.52-SA-6%	95
GBFS-0.45-NA-3%	95
GBFS-0.45-NA-6%	95
GBFS-0.50-NA-3%	85
GBFS-0.50-NA-6%	85
GBFS-0.52-NA-3%	85
GBFS-0.52-NA-6%	85
GBFS-0.45-SA-3%	85
GBFS-0.45-SA-6%	85
GBFS-0.52-SA-3%	85
GBFS-0.52-SA-6%	85
FA-0.45-NA-3%	85
FA-0.45-NA-6%	85
FA-0.45-SA-3%	85
FA-0.45-SA-6%	85

**Work Next Quarter:**

Work will focus on completion of concrete testing and data analysis.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Perform bulk of physical testing for Phase 2. Prepare and submit interim report

**JUSTIFICATION(S) FOR REVISION(S) (Date justification(s) for revision(s))**

\*The original authorized total budget amount of the project

**OFFICE OF RESEARCH and BEST PRACTICES  
STATEWIDE PLANNING AND RESEARCH (SPR), PART II  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Efficient Use of Recycled Concrete in Transportation Infrastructure

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: John F. Staton

CONTRACT/AUTHORIZATION #	2006-0414 / A12	PROJECT START DATE	09/10/2007
SPR NUMBER	101746	COMPLETION DATE (Original)	08/31/2009
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Michigan Technological University		
PRINCIPLE INVESTIGATOR	Dr. Jacob E. Hiller		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$180,181.61	TOTAL		\$80,122.52
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$12,490.87	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$19,003.11	EQUIPMENT	(Non-expandable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$12,490.87	OTHER		
PERCENT COMPLETE (By Budget)		7%	PERCENT COMPLETE (By Work)		10%

**PURPOSE AND SCOPE**

The central objective of this study is to minimize risks inherent in using recycled concrete aggregates (RCA) as an engineered material in the transportation industry and thus increase the use of this resource. This will be accomplished through literature review, laboratory studies, life-cycle cost analysis and development of a manual of practice to guide the use of RCA in transportation applications.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

none

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

PI change from T. Van Dam to J. Hiller  
New PI has initiated the literature review on the subject and outlined a plan for the laboratory study. Much of the work that has been conducted so far has included literature review of research in this area, state and international practices, and RCA project performances. RCA characterizations using AASHTO T85, M43, and other methods have been conducted. Grading of the RCA has also been accomplished to fit MDOT specifications. In addition, aggregates are being characterized using helium pycnometry to assess absorption capacity and pore structure as typical methods have overestimated absorption capacity, thereby leading to poor concrete mixes. An in-depth study on volumetric stability (free, sealed, and restrained shrinkage testing) and mechanical properties of concrete made from RCA is currently underway.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Commencement of the laboratory study  
Development of the manual of practice is the top priority for FY 2009. This will outline MDOT, other states, national, and international practices for using RCA that have been successful as well as failures to identify best practices.  
Microstructural evaluation of existing concrete specimens, recycled concrete aggregates, and new concrete made from RCA.

**JUSTIFICATION(S) FOR REVISION(S) (Date justification(s) for revision(s))**

The change of PI from T. Van Dam to J. Hiller has put the project behind schedule. It is anticipated at this point that the new PI will request a no-cost time extension.

\*The original authorized total budget amount of the project  
\*\*The authorized total budget amount as revised, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Evaluation of Concrete Pavements with Material-Related Distress

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: David Smiley

CONTRACT/AUTHORIZATION #	2003-0063 / A20	PROJECT START DATE	12/05/2005
SPR NUMBER	101997	COMPLETION DATE (Original)	12/05/2008
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Michigan Technological University		
PRINCIPAL INVESTIGATOR	Dr. Larry Sutter and Dr. Tom VanDam		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$350,062.36	TOTAL	\$165,407.39	
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$184,654.97	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$173,408.35	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$8,000.96	OTHER		
% PERCENT COMPLETE (By Budget)		53%	PERCENT COMPLETE (By Work)	45%	

**PURPOSE AND SCOPE**

The project study has two phases. Phase I is a comprehensive laboratory investigation to determine the causes for observed material-related distress involving recently constructed concrete pavements. Phase II is intended to be a structured laboratory study to refine existing concrete mixtures to prevent such distress in the future and improve overall concrete performance. This phase will also likely involve concrete sampling and monitoring of active paving projects during duration of study.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

The remaining pavement sites were cored and the laboratory analysis for phase I was mostly completed. Several preliminary lab reports were prepared and a RAP meeting was held with PI to discuss results and consider preliminary objectives for phase II. The final report for phase I was mostly completed, but not submitted.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Note: There were no cost expenditures for 2<sup>nd</sup> and 3<sup>rd</sup> quarters and probably 4<sup>th</sup> (no invoice for July or August). \*\* Original estimate, which will change pending a time extension and proposal (work tasks) for phase II of study. FY 09 est. is \$105,000.

1<sup>st</sup> - The PI completed the phase I report, which was submitted in late Nov. 07. The report was reviewed by RAP and discussions began regarding a formal meeting to discuss its content and recommendations for phase II. The meeting was not held this quarter. Note: A revision of the project's time table and budget appear needed. A decision of phase II plans will determine extent of needed changes.

2<sup>nd</sup> - A RAP meeting was held with the PI in February 08 to discuss plans for phase II. Several preliminary objectives were developed. As the quarter ended, the PI was preparing a detailed work plan for phase II. Note in 1st quarter summary still applies.

3<sup>rd</sup> - PI presented a draft plan for phase II (w/o budget) that the RAP returned comments. Approval of phase II work is still pending.

4<sup>th</sup> - Discussions regarding proposal and budget for Phase II. As quarter ended, a revised draft proposal was submitted for RAP review.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Activities are dependent upon the task details for Phase II of the study, which are not finalized. The current completion date will have to be revised, and perhaps the budget, to fit the proposed tasks being discussed with the PI.

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

This study is too far from completion to determine an implementation plan.

\*The original authorized total budget amount of the project

\*\*The authorized total budget amount as revised, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Value Effect of Construction Incentive Payments on Pavement Performance

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: David Smiley

CONTRACT/AUTHORIZATION #	2006-0411 / A10	PROJECT START DATE	10/01/2007
SPR NUMBER	101999	COMPLETION DATE (Original)	09/30/2008
ORBP NUMBER	OR00026	COMPLETION DATE (Revised)	
RESEARCH AGENCY	Michigan State University		
PRINCIPAL INVESTIGATOR	Dr. Gilbert Baladi		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$50,000.00	TOTAL		N/A
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$49,951.36	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$50,000.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$49,951.36	OTHER		
% PERCENT COMPLETE (By Budget)		100%	PERCENT COMPLETE (By Work)		100%

**PURPOSE AND SCOPE**

Conduct a preliminary data assessment of representative past projects to judge their data quality (file record completeness) to determine if an extensive project (subsequent authorization - Phase II) is justified to conduct a cost-benefit analysis of project incentive payments to find their actual relationship to pavement performance. Only incentives related to material items are being studied in this first phase.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Note: Costs don't include September 2008, which will likely use all remaining funds.

1<sup>st</sup> - The project data search started late due to a delay in DIT approval (early December) for a MSU student to gain access to MDOT's intranet files. Since then, the MSU team has been diligent in catching up. The data search is now fully underway. Some progress has been made on a national literature search of similar study efforts by others.

2<sup>nd</sup> - Task work continued in three areas: Project data (records) search, literature review, and collection of pavement performance data.

Progress has been mixed. The completeness of project records is highly variable - more files were reviewed. Literature review is almost ready for a written summary. There was an access problem to view PMS data files, but it is being resolved as quarter ended.

3<sup>rd</sup> - Some additional files were reviewed. Data analysis was conducted to judge merits of whether the proposed extensive project analysis is warranted. PI and RAP held several meetings to review work and begin discussion of conducting next phase of study.

4<sup>th</sup> - Data search and analysis were completed per proposal. PI began, with RAP approval, voluntary extra work (no cost) to demonstrate possible ways to conduct a cost/benefit analysis of actual project performance results that will be part of Phase II.

Submittal of final report is being delayed slightly to include results of this extra work effort.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

This study ends September 30, 2008.

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

The findings thus far support the next study phase of extensive data analysis to determine how cost effective material incentive payments are. However, this effort will be hindered because some key data results are missing from the construction project files.

\*The original authorized total budget amount of the project

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Assessment of Pavement Acceptance Criteria and Quantifying As-constructed Material and Structural Properties

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: David Smiley

CONTRACT/AUTHORIZATION #	2006-0411 / A4	PROJECT START DATE	01/04/2007
SPR NUMBER	102001	COMPLETION DATE (Original)	03/04/2009
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Michigan State University		
PRINCIPAL INVESTIGATOR	Dr. Karim Chatti		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$220,090.00	TOTAL		\$70,599.93
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$149,490.07	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$128,460.91	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$93,971.98	OTHER		
% PERCENT COMPLETE (By Budget)		68%	PERCENT COMPLETE (By Work)		60%

**PURPOSE AND SCOPE**

Study consists of two primary objectives: First, review acceptance criteria (QA specifications) of past projects to determine their relationship with the pavement's performance. Then, consider feasibility (need) of revising criteria to better correlate with the desired (predicted) performance. Second, develop a process to verify as-constructed material properties so as to be able to compare with design assumptions (values). Overall, identify strategies to adopt true performance related specifications.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

The review of project record files and their respective acceptance criteria were gathered for analysis. A report of findings was completed and submitted to the RAP, as the year ended. A literature review of similar work by other state agencies was conducted.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Note: Costs do not include September 08 expenses. FY 09 budget is original, which will increase from FY 08 carryover funds.

1<sup>st</sup> - The majority of the quarter involved meetings between the PI and RAP to review Phase I accomplishments and findings. The PI's original plan for comparison with performance data required revision as most project records lacked specific results regarding material test records. In December, the RAP approved a tentative alternate plan suggested by the PI.

2<sup>nd</sup> - Work on the alternate comparison plan began, but the results soon were deemed inadequate and another alternate was agreed to during meetings with the PI as the quarter ended.

3<sup>rd</sup> - PI continued study with revised alternate plan per RAP's oversight. The majority of work involved statistical analysis of QA variables - comparing their individual and interaction effects regarding performance measures using the ME-PDG model.

4<sup>th</sup> - Analysis from 3<sup>rd</sup> quarter continued. Heavy reliance on LTPP data for analysis simulation. Most work on HMA mixtures and flexible pavements. Began similar work for concrete mixtures/rigid pavements as quarter ended. A RAP progress mtg. was held in August.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Note: There is possibility of a no-cost time extension being necessary, as initial data search of project records took longer than anticipated due to missing information, which required a revised approach for task work. Primary work should involve completing second objective (see part two of PandS description) and preparing the final report, including its review and acceptance by the RAP.

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

The study has about six months remaining, but is slightly behind schedule. Thus, the conclusions are incomplete and cannot support an implementation plan at this time.

\*The original authorized total budget amount of the project

**OFFICE OF RESEARCH and BEST PRACTICES  
STATEWIDE PLANNING AND RESEARCH (SPR), PART II  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Evaluation of the 1-37A Design Process for New and Rehabilitated JPCP and HMA Pavements

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Michael Eacker

CONTRACT/AUTHORIZATION #	2002-0532 / A17	PROJECT START DATE	11/29/2005
SPR NUMBER	102008	COMPLETION DATE (Original)	05/29/2008
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Michigan State University		
PRINCIPLE INVESTIGATOR	Dr. Neeraj Buch, Dr. Karim Chatti		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$189,538.00	TOTAL		N/A
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$178,724.01	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$53,366.37	EQUIPMENT	(Non-expandable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$42,552.38	OTHER		
PERCENT COMPLETE (By Budget)		94%	PERCENT COMPLETE (By Work)		100%

**PURPOSE AND SCOPE**

Analyze the proposed Mechanistic-Empirical Pavement Design Software to determine sensitivities and whether or not it makes sense for Michigan to utilize as pavement design software

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Side study on sensitivity to traffic inputs, compare predicted results with actual performance of in-service pavements.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Continued with validation using in-service pavements, began preparation of technology transfer class and delivered draft final report. Complete final report

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

**JUSTIFICATION(S) FOR REVISION(S) (Date justification(s) for revision(s))**

Coordinate short course content and date with the PI's

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Quantifying Coefficient of Thermal Expansion Values of Typical Hydraulic Cement Concrete Paving Materials

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Michael Eacker

CONTRACT/AUTHORIZATION #	2002-0532 / A18	PROJECT START DATE	11/29/2005
SPR NUMBER	102009	COMPLETION DATE (Original)	11/29/2007
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Michigan State University		
PRINCIPAL INVESTIGATOR	Dr. Neeraj Buch		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$101,227.00	TOTAL		N/A
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$80,076.58	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$27,024.55	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$5,874.13	OTHER		
% PERCENT COMPLETE (By Budget)		79%	PERCENT COMPLETE (By Work)		100%

**PURPOSE AND SCOPE**

Test and catalog the Coefficient of Thermal Expansion (CTE) of a typical concrete paving mix utilizing different coarse aggregates. CTE to be tested at several different ages after the concrete was made, out to one year.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Testing continued at specified specimen ages. Hiperpave and Mechanistic-Empirical software runs completed.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Final report submitted and accepted by MDOT - project complete.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

N/A

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

CTE values will be utilized in the Mechanistic-Empirical pavement design software should Michigan decide to adopt it.

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Resilient Modulus at the Limits of Gradation and Varying Degrees of Saturation

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: AI Robords

CONTRACT/AUTHORIZATION #	03-0063 / A8	PROJECT START DATE	09/08/2004
SPR NUMBER	102016	COMPLETION DATE (Original)	09/12/2006
ORBP NUMBER		COMPLETION DATE (Revised)	05/31/2007
RESEARCH AGENCY	Michigan Technological University		
PRINCIPAL INVESTIGATOR	Dr. Ralph Hodek		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$229,392.00	TOTAL		N/A
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$229,392.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$5,472.09	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$5,472.09	OTHER		
% PERCENT COMPLETE (By Budget)		100%	PERCENT COMPLETE (By Work)		100%

**PURPOSE AND SCOPE**

The purpose of this study is to determine whether the dynamic stiffness of an unbound pavement base course, represented by a lab specimen, of a 4G gradation, varies significantly over the acceptable gradation limits and a broad range of degrees of saturation.

To determine this, the stiffness characteristics of several unbound aggregate types, of a 4G gradation, will be tested at the upper and lower bound gradation curves of the 4G gradation specification. Furthermore, aggregate specimens constructed at the upper and lower bound gradation curves will be tested at four different degrees of saturation. The stiffness will be characterized by the material's resilient modulus.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

This project closed in 2007, shows 2008 fiscal activity only.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Development of Specifications for the Superpave Simple Performance Tests

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: John Barak

CONTRACT/AUTHORIZATION #	2006-0414 / Z2	PROJECT START DATE	10/18/2006
SPR NUMBER	102017	COMPLETION DATE (Original)	10/18/2008
ORBP NUMBER		COMPLETION DATE (Revised)	05/16/2009
RESEARCH AGENCY	Michigan Technological University		
PRINCIPAL INVESTIGATOR	Dr. Zhanping You		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$180,001.09	TOTAL		\$85,917.38
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$94,083.71	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$104,902.35	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$43,022.79	OTHER		
% PERCENT COMPLETE (By Budget)		52%	PERCENT COMPLETE (By Work)		55%

**PURPOSE AND SCOPE**

To use the Simple Performance Test (SPT) and conduct a laboratory study to measure the five parameters including the dynamic modulus terms ( $E^*/\sin\theta$  and  $E^*$ ) and the flow number ( $F_n$ ) for typical Michigan HMA mixtures.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

The research team has conducted the literature review on the test methods as well as application, designed the experimental plan, collected samples from different projects in the State, conducted dynamic modulus and flow number (dynamic creep) testing on a small number of the mixtures.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

The research team has collected a few more field mixtures and prepared lab testing samples in order to measure the dynamic modulus of higher traffic volume mixtures such as E10 and E30. The team conducted more testing of dynamic modulus and flow number (dynamic creep) testing on the other mixtures. The major accomplishment is the test mode, temperature and frequency selection in dynamic modulus testing for the Michigan mixtures. The master curve generation technique is developed so that the rutting prediction is possible. The team found that the flow number test may not be an ideal test for rutting control. Some of the analysis work such as the performance of the mixtures have been analyzed. The team found that the dynamic modulus has correlation to the field rutting. The research team has planned on the data analysis on the dynamic modulus. The project is satisfactory and the research team has identified applications for this project. \$61,879.56 has been added to the FY 2009 estimated budget of \$24,037.82. These funds were the unused portion of the FY 2008 budget.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Completion of the development of the specifications for the superpave simple performance tests.

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project

\*\*The authorized total budget amount as revised, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Pavement Subgrade MR Design Values for Michigan's Seasonal Changes

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: David Weber

CONTRACT/AUTHORIZATION #	2002-053 / A20	PROJECT START DATE	01/04/2007
SPR NUMBER	102018	COMPLETION DATE (Original)	01/04/2009
ORBP NUMBER	N/A	COMPLETION DATE (Revised)	
RESEARCH AGENCY	Michigan State University		
PRINCIPAL INVESTIGATOR	Dr. Gilbert Baladi		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$265,908.00	TOTAL		\$152,521.92
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$113,386.08	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$96,255.01	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$48,070.99	OTHER		
% PERCENT COMPLETE (By Budget)		42%	PERCENT COMPLETE (By Work)		80%

**PURPOSE AND SCOPE**

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Initial work to establish geographical boundaries to represent specific soil types was completed. Work continued on the literature review. Disturbed soil samples were collected from a total of 81 locations statewide. Testing of samples to determine soil classification, gradation, Atterberg limits, cyclic load triaxial testing, and hydrometer analysis were conducted during fiscal quarters one through four. Shelby tube samples were collected at ten locations throughout the state. Falling Weight Deflectometer testing was performed at nineteen locations and backcalculation of roadbed resilient modulus was performed on data from all of these locations.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Nearly all data collection and field testing has been completed. Data has been modeled to provide equations for the determination of subgrade modulus for pavement design by soil classification.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Data collection will be completed early in the spring of 2009 to model conditions related to saturated soil. MR predictive models will be completed and a final report will be submitted.

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITL: Evaluation of Economic Impacts of VII Program in Michigan

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Greg Krueger

CONTRACT/AUTHORIZATION #	2006-0411 / A1	PROJECT START DATE	09/08/2006
SPR NUMBER	102043	COMPLETION DATE (Original)	03/08/2007
ORBP NUMBER		COMPLETION DATE (Revised)	03/08/2008
RESEARCH AGENCY	Michigan State University		
PRINCIPAL INVESTIGATOR	Dr. Kunwar Rajendra		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$178,937.00	TOTAL		N/A
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$178,789.33	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$59,113.02	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$58,965.35	OTHER		
% PERCENT COMPLETE (By Budget)		100%	PERCENT COMPLETE (By Work)		100%

**PURPOSE AND SCOPE**

Determine the economic impacts of Michigan's VII research and deployment program.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Completed the economic evaluation study, including performing all modeling and development of alternatives. Report delivered in September, 2007.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Only activities anticipated are minor revisions and adjustments of the final report and printing of the report. Report will be presented at the 2007 ITS World Congress in Beijing.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

Report presented at the 2007 ITS World Congress in Beijing.

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: MDOT Vehicle Infrastructure Integration Data Analysis Documentation and Research Support Program

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Greg Krueger

CONTRACT/AUTHORIZATION #	2003-0026 / A12	PROJECT START DATE	08/30/2006
SPR NUMBER	102044	COMPLETION DATE (Original)	12/30/2008
ORBP NUMBER		COMPLETION DATE (Revised)	09/30/2009
RESEARCH AGENCY	University of Michigan		
PRINCIPAL INVESTIGATOR	Dr. Peter Sweatman		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$800,000.00	TOTAL		\$469,244.50
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$330,775.50	SALARIES		
<b>FY 2008 Budget</b>			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$363,262.63	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$242,463.68	OTHER		
% PERCENT COMPLETE (By Budget)		45%	PERCENT COMPLETE (By Work)		45%

**PURPOSE AND SCOPE**

The overall hypothesis of this program is that the VII program will significantly alter how DOTs do business as a result of the significant quantity of additional data on all major (and eventually minor) roads. This information is anticipated to permit MDOT and MDOT's partners to more effectively manage traffic on all facilities in the region, manage assets and road conditions, and respond to safety concerns. The objective of this research is to use develop prototype applications and data management software to use preliminary data being acquired through the Michigan VII test bed program.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Developed three quarterly VII newsletters outlining activities of Michigan VII activities. Developed draft white paper on VII communications methods. Attended DUAP stakeholder meetings and design reviews and provided written and verbal comments on first two DUAP deliverables. Attended MDOT International Vehicle Communications Summit and developed white paper regarding the outcomes of that meeting (posted to MDOT VII web site). Developed draft white paper on data needs of international VII evaluation program.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

This contract has been extended to September 30, 2009. There has been no work to date because the contract that DUAP project Mixon\Hill is working on was delayed because of USDOT POC data was needed. UMTRI can not begin until Mixon\Hill has completed more data collection and further developed protocols for data use and display.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

UMTRI will test and validate DUAP protocols and displays developed by Mixon\Hill and review designs and comment on work. Suggest improvements to the system and provide a written and verbal comments on DUAP deliverables.

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project

\*\*The authorized total budget amount as revised, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
STATEWIDE PLANNING AND RESEARCH (SPR), PART II  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Evaluation of the Usage and Impact of the Michigan VII Program

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

FUNDING SOURCE SPR Part II

PROJECT MANAGER: Greg Krueger

CONTRACT/AUTHORIZATION #	2007-0371	PROJECT START DATE	02/15/2007
SPR NUMBER	102045	COMPLETION DATE (Original)	12/31/2008
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Mixon/Hil		
PRINCIPLE INVESTIGATOR	Lee Mixon		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$3,500,000.00	TOTAL		\$1,486,230.25
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$2,013,769.75	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$2,891,106.81	EQUIPMENT	(Non-expandable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$1,404,876.56	OTHER		
PERCENT COMPLETE (By Budget)		58%	PERCENT COMPLETE (By Work)		60%

**PURPOSE AND SCOPE**

To support MDOT and its partners in the evaluation of the uses and benefits of VII-related data. Evaluate and determine how the VII program will impact how state and local departments of transportation do business as a result of the significant quantity of additional data collected on all major (and eventually minor) roads.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

- DUAP Concepts of Operations and Requirements Document have been completed and currently reside on the MDOT VII website for stakeholder's general use.
- Design Requirements are currently being developed based on current form of the Requirements. Additionally, TTI is currently developing system specification for algorithms for the DUAP systems.
- Systems Architecture (frame work of hardware to software) is about 90 percent complete with minor adjustments based on comments received from the Requirement Document and DUAP project team review.
- Hardware and software purchasing for data collection and processing has been initiated.
- System Design descriptions have been initiated as well as data collection from MDOT MITS Center detectors.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

- Server and software installed and configured for programming.
- Continue partnering with VII data collection stakeholders to storage, archive, and manage data on Mixon/Hill serves for processing and display.
- Systems Architecture (frame work of hardware to software) is complete and posted to MDOT VII website for stakeholder's general use next quarter.
- Design Requirements are currently being developed based on the out comes of the current form of the Requirements. Additionally, TTI has developed appropriate algorithms to process data for the DUAP system map.

- DUAP HTTP website map currently using processed data from probe vehicle and MITS detectors.
- System Design descriptions and algorithms continue in development and deployment for prototype testing and validation.
- Completed system architecture.
- Complete design and implement algorithms to start system testing and validation for prototypes one and two.
- Updated DUAP website map to include roadway segment display.
- Pursued and acquired additional input probe data from USDOT VII Proof-of-Concept Demonstration.
- Pursued fleet probe data hardware, software, and services to supplement existing data sources.

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**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

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- Complete system testing and validation for prototypes one and two.
- Pursue and acquire additional probe data sources as they become available
- Complete system acceptance testing.
- Implement system extensions (if required as a result of acceptance testing)
- Complete final system testing, validation, and documentation.

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**JUSTIFICATION(S) FOR REVISION(S) (Date justification(s) for revision(s))**

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- \*The original authorized total budget amount of the project
- \*\*The authorized total budget amount as revised, if applicable
- \*\*\* The project life to date expenditure
- \*\*\*\*The current fiscal year's original budget amount
- \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: An Evaluation of Right-Turn-In/Right-Turn-Out Restrictions in Access Management

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Lauri Olsen

CONTRACT/AUTHORIZATION #	2006-0411 / A9	PROJECT START DATE	08/24/2007
SPR NUMBER	102047	COMPLETION DATE (Original)	05/24/2008
ORBP NUMBER	OR00004	COMPLETION DATE (Revised)	12/31/08
RESEARCH AGENCY	Michigan State University		
PRINCIPAL INVESTIGATOR	Rick Lyles		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$66,144.00	TOTAL		\$14,172.69
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$51,971.31	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$66,144.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$51,971.31	OTHER		
% PERCENT COMPLETE (By Budget)		85%	PERCENT COMPLETE (By Work)		80%

**PURPOSE AND SCOPE**

To access the magnitudes of the positive and negative impacts of restricting access; evaluate the outcomes of the restrictions in several specific situations where the technique has been (or could have been) applied; and develop general guidelines for when the technique should be considered.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

First Phase (basically completed): Search of traditional published sources, review of practice which consists of querying selected consultants, local agencies/jurisdictions, and selected developers regarding experience with turning restrictions; and a general on-site review of existing sites where restrictions either were or could have been implemented. Completed and submitted written report of initial data collected and proposal of how the second phase data collection will proceed. Second Phase: traffic and site data collection at all selected sites completed and data analysis begun. Continuation of data analysis, computer simulation.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Complete data analysis, complete computer simulations, and prepare final report to be submitted to MDOT.

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

At the last quarterly report, a revised completion date of 8/30/08 was requested because the actual start of the project had been delayed by three months. Data collection took somewhat longer than anticipated, delaying the analysis, computer simulation, and final report tasks. Therefore, we are requesting that the completion needs to be extended to the end of the calendar year. There is no increase in the cost.

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Characterization of Traffic for the New ME Design Guide (I-37A) for Michigan

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Michael Eacker

CONTRACT/AUTHORIZATION #	2006-0411 / A8	PROJECT START DATE	10/1/2007
SPR NUMBER	102078	COMPLETION DATE (Original)	09/30/2009
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Michigan State University		
PRINCIPAL INVESTIGATOR	Dr. Neeraj Buch, Dr. Karim Chatti		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$140,039.00	TOTAL		\$90,270.86
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$49,768.14	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$27,020.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****	\$96,480.00	TRAVEL		
FY EXPENDITURE		\$49,768.14	OTHER		
% PERCENT COMPLETE (By Budget)		33%	PERCENT COMPLETE (By Work)		40%

**PURPOSE AND SCOPE**

This project will characterize the truck traffic information gathered from Michigan's 40+ weigh-in-motion sites and other traffic count and classification sites. This will allow MDOT to process and report the most accurate traffic information possible for any location in Michigan requiring pavement design. This project will also investigate how MDOT's traffic business processes need to be changed, and any resources that may be needed to bring about those changes.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

N/A

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Project started. Obtained maps of all of Michigan's permanent traffic recorders. Obtained truck weight information from MDOT weigh-in-motion sites. Began quality control analysis of truck weight information.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Develop axle distribution maps for the state, develop technology transfer class, final report

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Height Modernization Phase III and IV

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Andrew Semenchuk

CONTRACT/AUTHORIZATION #	2006-0545	PROJECT START DATE	04/07/2008
SPR NUMBER	102103	COMPLETION DATE (Original)	09/30/2008
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Coleman Engineering Company		
PRINCIPAL INVESTIGATOR	Jim Moore		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$435,000.00	TOTAL		N/A
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$425,379.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$435,000.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$425,379.00	OTHER		
% PERCENT COMPLETE (By Budget)		98%	PERCENT COMPLETE (By Work)		100%

**PURPOSE AND SCOPE**

Install Geodetic Control Monuments to be used in the observations to be performed in Phase IV. The RFP for Phase 4 has been posted

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Phase 3 is Completed and we are starting Phase IV

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Phase IV has commenced the RFP will be due November 20<sup>th</sup> 2008

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Michigan Ohio University Transportation Center

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Niles Annelin

CONTRACT/AUTHORIZATION #	2007-0538	PROJECT START DATE	05/01/2007
SPR NUMBER	102106	COMPLETION DATE (Original)	09/30/2009
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	University of Detroit Mercy		
PRINCIPAL INVESTIGATOR	Dr. Leo E. Hanifin		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$250,000.00	TOTAL		\$39,962.14
	(Revised)**	\$498,434.00			
EXPENDED FUNDS TO DATE***		\$458,471.86	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$417,043.84	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$377,081.70	OTHER		
% PERCENT COMPLETE (By Budget)		92%	PERCENT COMPLETE (By Work)		92%

**PURPOSE AND SCOPE**

The MIOH-UTC is a critical project which will enable MDOT and the State of Michigan economy to benefit from research focused on improving transportation efficiencies, supply chain management and alternative fuels. This research is being conducted at local universities in Michigan and Ohio which will benefit our region. The partnering Michigan universities are University of Detroit Mercy (lead), Wayne State University and Grand Valley State University.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Seven projects were underway at the end of FY 07. Most will continue into years two and three. Following are examples of specific accomplishments for MDOT fiscal year 2006-07.

- Two laboratory experiments have been developed around the hydraulic hybrid test stands employing an innovative problem solving approach to improve students' learning and to ensure achieving course objectives. These experiences support the development of transportation professionals and, ultimately, through their career efforts, the reduction of our nation's dependence on foreign oil, improvement of the environment and enhanced competitiveness of U.S. automakers.
- Extensive K12 educational models and courseware has been developed and piloted at the University of Detroit Mercy and made available for transfer to high schools. These materials focus on transportation systems and alternative fuels and include 17 activities that can be incorporated into high school courses. By engaging participants in the excitement of such areas as intelligent transportation systems and biofuels, these materials and programs will attract a larger and more diverse group of students into studies and careers as transportation professionals.
- One project was successful in developing a small scale chemical process for the conversion of peat into ethanol. However, the efforts to employ common yeasts as fermentors of ethanol from peat were not successful. Like much advanced research, both the positive and negative results are valuable findings.
- A team of researchers at Wayne State University have investigated the oxidative stability of different types of biodiesels and blends and the results of long-term indoor and outdoor storage. This project will be long term.
- The team of MIOH researchers, most from Wayne State University, has made great progress in the development of dynamic routing algorithms and models that will be linked to ITS systems to be responsive to the occurrence of incidents (especially accidents) that currently cause 25% of traffic congestion. This effort is specifically focused on improvement of supply chain (freight) performance.
- Researchers from Grand Valley and Wayne State Universities have made great progress in their efforts to describe, explain and

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predict the flow of traffic in a corridor with respect to time and space and to apply these results in the routing of traffic. Specifically, they have implemented a database management system (DBMS) in MySQL to properly organize and control the data and performed an initial data mining assessment of the data. They have also designed and implemented a traffic routing algorithm for re-routing all traffic around an incident in a corridor. This algorithm is believed to be unique, since existing routing algorithms are designed for routing a single vehicle and do not consider the consequences of re-routing a large number vehicles in a relatively short span of time. The algorithm is also dynamic as it allows metrics of congestion to be re-computed over time.

As most projects are not yet completed, even more significant accomplishments are expected in the future.

### **FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

During the Spring of 2008 researchers at the partner universities of the MIOH UTC presented status reports on all MIOH projects to members of the Operating Committee and select members of partner organizations including MDOT. The purpose of these meetings was to share general information about the work in progress and to solicit professional feedback and insights.

On May 14, 2008 seven research projects and two K-12 outreach projects were presented during a site visit of representatives of US DOT RITA. The presentations at UDM were made by partner universities UDM, WSU, GVSU and the UT. Invited guests and corporate partners attended. Additionally the DOT representatives toured the biodiesel research project's lab at NextEnergy.

Following are the urls for two newsletters of the MIOH UTC published in 2008:  
[mioh-utc.udmercy.edu/MIOH.UTC\\_Newsletter\\_Winter\\_2008.pdf](http://mioh-utc.udmercy.edu/MIOH.UTC_Newsletter_Winter_2008.pdf)  
[mioh-utc.udmercy.edu/MIOH.UTC\\_newsletter\\_Summer\\_2008.pdf](http://mioh-utc.udmercy.edu/MIOH.UTC_newsletter_Summer_2008.pdf)

Several projects will be drawing to a close in August 2008 or shortly thereafter (numbers 1, 2, 5, 7 and 9 below). Others will continue new phases in the coming year.

1. "Evaluation of SCATS Control System" TS4,p2: This University of Detroit Mercy project has received approval from MDOT of the draft final report. The final report is being produced summer 2008. Research was conducted to determine the effectiveness of the SCATS (Sydney Coordinated Adaptive Traffic System) signal system as compared to a pre-timed signal system in terms of traffic flow, delay and other selected measures of effectiveness. The research was conducted through a field experiment along a four-mile segment of M-59 between Pontiac Lake Road West to Pontiac Lake Road East consisting of seven signalized intersections. The M-59 corridor is located in Oakland County, Michigan. The data for the corridor was collected for the two signal system scenarios on a typical weekday and Friday for the noon (12 PM to 1 PM) and PM (4 PM to 6 PM) peak period, as well for a Saturday peak (9 AM to 11 AM). When comparing the mean values for the various measures of effectiveness, the SCATS signal system outperformed the pre-timed signal system based upon the percent differences between the two systems.
2. "Congestion Relief by Travel Time Minimization in Near Real Time" TS1,p2 and P3: This Grand Valley State University and Wayne State University project developed a hardware based (analog) solver providing very rapid determination of an "optimal" route solution for sending vehicles around congestion. Eventually this hardware solver will be placed on a chip. This team also developed a valuable data set that other researchers can employ. This captures the traffic data from 24 sensors for one full year (Nov 2005 thru 2006). This data is available on the GVSU website ([utc.egr.gvsu.edu/mdot/](http://utc.egr.gvsu.edu/mdot/)). Researches on this project have produced two articles that are being submitted for a conference and/or publication. (Both have been reviewed by MDOT.) A student researcher from WSU has won a student paper award from ITE announced June 2008.

This GVSU-WSU project will conclude in November 2008. It has provided the foundation for a new research proposal examining MITS Center Data with application to the I-75 corridor in MetroDetroit beginning fall 2008. The project has focused on developing and validating both a routing model and a simulation model of the Detroit area I-75 corridor. In addition, the analysis of the MITS data has identified patterns of traffic flow including volume and speed relationships for the same corridor.

3. "Enabling Congestion Avoidance and Reduction in the Michigan-Ohio Transportation Network to Improve Supply Chain Efficiency: Freight ATIS" SC2,p2 and p3: This project at Wayne State University and UDM in cooperation with industry partners such as Ford, is developing efficient dynamic routing algorithms to react to both recurring and non-recurring incidents by using real-time ITS traffic information and non-recurrent congestion modeling for reactive and anticipatory routing decisions based on networks of alternative routes for freight. One of the key aspects of this work is that its scalability enables implementation in real highway systems for dynamic rerouting of freight. In automotive plants 80% of all parts are delivered to assembly plants JIT (just in time) with only 3 hours of inventory on site. Targets for supply chain efficiencies are becoming even more aggressive. As such, these plants' operations have become susceptible to traffic congestion delaying delivery trucks causing part shortages and shutdowns of assembly operation. In the future the routing methods will be field tested with real data for a complex system. Additional phases of this research will be completed over the next two years.

The vast majority of the team's efforts in the first year went toward developing static and dynamic routing algorithms that enable congestion avoidance and travel time reduction in commercial cargo transportation networks. They have developed not just static but both static and dynamic routing algorithms based on Stochastic Dynamic Programming. In the second year, the team has improved the efficiency of the exact dynamic routing algorithm and developing heuristic algorithms (AO\* algorithms).

In addition to routing, the team also developed preliminary incident delay models which are extended and refined by calibrating according to the incident data obtained from MITS Center and Traffic.com. This incident model is currently integrated within the recurring congestion modeling and algorithmic framework and further improvements (shockwave propagation, traffic behavior) are in the team's current and future project plan.

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4. "Improved Oxidative Stability of Biodiesel Fuels: Antioxidant Research and Development" AF4,p2 and p3: This Wayne State University project, located in laboratories at NextEnergy, investigates the effect of antioxidants on the stability of different types of biodiesel; additionally, it is studying the long-term stability of biodiesel with synthetic/natural antioxidants. Results indicate that the effect of different antioxidants on biodiesel varies significantly depending on biodiesel feedstock and content of minor components. A goal is to develop/evaluate commercial antioxidants to improve the oxidative stability of biodiesel and thus make it a viable alternative fuel. Additional phases of this research are anticipated to continue through 2010.

As of summer 2008, researchers are determining that binary mixtures of antioxidants are more effective in improving oxidative stability of biodiesel than individual ones, suggesting a synergistic interaction which may be important in the development of suitable blends for long term storage. The effect of metal chelator and oxygen quencher on the antioxidant activity will be further investigated. The selected binary antioxidants on biodiesel oxidative stability under long-term storage conditions are also being studied as a function of time.

5. "Multipurpose Educational Modules to Teach Hydraulic Hybrid Vehicle Technologies" AF1,p2 and p3: A research team at the University of Detroit Mercy is creating a virtual replica of a physical test stand. The project is to develop education modules for use in courses to enhance students' understanding of the performance of a hydraulic pump or a hydraulic motor through its complete range of operation. The main components of the modules will be laboratory experiments based on the hydraulic hybrid vehicle components. The developed experiments can be used to facilitate students' understanding of engineering principals in fluid dynamics, hydraulics, energy systems, vibrations, mechatronics and controls. The University of Toledo team (funded by US DOT) is building the physical test stand. The UDM team is creating a virtual replica of the physical test stand. All designs and software for these real and virtual systems will be available to other universities for their use. This project will be completed in fall 2008.

6. In July 2008 the second annual Transit Camp (funded by US DOT and UDM) was conducted to introduce high school students to careers in transportation related fields. This involved participation, lectures and demonstrations by personnel from partner organizations such as: MDOT, SEMCOG, RCOC. The 2008 student group was composed of 9 males and 8 females. Additionally, the group was approximately 82% ethnic minority.

7. "K-12 Ford PAS Alternative Fuels Curriculum Module" and "Pilot Testing" K-12-1,p2 and p3: The K-12 Outreach course materials developed in K-12-1,p2 and provided to high school teachers are being enhanced based on the feedback from HS teachers who piloted the teaching modules in the past academic year. The improved modules developed in project K-12-1,p3 will be disseminated on a broader scale in fall 2008 including through the Ford Partnership for Advanced Studies Program. Ford PAS is a partnership between Ford Motor Company, leading universities (i.e. UDM, U. of California-Berkeley, U. of New Mexico,...) and well over 100 high schools across the nation.

8. "New Approach to Enhance and Evaluate the Performance of VIL and ITS Communication Systems" TS15,p1: Begun in Spring 2008 this project undertakes development of a test bed that allows for testing different inter-vehicle communication protocols. The test bed will provide a tool to evaluate message delay and channel throughput. Additionally, it will facilitate investigation of real-world inter-vehicle communication scenarios with actual vehicles. This is a University of Detroit Mercy research project partnering with the Center for Advanced Research (CAR). This project anticipates completion fall 2008 with the next phase begun thereafter.

In summer 2008 a test bed has been developed to evaluate the performance of the most commonly used protocols, which are the IEEE 802.11b and IEEE 802.11g. The performance of the IEEE 802.11b/g protocols have been evaluated in both indoor and outdoor environments. The results will be summarized in a paper and submitted to a conference on this topic after review by MDOT. Pending completion of an agreement with the Center for Automotive Research (CAR) UDM researchers will participate in CAR's Connected Vehicle Proving Center developers' program. In particular they are planning to use VIILAB that can provide a powerful development tool that allows them to design and simulate different traffic scenarios.

9. "Modeling Metropolitan Detroit Transit" TS14,p1: In response to transit issues in MetroDetroit, WSU and UDM researchers undertook a project to develop a quick response, computer based model that will efficiently analyze and capture the effect of transit vehicular changes (speed, capacity, acceleration, deceleration, etc.) and corridor/station parameters (BRT, LRT, station-spacing, station-length, etc.) upon the operation and cost of the system. The project has two components: model development and model demonstration. The proposed model is intended for planners and engineers for testing the operating and cost implication of changes in parameters in transit vehicles, transit corridors and stations. This project is projected to be completed December 2008.

In the summer of 2008, the researcher team from WSU and UDM has been working on a demand model in consultation with SEMCOG, and has been exploring different avenues of estimating transit demand along the Woodward corridor in the Detroit metro area. Work on system cost analysis is progressing concurrently.

10. "The Woodward Transit Catalyst Project" TS19,p1: With support solely from private sources, the MIOH UTC managed a UDM-DeLoitte team that developed a plan for a light rail system in Detroit. This plan has been further developed and the acquisition of private funding has proceeded during the 4th quarter of FY 2008. Director Hanifin continues to advise the project on a pro bono basis.

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#### FISCAL YEAR 2009 PROPOSED ACTIVITIES

The Michigan Ohio University Transportation Center issued a RFP for FY2008-09. Ten proposals for new and continuing projects have been received. These submittals undergo evaluation by MIOH's Interest Groups, composed of external reviewers and MIOH's Operating Committee for funding in 2008-2009.

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After reviewing the evaluations of Interest Groups, the MIOH UTC Operating Committee selected four continuing projects and two new projects to receive funding in Fiscal 2009. Both new projects are outgrowths of previously funded projects that have or will come to closure by December 2008. In addition to these six research initiatives, two additional projects to be defined by November 2008 will be funded to start January 2009. In the area of K-12 Outreach, the editing of the alternative fuels teaching modules will be completed in fall 2008. Additionally, a teaching module at the university level similar to that being developed for the hydraulic hybrid topic is about to be proposed for a bio-diesel topic.

Following are project titles selected to date for fiscal 2009:

1. "Crash Benefits of SCATS Control System" -- new at UDM.
2. "Management and Analysis of Michigan Intelligent Transportation Systems Center Data with Application to the Detroit Area I-75 Corridor" -- new at GVSU and WSU.
3. "Enabling Congestion Avoidance and Reduction in the Michigan-Ohio Transportation Network to Improve Supply Chain Efficiency: Freight ATIS" SC2, project 4: Continuing at Wayne State University and UDM in cooperation with industry partners, phases of this research will be completed over the next two years.
4. "Improved Oxidative Stability of Biodiesel Fuels: Antioxidant Research and Development" AF4, project 4: Continuing as a Wayne State University project, located in laboratories at NextEnergy, phases of this research are anticipated to continue through 2010.
5. "Improving the Energy Density of Hydraulic Hybrid Vehicles (HHVs) and Evaluating Plug-In HHVs" AF12, project 2: A continuing UDM project in collaboration with UT is proceeding into a second year of research.
6. "New Approach to Enhance and Evaluate the Performance of VII and ITS Communication Systems" TS15, project 2: Continuing as a UDM project in collaboration with CAR is proceeding with a second year of research.

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**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

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**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

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- \*The original authorized total budget amount of the project
  - \*\*The authorized total budget amount as revised, if applicable
  - \*\*\* The project life to date expenditure
  - \*\*\*\*The current fiscal year's original budget amount
  - \*\*\*\*\*The revised fiscal year budget amount, if applicable

# SPR, PART II FUNDED PROGRAM

Contract Research Studies  
(Proposed)

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Rapid Construction Solutions Using Prefabricated Prestressed Concrete Systems - Phase II

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Steve Kahl

CONTRACT/AUTHORIZATION #		PROJECT START DATE	Project Canceled
SPR NUMBER	101718	COMPLETION DATE (Original)	
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Michigan Technological University		
PRINCIPAL INVESTIGATOR	Dr. Tess Ahlborn		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$117,500.00	TOTAL		
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$0.00	SALARIES		
<b>FY 2008 Budget</b>			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$32,500.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$0.00	OTHER		
% PERCENT COMPLETE (By Budget)		0%	PERCENT COMPLETE (By Work)		
					0%

**PURPOSE AND SCOPE**

Prefabricated systems have been successfully used in some states as a method of rapid construction for decreasing construction time and in turn, decreasing traffic delays. This research is intended to assist MDOT in developing a prefabricated superstructure for implementation and to analytically evaluation the selected system. Primary concern rests in the durability of the longitudinal joints which are known to crack, potentially leading to accelerated deterioration. Finite element analysis will determine promising joint configurations for the prefabricated element in combination with a post-tensioned deck.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

On October 28, 2008, it was decided that this projected would be removed from the program due to lack of activity.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Scour Countermeasures for Michigan

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Kristin Schuster

CONTRACT/AUTHORIZATION #		PROJECT START DATE	
SPR NUMBER	101729	COMPLETION DATE (Original)	
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Michigan Technological University		
PRINCIPAL INVESTIGATOR			

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$195,000.00	TOTAL		\$95,000.00
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$0.00	SALARIES		
<b>FY 2008 Budget</b>			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$100,000.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$0.00	OTHER		
% PERCENT COMPLETE (By Budget)		0%	PERCENT COMPLETE (By Work)		0%

**PURPOSE AND SCOPE**

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

No activities to report.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

- \*The original authorized total budget amount of the project
- \*\*The authorized total budget amount as revised, if applicable
- \*\*\* The project life to date expenditure
- \*\*\*\*The current fiscal year's original budget amount
- \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Causes and Solution Strategies for Deck Cracking in Jointless Bridges

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Eric Burns

CONTRACT/AUTHORIZATION #		PROJECT START DATE	
SPR NUMBER	101731	COMPLETION DATE (Original)	
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Michigan Technological University		
PRINCIPAL INVESTIGATOR			

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$170,000.00	TOTAL		
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$0.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$106,000.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$0.00	OTHER		
% PERCENT COMPLETE (By Budget)		0%	PERCENT COMPLETE (By Work)		
					0%

**PURPOSE AND SCOPE**

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

No activities to report.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: High Skew Link Slab Bridge System with Deck Sliding over Backwall or Backwall Sliding over Abutments

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Steve Kahl

CONTRACT/AUTHORIZATION #	2006-0415 / Z3	PROJECT START DATE	10/21/2008
SPR NUMBER	101732	COMPLETION DATE (Original)	9/30/2010
ORBP NUMBER	OR00008	COMPLETION DATE (Revised)	
RESEARCH AGENCY	Western Michigan University		
PRINCIPAL INVESTIGATOR	Dr. Haluk Aktan		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$265,022.63	TOTAL		\$132,296.66
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$0.00	SALARIES		
<b>FY 2008 Budget</b>			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****		EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$0.00	OTHER		
% PERCENT COMPLETE (By Budget)		0%	PERCENT COMPLETE (By Work)		0%

**PURPOSE AND SCOPE**

Performance assessment of skew (>20 deg) link slab deck system with deck sliding over backwall or backwall sliding over abutments by field investigations. Develop analytical models of the bridge system and analyze under intrinsic and live loads. Instrument a bridge and validate finite element results. Fine-tuning of the design assumptions based on field evaluation and analytical investigation results. Instrument and monitor a high skew bridge to evaluate thermal and live load effects.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

No activities to report

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Accomplish the bulk of the state of the art literature review, conduct field inspections, start analytical modeling and identify and plan the instrumentation and testing phase.

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Causes and Cures for Deterioratin of Box-Beam Bridges - Phase II

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Steve Kahl

CONTRACT/AUTHORIZATION #		PROJECT START DATE	Project canceled
SPR NUMBER	101733	COMPLETION DATE (Original)	
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Michigan Technological University		
PRINCIPAL INVESTIGATOR			

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$210,000.00	TOTAL		
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$0.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$105,000.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$0.00	OTHER		
% PERCENT COMPLETE (By Budget)		0%	PERCENT COMPLETE (By Work)		
					0%

**PURPOSE AND SCOPE**

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

No activity to report.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Investigate Causes and Develop Methods for Preventing Falling Concrete from Bridge Decks or Falling Deck Concrete Hazard: Reasons, Detection, and Mitigation

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Rick Smith

CONTRACT/AUTHORIZATION #		PROJECT START DATE	
SPR NUMBER	101734	COMPLETION DATE (Original)	
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Lawrence Technological University/University of Michigan		
PRINCIPAL INVESTIGATOR			

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$280,000.00	TOTAL		\$160,000.00
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$0.00	SALARIES		
<b>FY 2008 Budget</b>			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$120,000.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$0.00	OTHER		
% PERCENT COMPLETE (By Budget)		0%	PERCENT COMPLETE (By Work)		0%

**PURPOSE AND SCOPE**

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

No activity to report.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

- \*The original authorized total budget amount of the project
- \*\*The authorized total budget amount as revised, if applicable
- \*\*\* The project life to date expenditure
- \*\*\*\*The current fiscal year's original budget amount
- \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Reliability-Based Evaluation of Loading Configuration for Long Span Bridges or Reliability-Based Load Configurations for Rating of Long-Span Bridges in Michigan

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Rebecca Curtis

CONTRACT/AUTHORIZATION #		PROJECT START DATE	
SPR NUMBER	101735	COMPLETION DATE (Original)	
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Michigan State University/Michigan Technological University		
PRINCIPAL INVESTIGATOR			

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$120,000.00	TOTAL		\$40,000.00
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$0.00	SALARIES		
<b>FY 2008 Budget</b>			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$80,000.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$0.00	OTHER		
% PERCENT COMPLETE (By Budget)		0%	PERCENT COMPLETE (By Work)		0%

**PURPOSE AND SCOPE**

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

No activity to report.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

RFP from MSU and MTU. Selection and commence work after project authorization.

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
STATEWIDE PLANNING AND RESEARCH (SPR), PART II  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Pavement Management System Pilot for Automated Distress Recognition

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Pat Schafer

CONTRACT/AUTHORIZATION #		PROJECT START DATE	
SPR NUMBER	102031	COMPLETION DATE (Original)	
ORBP NUMBER	OR00038	COMPLETION DATE (Revised)	
RESEARCH AGENCY			
PRINCIPLE INVESTIGATOR			

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$150,000.00	TOTAL		\$75,000.00
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$0.00	SALARIES		
<b>FY 2008 Budget</b>			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$75,000.00	EQUIPMENT	(Non-expandable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$0.00	OTHER		
PERCENT COMPLETE (By Budget)		0%	PERCENT COMPLETE (By Work)		0%

**PURPOSE AND SCOPE**

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

No activity

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Preliminary steps have beginning. Most work and all costs are expected to occur in FY 2009.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Select up to three vendors to perform pilot data collection and automated processing of pavement distress. Background investigation related to the technology will be conducted prior to developing a scope of work.

**JUSTIFICATION(S) FOR REVISION(S) (Date justification(s) for revision(s))**

- \*The original authorized total budget amount of the project
- \*\*The authorized total budget amount as revised, if applicable
- \*\*\* The project life to date expenditure
- \*\*\*\*The current fiscal year's original budget amount
- \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Investigating New Technologies to Detect Dowel Alignment Errors in Jointed Concrete Pavement

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Michael Eacker

CONTRACT/AUTHORIZATION #	N/A	PROJECT START DATE	Project Canceled
SPR NUMBER	102053	COMPLETION DATE (Original)	
ORBP NUMBER	OR00040	COMPLETION DATE (Revised)	
RESEARCH AGENCY	Michigan State University		
PRINCIPAL INVESTIGATOR	Dr. Neeraj Buch		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$7,000.00	TOTAL		\$0.00
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$0.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$7,000.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$0.00	OTHER		
% PERCENT COMPLETE (By Budget)		0%	PERCENT COMPLETE (By Work)		0%

**PURPOSE AND SCOPE**

The overall goal of this project is to evaluate the applicability of Ground Penetrating Radar and MIT-Scan 2 equipment to detect dowel bar alignments in concrete pavements. This would be done in terms of the repeatability, accuracy, and precision of each technology.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

The MDOT Project Manager decided that the time and money proposed by the principal investigator was much more than the benefit received. He also believed that work proposed could be done much cheaper by MDOT personnel. Since the project was not to be started, most of the money allotted to this project was moved to other projects

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

None

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

None

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Assessment of Modified Asphalt Binders

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: John Barak

CONTRACT/AUTHORIZATION #		PROJECT START DATE	Project Canceled
SPR NUMBER	102055	COMPLETION DATE (Original)	
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	TBD		
PRINCIPAL INVESTIGATOR			

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)       2<sup>nd</sup> (Jan 1 – Mar 31)       3<sup>rd</sup> (Apr 1 – Jun 30)       4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$80,000.00	TOTAL		
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$0.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$20,000.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$0.00	OTHER		
% PERCENT COMPLETE (By Budget)		0%	PERCENT COMPLETE (By Work)		
					0%

**PURPOSE AND SCOPE**

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

No activity to report.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Develop a Trial Specification Criteria for Mineral Fines Used in Hot Mix Asphalt for Michigan

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: TBD

CONTRACT/AUTHORIZATION #		PROJECT START DATE	Project Canceled
SPR NUMBER	102057	COMPLETION DATE (Original)	
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Michigan Technological University		
PRINCIPAL INVESTIGATOR			

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$145,000.00	TOTAL		
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$0.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$50,000.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$0.00	OTHER		
% PERCENT COMPLETE (By Budget)		0%	PERCENT COMPLETE (By Work)		
					0%

**PURPOSE AND SCOPE**

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

No activity to report.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Laboratory Evaluation of Warm Mix Asphalt

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: John Barak

CONTRACT/AUTHORIZATION #	2006-0414 Z21	PROJECT START DATE	11/03/2008
SPR NUMBER	102058	COMPLETION DATE (Original)	12/03/2010
ORBP NUMBER	OR00005	COMPLETION DATE (Revised)	
RESEARCH AGENCY	Michigan Technological University		
PRINCIPAL INVESTIGATOR	Dr. Zhanping You		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$190,001.08	TOTAL	\$55,419.00	
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$0.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****		EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$0.00	OTHER		
% PERCENT COMPLETE (By Budget)		0%	PERCENT COMPLETE (By Work)	0%	

**PURPOSE AND SCOPE**

To evaluate warm mix asphalt for highway pavements.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

No activity to report.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Project to start in FY 2009

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: A New Generation of High-Performance JPCP for Michigan High-Volume Truck Routes Such as I-75 and I-94

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Michael Eacker

CONTRACT/AUTHORIZATION #	N/A	PROJECT START DATE	N/A
SPR NUMBER	102077	COMPLETION DATE (Original)	
ORBP NUMBER	R00012	COMPLETION DATE (Revised)	
RESEARCH AGENCY	University of Michigan		
PRINCIPAL INVESTIGATOR	Dr. Will Hansen		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$300,000.00	TOTAL		\$150,000.00
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$0.00	SALARIES		
<b>FY 2008 Budget</b>			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$150,000.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$0.00	OTHER		
% PERCENT COMPLETE (By Budget)		0%	PERCENT COMPLETE (By Work)		0%

**PURPOSE AND SCOPE**

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Project has not started yet. Researcher has not submitted a work plan to the project manager.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Decide whether or not to proceed with this project. Will need to go through RFP process if it is to proceed.

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Backcalculation of Resilient Modulus Values for Unbound Pavement Materials

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Michael Eacker

CONTRACT/AUTHORIZATION #	2006-0411 / Z15	PROJECT START DATE	11/19/2008
SPR NUMBER	102079	COMPLETION DATE (Original)	09/30/2010
ORBP NUMBER	R00013	COMPLETION DATE (Revised)	
RESEARCH AGENCY	Michigan State University		
PRINCIPAL INVESTIGATOR	Dr. Gilbert Baladi		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$157,746.00	TOTAL		\$77,508.00
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$0.00	SALARIES		
<b>FY 2008 Budget</b>			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$0.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$0.00	OTHER		
% PERCENT COMPLETE (By Budget)		0%	PERCENT COMPLETE (By Work)		0%

**PURPOSE AND SCOPE**

Resilient modulus is a critical input for almost any pavement design method. It is an input in MDOT's current design method, AASHTO 1993, and is even more prevalent in the latest pavement design methodology, Mechanistic-Empirical (M-E), which is under consideration by MDOT. This project will utilize Falling Weight Deflectometer tests to backcalculate the resilient modulus values for common base and sub-base materials used under our pavements. Some laboratory testing will also be utilized for correlation information.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

N/A

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

No activity to report.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Gather information. Commence backcalculation of Layer Moduli. Commence resilient modulus design values.

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Investigation of Pavement Distress Due to Logging Trucks in the Superior Region

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Curtis Bleech

CONTRACT/AUTHORIZATION #		PROJECT START DATE	Project Canceled
SPR NUMBER	102084	COMPLETION DATE (Original)	
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	TBD		
PRINCIPAL INVESTIGATOR			

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$180,000.00	TOTAL		
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$0.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$90,000.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$0.00	OTHER		
% PERCENT COMPLETE (By Budget)		0%	PERCENT COMPLETE (By Work)		
					0%

**PURPOSE AND SCOPE**

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

No activity to report.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Major Factors Controlling Dowel Bar Looseness in JPCP

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Dave Smiley

CONTRACT/AUTHORIZATION #		PROJECT START DATE	
SPR NUMBER	102085	COMPLETION DATE (Original)	
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	University of Michigan		
PRINCIPAL INVESTIGATOR			

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$267,914.09	TOTAL		\$106,096.97
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$0.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$54,583.80	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$0.00	OTHER		
% PERCENT COMPLETE (By Budget)		0%	PERCENT COMPLETE (By Work)		0%

**PURPOSE AND SCOPE**

Conduct a comprehensive performance evaluation of JPCP used as an overlay for severely distress concrete and flexible pavements. The primary study objectives are: (1) Conduct a 5-year review (written report) of the Overlay Demonstration project on I-75, near west branch, which has unique design features. (2) Investigate other overlay projects to compare results with I-75 to judge which features are superior in extending service life cost-effectively. (3) From modeling and data analysis from (1) and (2), develop new or modified overlay designs that can prevent premature distress formation cost-effectively. (4) Determine any preventive actions (design or construction) for projects with premature distress to nullify their adverse performance effects for future projects.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Project should start in FY 2009.

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Guidelines for Applying Traffic Microsimulation Modeling

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: Sue Gorski

CONTRACT/AUTHORIZATION #		PROJECT START DATE	
SPR NUMBER	102104	COMPLETION DATE (Original)	
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY			
PRINCIPAL INVESTIGATOR			

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$300,000.00	TOTAL		
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$0.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$150,000.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$0.00	OTHER		
% PERCENT COMPLETE (By Budget)		0%	PERCENT COMPLETE (By Work)		0%

**PURPOSE AND SCOPE**

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

No Activity in FY 2008

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Before and After Analysis-Affect of All Red Phase at Signalized Intersections on State Trunkline Roadways

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_ %)  OTHER (\_\_\_ %)

PROJECT MANAGER: Paula Corlett

CONTRACT/AUTHORIZATION #		PROJECT START DATE	
SPR NUMBER	104849	COMPLETION DATE (Original)	
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY			
PRINCIPAL INVESTIGATOR			

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$150,000.00	TOTAL		
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$0.00	SALARIES		
<b>FY 2008 Budget</b>			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****		EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$0.00	OTHER		
% PERCENT COMPLETE (By Budget)		0%	PERCENT COMPLETE (By Work)		
					0%

**PURPOSE AND SCOPE**

In April 2006, MDOT completed the installation of all red phases to all signalized intersections under the state's jurisdiction. An all red phase is thought to reduce the incidence of crashes at signalized intersections by providing a time per red light runners could safely transverse an intersection. This project will study the impact of the all red phase or patterns at signalized intersections.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Proposed project.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: A Study of Port and Waterways: Their Integration into the Rail and Highway Networks of Michigan

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

PROJECT MANAGER: TBD

CONTRACT/AUTHORIZATION #		PROJECT START DATE	
SPR NUMBER	104852	COMPLETION DATE (Original)	
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Michigan Technological University		
PRINCIPAL INVESTIGATOR	Ralph Hodek		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$55,000.00	TOTAL		
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$0.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****		EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$0.00	OTHER		
% PERCENT COMPLETE (By Budget)		0%	PERCENT COMPLETE (By Work)		
					0%

**PURPOSE AND SCOPE**

Michigan Ports have closed and Michigan's rail lines are becoming fewer. This leaves only the high-cost highway transportation available for Michigan's bulk transport needs. In order to better serve Michigan's manufacturing, mining, logging, and agricultural industries, its ports and waterways must again become an integrated part of the Michigan transportation system, composed of an integrated water, rail and highway-based system.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Proposed project.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

\*The original authorized total budget amount of the project  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
MDOT RESEARCH PROJECT REPORT FORM  
FISCAL YEARS 2008-2009**

PROJECT TITLE: Our Aging Population and Its Impact on Michigan Transit

FUNDING SOURCE:  SPR, Part II (80 %)  FHWA (\_\_\_ %)  MFUNDS (20 %)  NCHRP (\_\_\_ %)  OTHER (\_\_\_ %)

PROJECT MANAGER: TBD

CONTRACT/AUTHORIZATION #		PROJECT START DATE	
SPR NUMBER	104853	COMPLETION DATE (Original)	
ORBP NUMBER		COMPLETION DATE (Revised)	
RESEARCH AGENCY	Michigan Technological University		
PRINCIPAL INVESTIGATOR	William Sproule		

**FY 2008 QUARTER**

1<sup>st</sup> (Oct 1 – Dec 31)  2<sup>nd</sup> (Jan 1 – Mar 31)  3<sup>rd</sup> (Apr 1 – Jun 30)  4<sup>th</sup> (July 1 – Sept 30)

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$60,000.00	TOTAL		
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$0.00	SALARIES		
<b>FY 2008 Budget</b>			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****		EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$0.00	OTHER		
% PERCENT COMPLETE (By Budget)		0%	PERCENT COMPLETE (By Work)		
					0%

**PURPOSE AND SCOPE**

Michigan's population is getting older and is living longer. This will not only present challenges for our highways, but also for our transit systems as residents want to retain their mobility. Are our transit systems ready for an expected greater usage by older passengers?

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Proposed project, no activity to report.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of the project)**

- \*The original authorized total budget amount of the project
- \*\*The authorized total budget amount as revised, if applicable
- \*\*\* The project life to date expenditure
- \*\*\*\*The current fiscal year's original budget amount
- \*\*\*\*\*The revised fiscal year budget amount, if applicable

# SPR, PART II FUNDED PROGRAM

Pooled Fund Studies

**OFFICE OF RESEARCH and BEST PRACTICES  
TRANSPORTATION POOLED FUND STUDY  
ANNUAL REPORT  
FISCAL YEAR 2008**

STUDY TITLE: Evaluation of CTCLS Series Traffic Signal Load Switches in Field, Bulb Life Determinations and Development of a Group Relamping Model.

FUNDING SOURCE:  SPR, Part II (100%)  FHWA (\_\_\_\_ %)  MFUNDS(\_\_\_\_ %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

TECHNICAL CONTACT: Homer Suter

TPF #	SPR-3(068)	MDOT START DATE	10/01/1998
JOB NUMBER	102035	MDOT COMPLETION DATE (Original)	09/30/2000
ORBP NUMBER		COMPLETION DATE (Revised)	09/30/2008
LEAD AGENCY	Ohio DOT		
PROJECT MANAGER	Andre' D. Clover, P.E.		
CONTRACTOR	Ohio University, Monique Evans		

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$120,000.00	TOTAL	N/A	
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$120,000.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$40,000.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$40,000.00	OTHER		
PERCENT COMPLETE (By Budget)		100%	PERCENT COMPLETE (By Work)	100%	

**PARTICIPATING STATES**

ABBREVIATE THE PARTICIPATING STATES. IF MDOT IS THE LEAD AGENCY, ALSO LIST THE CONTRIBUTION PERCENTAGE PER STATE.

(\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %),

**PURPOSE AND SCOPE**

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

This TPF project was originally approved by MDOT and FHWA- Michigan Division using SPR- II funds in FY1999 and FY2000. The original Michigan commitment level was \$56,497 for each fiscal year.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

None.

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

To fulfill MDOT SPR- II funding commitment .

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of participation)**

Unknown.

\*The original authorized total budget amount of the study  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
TRANSPORTATION POOLED FUND STUDY  
ANNUAL REPORT  
FISCAL YEAR 2008**

STUDY TITLE: Midwest Pavement Preservation Partnership (MPPP) TPF-5(112)

FUNDING SOURCE:  SPR, Part II (100%)  FHWA (\_\_\_\_ %)  MFUNDS(\_\_\_\_ %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

TECHNICAL CONTACT: Larry Galehouse

TPF #	TPF-5(112)	MDOT START DATE	08/24/2005
JOB NUMBER	85665	MDOT COMPLETION DATE (Original)	08/24/2008
ORBP NUMBER		COMPLETION DATE (Revised)	09/30/2008
LEAD AGENCY	Michigan		
PROJECT MANAGER	Kevin Kennedy		
CONTRACTOR	Michigan State University/National Center for Pavement Preservation		

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$25,000.00	TOTAL		N/A
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$25,000.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$12,475.51	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$12,475.51	OTHER		
PERCENT COMPLETE (By Budget)		100%	PERCENT COMPLETE (By Work)		100%

**PARTICIPATING STATES**

ABBREVIATE THE PARTICIPATING STATES. IF MDOT IS THE LEAD AGENCY, ALSO LIST THE CONTRIBUTION PERCENTAGE PER STATE.

IA (7.00 %), IL (7.00 %), IN (19.50 %), KS (7.00 %), MI (10.500 %), MN (7.00 %), MO (7.00 %),  
MT (7.00 %), ND (7.00 %), OH (7.00 %), WI (7.00 %), MB (7.00 %),

**PURPOSE AND SCOPE**

Provide an ongoing regional forum for State Pavement Preservation practitioners by sharing and exchanging improvements in research, design, specifications and materials at an annual meeting. Assure participation and collaboration among the states annual workshop. Implement task operations, as designated by the MPPP's Steering committee and manage the operations of the MPPP including an annual meeting, reporting and developing and maintaining an informational web-site.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Promoted the MPPP at various venues and locations nationwide. Updated the partnership web page as directed by the MPPP Board of Directors. Held the Annual meeting in Missoula, Montana in October 2007.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Promoted the MPPP at various venues throughout the regional. Finalized meeting minutes and accounting for October 2007 meeting. Corresponded with various Directors to identify Minneapolis, Minnesota meeting information. Formalized September 2008 meeting logistics. Developed 2008 meeting brochure. Notified MPPP members of 2008 meeting. Facilitated the 2008 Annual Meeting in Minneapolis, MN in September 2008. Took Meeting minutes and posted minutes and presentations on web site. Arrange and accounted for all State travel. Accounting and Web Page updates.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of participation)**

\*The original authorized total budget amount of the study

**OFFICE OF RESEARCH & BEST PRACTICES  
TRANSPORTATION POOLED FUND STUDY  
ANNUAL REPORT  
FISCAL YEAR 2008**

STUDY TITLE: Base Funding for North Central SuperPave Center TPF-5(021)

FUNDING SOURCE:  SPR, Part II (100%)  FHWA (\_\_\_\_ %)  MFUNDS(\_\_\_\_ %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

TECHNICAL CONTACT: Tommy Nantung, 765-463-1521 ext 248

TPF #	TPF-5(021)	MDOT START DATE	10/1/2005
JOB NUMBER	86737	MDOT COMPLETION DATE (Original)	09/30/2009
ORBP NUMBER		COMPLETION DATE (Revised)	
LEAD AGENCY	Indiana Department of Transportation		
PROJECT MANAGER	John Barak		
CONTRACTOR			

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$125,000.00	TOTAL		\$25,000.00
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$75,000.00	SALARIES		
<b>FY 2008 Budget</b>			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$50,000.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$50,000.00	OTHER		
PERCENT COMPLETE (By Budget)		60%	PERCENT COMPLETE (By Work)		60%

**PARTICIPATING STATES**

ABBREVIATE THE PARTICIPATING STATES. IF MDOT IS THE LEAD AGENCY, ALSO LIST THE CONTRIBUTION PERCENTAGE PER STATE.

(\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %)

**PURPOSE AND SCOPE**

This pooled fund project will provide for continued operation of the North Central Superpave Center to assist agencies and industry with Superpave implementation and hot mix asphalt issues. Contract Amount is \$125,000. The commitment received is \$800,000.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Meeting of the planning committee, AMRL certification of the laboratory used for superpave research work. Development of web-site.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

continued work in the above areas as well as interaction with other superpave centers and transportation agencies.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of participation)**

Work will continue on marketing research findings. The areas of RAP, Binder studies, Hot mix design and pavement noise , as well as on going contacts with Aggregate research activities and Long term pavement performance activities.

\*The original authorized total budget amount of the study  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH & BEST PRACTICES  
TRANSPORTATION POOLED FUND STUDY  
ANNUAL REPORT  
FISCAL YEAR 2008**

STUDY TITLE: Recycled Unbound Pavement Materials (MNROAD Study) (National Pooled Fund project) TPF-5(129)

FUNDING SOURCE:  SPR, Part II (100%)  FHWA (\_\_\_\_ %)  MFUNDS(\_\_\_\_ %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

TECHNICAL CONTACT: Ben Worel, ben.worel@dot.state.mn.us

TPF #	TPF-5(129)	MDOT START DATE	05/01/2007
JOB NUMBER	88921	MDOT COMPLETION DATE (Original)	05/01/2012
ORBP NUMBER		COMPLETION DATE (Revised)	
LEAD AGENCY	Minnesota DOT		
PROJECT MANAGER	Mike Eacker		
CONTRACTOR	Craig Benson, University of Wisconsin/RMRC		

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$75,000.00	TOTAL		\$20,000.00
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$30,000.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$15,000.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$15,000.00	OTHER		
PERCENT COMPLETE (By Budget)		40%	PERCENT COMPLETE (By Work)		40%

**PARTICIPATING STATES**

ABBREVIATE THE PARTICIPATING STATES. IF MDOT IS THE LEAD AGENCY, ALSO LIST THE CONTRIBUTION PERCENTAGE PER STATE.

(\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %)

**PURPOSE AND SCOPE**

The purpose of this project is to study the use of recycled materials (concrete and asphalt) as unbound base for a common pavement. Three test sections will be built at the MNRoad facilities utilizing recycled materials, along with a control section which will contain a standard non-recycled material. Performance as well as material properties are to be studied.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Initial meetings of the participating states were held to determine the scope of work for a researcher to be chosen to do the analysis. A researcher from the Univ. of Wisconsin was chosen and negotiations on scope and contract amount are underway.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Get researcher under contract, construction of the test sections will occur and data gathering will begin, researcher to begin execution under his scope of work.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of participation)**

\*The original authorized total budget amount of the study  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
TRANSPORTATION POOLED FUND STUDY  
ANNUAL REPORT  
FISCAL YEAR 2008**

STUDY TITLE: Clear Roads Pooled Fund Study TPF-5(092)

FUNDING SOURCE:  SPR, Part II (100%)  FHWA (\_\_\_\_ %)  MFUNDS(\_\_\_\_ %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

TECHNICAL CONTACT: Mike Sproul (michael.sproul@dot.state.wi.us)

TPF #	TPF-5(092)	MDOT START DATE	10/01/2006
JOB NUMBER	102032	MDOT COMPLETION DATE (Original)	9/30/2010
ORBP NUMBER		COMPLETION DATE (Revised)	
LEAD AGENCY	Wisconsin DOT		
PROJECT MANAGER	Tim Croze		
CONTRACTOR	CTC and Associates		

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$100,000.00	TOTAL		\$25,000.00
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$50,000.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$25,000.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$25,000.00	OTHER		
PERCENT COMPLETE (By Budget)		50%	PERCENT COMPLETE (By Work)		50%

**PARTICIPATING STATES**

ABBREVIATE THE PARTICIPATING STATES. IF MDOT IS THE LEAD AGENCY, ALSO LIST THE CONTRIBUTION PERCENTAGE PER STATE.

(WI %), (MN %), (OH %), (IN %), (NY %), (MA %), (CO %),

**PURPOSE AND SCOPE**

The Clear Roads pooled fund project (#TPF-5(092)) began in early 2004 in response to a need for real-world testing in the field of winter highway operations.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Work was performed on the following two projects throughout the fiscal year. Both projects will be completed during the 2008 fiscal year.

**"Calibration Accuracy of Manual and Ground Speed Spreaders"**

The objective of this study is to document controller settings, actual salt usage and prewetting rat information from trucks with various types of controller units during winter storm events. The results will include guidelines to help snowplow operators establish and maintain accurate calibration of ground speed controllers. Expected benefits: This project has the potential to save DOTs hundreds of thousands of dollars per year in material use. Yard testing already completed on this project indicates a tremendous need for improved calibration.

**"Determining the Effectiveness of Deicing Materials and procedures"**

In progress with an expected completion date of August 2008. The objective of this study is to develop field testing procedures and guidelines for determining the effectiveness of various winter chemicals at various application rates. Expected benefits: This study will result in a portable testing tool that DOTs can use to determine the effectiveness of various chemical under a range of winter conditions. The test method will help DOTs select the most effective chemical available for the lowest cost.

Also, RFPs were issued for two projects and contracts were awarded to vendors. These projects will both be started in October of 2007. (See proposed activities for more information).

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Work continued this year on the following Clear Roads research projects:

**Calibration Accuracy of Manual and Ground-Speed-Controlled Spreaders**

Expected results: Guidelines to help snow plow operators establish and maintain accurate calibration of ground speed controllers, resulting in reduced salt usage and improved efficiency.

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Expected completion date: September 2008

**Determining Effectiveness of Deicing Materials and Procedures**

Expected results: A portable test method for determining the effectiveness of deicers in a variety of locations under a variety of winter conditions.

**Standardized Test Procedures for Carbide Insert Snowplow Blade Wear**

Expected results: Testing procedures for use by an independent testing laboratory to determine life expectancy of any carbide insert snowplow blade.

Expected completion date: July 2009

**Standardized Test Procedures for Evaluating Deicing Chemicals**

Expected results: A standard set of performance tests for deicing chemicals, additives and mixtures to help agencies anticipate how products may work in their specific environment.

Expected completion date: April 2009

In the past year Clear Roads partnered with other pooled fund studies and winter maintenance organizations to perform several studies. A short description of each study is below:

**National Winter Maintenance Peer Exchange**

In collaboration with Aurora, SICOP, FHWA, and PNS, Clear Roads helped plan a national winter maintenance peer exchange conference dedicated to information sharing and research coordination among winter maintenance professionals. The conference took place in Columbus, Ohio on August 28 and 29, 2007. Thirty-five states plus Washington D.C. attended. Work continues on the 70 research problem statements developed.

**National Winter Safety Campaign (Ice and Snow ... Take It Slow)**

Clear Roads initiated a national multimedia campaign designed to educate drivers about the importance of driving safely in winter conditions.

**Computer-Based Training**

Clear Roads supports the efforts of the Snow and Ice Pooled Fund Cooperative Program in developing additional computer-based training modules related to winter maintenance. Proper Plowing Techniques, Mitigating Blowing Snow and Deicing Chemicals were all released within the last year. Snow and Ice Management should be available by the end of 2008.

**Snowplow Design**

Clear Roads is working with the Winter Concept Vehicle Pooled Fund to conduct research on optimum snowplow design.

A technical advisory committee meeting was held in Madison, WI in July where responses to 2 RFP's were reviewed. The TAC picked contractors to start work on these research projects during the winter of 2008-2009.

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**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

The following are new projects that will be funded this fiscal year with Clear Roads funds.

**Interface Specifications for Mobile Data Platforms on DOT Vehicles**

Expected results: Communication and data format specifications to support a "plug and play" approach to integrating sensors and other devices used on winter maintenance vehicles.

Expected completion date: August 2009

**Cost/Benefit Analysis Toolkit**

Expected results: A toolkit and methodology for conducting a cost-benefit analysis of specific winter maintenance practices, equipment and operations.

Expected completion date: February 2010

**Developing and Evaluating Safe Winter Driving Messages**

Expected results: Recommendations for how to influence the winter driving behavior of high-risk drivers based on a pilot media campaign and evaluation.

Expected completion date: August 2009

We anticipate that all projects funded in FY2008 will be completed in FY2009.

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**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

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**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of participation)**

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\*The original authorized total budget amount of the study

**OFFICE OF RESEARCH and BEST PRACTICES  
TRANSPORTATION POOLED FUND STUDY  
ANNUAL REPORT  
FISCAL YEAR 2008**

STUDY TITLE: Technology Transfer Concrete Consortium (TTCC)

FUNDING SOURCE:  SPR, Part II (100%)  FHWA (\_\_\_\_ %)  MFUNDS(\_\_\_\_ %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

TECHNICAL CONTACT: Todd Hanson

TPF #	TPF-5(159)	MDOT START DATE	10/01/2008
JOB NUMBER	102034	MDOT COMPLETION DATE (Original)	9/30/2012
ORBP NUMBER		COMPLETION DATE (Revised)	
LEAD AGENCY	Iowa Department of Transportation		
PROJECT MANAGER	Sandra Larson		
CONTRACTOR	National Concrete Pavement Technology Center (CP Tech Center), Iowa State University.		

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$29,000.00	TOTAL		\$7,000.00
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$7,000.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$7,000.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$7,000.00	OTHER		\$7,000.00
PERCENT COMPLETE (By Budget)		20%	PERCENT COMPLETE (By Work)		20%

**PARTICIPATING STATES**

ABBREVIATE THE PARTICIPATING STATES. IF MDOT IS THE LEAD AGENCY, ALSO LIST THE CONTRIBUTION PERCENTAGE PER STATE.

(\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %)

**PURPOSE AND SCOPE**

The purpose of this pooled fund project is to identify, support, facilitate and fund concrete research and technology transfer initiatives.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

The participants have coordinated their meetings with the National Concrete Consortium (NCC) in order to participate in the technical exchange of concrete pavement expertise and information on research, innovations, problems and solutions. This exchange has coalesced into a diverse consortium of concrete pavement experts from state DOTs, FHWA, academia, and industry that have shared and evaluated the research results from the successful MCO research project and other ongoing research projects.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

The spring 2008 meeting of the NCC was held in Baton Rouge, Louisiana. The theme for this meeting was Sustainability in Concrete Construction. Approximately 90 experts attended this meeting from government, industry, and academia. The fall 2008 meeting was held in Minneapolis, Minnesota. The theme for this meeting was showcased around MnRoad and its accomplishments relative to concrete paving. Approximately 80 experts attended this meeting.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

The spring 2009 meeting is planned to be held in San Antonio, Texas. The theme for this meeting will be bridge and pavement joints.

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

No revisions, to date.

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of participation)**

This consortium is the national forum for state involvement in the technical exchange needed for collaboration and new initiatives, and be part of the CP Road Map Mix Design and Analysis Track team. The dynamic nature of this group provides continual technology transfer on a variety of topics that are important to the concrete construction community.

\*The original authorized total budget amount of the study

**OFFICE OF RESEARCH and BEST PRACTICES  
TRANSPORTATION POOLED FUND STUDY  
ANNUAL REPORT  
FISCAL YEAR 2008**

STUDY TITLE: Long Term Maintenance of Load and Resistance Factors Design Specs

FUNDING SOURCE:  SPR, Part II (100%)  FHWA (\_\_\_\_ %)  MFUNDS(\_\_\_\_ %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

TECHNICAL CONTACT:

TPF #	TPF5-(068)	MDOT START DATE	10/01/2002
JOB NUMBER	102035	MDOT COMPLETION DATE (Original)	09/30/2006
ORBP NUMBER		COMPLETION DATE (Revised)	09/30/2010
LEAD AGENCY	Iowa DOT		
PROJECT MANAGER	Roger Till		
CONTRACTOR	Modjeski and Masters, Inc		

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$120,000.00	TOTAL		N/A
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$100,000.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$20,000.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$20,000.00	OTHER		
PERCENT COMPLETE (By Budget)		80%	PERCENT COMPLETE (By Work)		80%

**PARTICIPATING STATES**

ABBREVIATE THE PARTICIPATING STATES. IF MDOT IS THE LEAD AGENCY, ALSO LIST THE CONTRIBUTION PERCENTAGE PER STATE.

(\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %),

**PURPOSE AND SCOPE**

Long Term Maintenance of LRFD Specifications for Highway Bridge Design. Forty Eight (48) DOTs are participating in this TPF with a total commitment of funding \$2,260,000. The current contract is funded at \$980,000. Support in FY's 2003, 2005, 2008, and 2010.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Maintenance of Specifications as requested by AASHTO's Bridges and Structures Subcommittee

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Maintenance of Specifications as requested by AASHTO's Bridges and Structures Subcommittee

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of participation)**

Changes in the specifications are incorporated as a guide specifications and later on are made part of the LRFD Specifications based on the approval and voting by the State Bridge Engineers at their annual meetings.

\*The original authorized total budget amount of the study  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH & BEST PRACTICES  
TRANSPORTATION POOLED FUND STUDY  
ANNUAL REPORT  
FISCAL YEAR 2008**

STUDY TITLE: Aurora Pooled Fund Project SPR-3(042)

FUNDING SOURCE:  SPR, Part II (100%)  FHWA (\_\_\_\_ %)  MFUNDS(\_\_\_\_ %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

TECHNICAL CONTACT: Carol Culver, 515-239-1208

TPF #	SPR-3(042)	MDOT START DATE	10/01/2007
JOB NUMBER	102036	MDOT COMPLETION DATE (Original)	09/30/2010
ORBP NUMBER		COMPLETION DATE (Revised)	
LEAD AGENCY	Iowa Department of Transportation		
PROJECT MANAGER	Dawn Gustafson		
CONTRACTOR			

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$75,000.00	TOTAL		\$25,000.00
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$25,000.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$25,000.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$25,000.00	OTHER		
PERCENT COMPLETE (By Budget)		25%	PERCENT COMPLETE (By Work)		25%

**PARTICIPATING STATES**

ABBREVIATE THE PARTICIPATING STATES. IF MDOT IS THE LEAD AGENCY, ALSO LIST THE CONTRIBUTION PERCENTAGE PER STATE.

(\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %)

**PURPOSE AND SCOPE**

Aurora is an international program collaborative research, development and deployment in the field of road and weather information systems (RWIS). Commitment of funds received is \$2,722,500.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Study is on going and will continue for the foreseeable future.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Study is on going and will continue for the foreseeable future.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Studies will be on going in the areas of RWIS.

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of participation)**

Regional demonstration of RWIS concepts to support FHWA' goals of Safety, Mobility and Operations.

\*The original authorized total budget amount of the study  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
TRANSPORTATION POOLED FUND STUDY  
ANNUAL REPORT  
FISCAL YEAR 2008**

STUDY TITLE: NCHRP for FY 2008

FUNDING SOURCE:  SPR, Part II (100%)  FHWA (\_\_\_\_ %)  MFUNDS(\_\_\_\_ %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

TECHNICAL CONTACT: Mr. W. Zaccagnino USDOT/FHWA

TPF #	TPF-5(408)	MDOT START DATE	10/01/2007
JOB NUMBER	102039	MDOT COMPLETION DATE (Original)	09/30/2008
ORBP NUMBER		COMPLETION DATE (Revised)	
LEAD AGENCY	FHWA/Transportation Research Board (TRB)		
PROJECT MANAGER	Mr. Calvin Roberts		
CONTRACTOR			

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$1,000,000.00	TOTAL		N/A
	(Revised)**	\$1,064,856.00			
EXPENDED FUNDS TO DATE***		\$1,064,856.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$1,000,000.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****	\$1,064,856.00	TRAVEL		
FY EXPENDITURE		\$1,064,856.00	OTHER		
PERCENT COMPLETE (By Budget)		100%	PERCENT COMPLETE (By Work)		100%

**PARTICIPATING STATES**

ABBREVIATE THE PARTICIPATING STATES. IF MDOT IS THE LEAD AGENCY, ALSO LIST THE CONTRIBUTION PERCENTAGE PER STATE.

(\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %),

**PURPOSE AND SCOPE**

A fund source to conduct research in acute problem areas that affect highway planning, design, construction, operation, and maintenance nationwide.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

To pay in full invoice receipt.

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of participation)**

Research findings are published in the NCHRP Reports series and the NCHRP Synthesis of Highway Practices series.

\*The original authorized total budget amount of the study  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
TRANSPORTATION POOLED FUND STUDY  
ANNUAL REPORT  
FISCAL YEAR 2008**

STUDY TITLE: National Transportation Asset Management Research Program

FUNDING SOURCE:  SPR, Part II (100%)  FHWA (\_\_\_\_ %)  MFUNDS(\_\_\_\_ %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

TECHNICAL CONTACT: Jason Bittner, WTC

TPF #	TPF-5(036)	MDOT START DATE	10/01/2007
JOB NUMBER	102509	MDOT COMPLETION DATE (Original)	09/30/2008
ORBP NUMBER		COMPLETION DATE (Revised)	
LEAD AGENCY	Wisconsin DOT		
PROJECT MANAGER	Jon Reincke		
CONTRACTOR	Wisconsin Transportation Center		

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$100,000.00	TOTAL		N/A
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$100,000.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$7,200.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$7,200.00	OTHER		
PERCENT COMPLETE (By Budget)		100%	PERCENT COMPLETE (By Work)		100%

**PARTICIPATING STATES**

ABBREVIATE THE PARTICIPATING STATES. IF MDOT IS THE LEAD AGENCY, ALSO LIST THE CONTRIBUTION PERCENTAGE PER STATE.

(\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %),

**PURPOSE AND SCOPE**

The SPR fund contribution of \$7200 to the existing pooled fund study allowed two MDOT representatives to attend the Maintenance Quality Assurance Peer Exchange and the National Workshop on Highway Asset Inventory and Data Collection. The peer exchange and workshop were held in Durham, North Carolina, from September 23-26, 2008.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

N/A

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

MDOT representatives participated with 33 other states in these sessions. A portion of the funds were used to update the existing MQA document library, prepare an MQA glossary, update the synthesis of commonly used standards and measures, and to produce the final proceedings and subsequent findings documents.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

N/A

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

N/A

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of participation)**

We will be receiving some very excellent documents and resource materials from the Peer Exchange. They will be integrated into our statewide best practices/QA initiative, including development and refinement of our outcome based performance measures.

\*The original authorized total budget amount of the study

\*\*The authorized total budget amount as revised, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
TRANSPORTATION POOLED FUND STUDY  
ANNUAL REPORT  
FISCAL YEAR 2008**

STUDY TITLE: Transportation Library Connectivity Pooled Fund Study

FUNDING SOURCE:  SPR, Part II (100%)  FHWA (\_\_\_\_ %)  MFUNDS(\_\_\_\_ %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

TECHNICAL CONTACT: Ann Pahnke, Lead State Chairperson, Wisconsin Department of Transportation and Maggie Sacco - Library Services Consultant - CTC and Associates LLC

TPF #	TPF-5(105)	MDOT START DATE	10/01/2007
JOB NUMBER	103162	MDOT COMPLETION DATE (Original)	09/30/2009
ORBP NUMBER		COMPLETION DATE (Revised)	
LEAD AGENCY			
PROJECT MANAGER	Alexandra Briseno		
CONTRACTOR	N/A		

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$10,000.00	TOTAL		\$5,000.00
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$5,000.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$5,000.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$5,000.00	OTHER		
PERCENT COMPLETE (By Budget)		50%	PERCENT COMPLETE (By Work)		50%

**PARTICIPATING STATES**

AZ, CT, CA, ID, IA, KA, LA, MI, MN, MS, MO, MT, NY, OH, OR, PA, TN, WA, WI, Univ. of WI, Univ. of MN, Los Angeles County Transit Authority  
(\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %),

**PURPOSE AND SCOPE**

The Transportation Library Connectivity Pooled Fund Study was instrumental in improving access to transportation information and building awareness of the importance of library services and Transportation Knowledge Networks.

Through the work of the pooled fund members, both individually and collectively, and the work of the pooled fund consultants, there has been much progress:

- Increased cooperation among member libraries in the collection, cataloguing and sharing of transportation resources.
- Widening participation by state DOT libraries in the Online Computer Library Center and the Transportation Libraries Catalog.
- A growing awareness among state DOT managers of the value of transportation libraries and information services to safety, planning, design, construction, operations and maintenance functions as well as to research.
- Momentum toward the formation of additional regional Transportation Knowledge Networks.
- Increased awareness of and participation in the activities of the National Transportation Library, regional Transportation Knowledge Networks and NCHRP project 20-75 on implementing TKNs.
- Creation of a task group on TKNs within the AASHTO Research Advisory Committee, which will provide a forum for ongoing dialogue between the transportation library/information community and state DOT research managers.
- Creation of the Transportation Librarian's Toolkit, a vital education and training tool that will be of immediate value to transportation librarians and other information professionals and managers.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Did not participate in FY 2007

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

TAC members worked closely with the pooled fund consultant to arrive at the following objectives for 2008. They are aimed at helping members raise the level of service they provide to their DOT customers and at communicating more effectively to top management how valuable these services are.

1. Technical guidance and support to members, focused on the smaller libraries that are served by only one librarian. Support activities will include such things as site visits, advice on cataloguing, inter-library loan procedures, on-line catalogues and library

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Web site presence (Internet and Intranet).

2. Teleconferences of pooled fund members to enable sharing of best practices and new ideas.
3. Promotion of the value and importance of transportation library and information services to top-level transportation administrators throughout the country through targeted activities, such as:
  - Feature articles that vividly tell the stories of library and information professionals helping agencies save time, money and lives.
  - Presentations to gatherings of top-level DOT administrators, such as meetings of AASHTO committees (Highways, Planning, Environment, Highway Traffic Safety).
  - A session for the TRB 2009 Annual Meeting that features top-level transportation administrators pointing to the value of their libraries in critical endeavors at the heart of their agencies' missions.
4. Workshops for librarians on the value of the Transportation Librarian's Toolkit, emphasizing how it can be used with top-level administrators to demonstrate the range and value of library and information services.
5. Annual meeting and workshop on strategic planning to help member states identify and communicate the value of library and information services to their internal customers and top management.
6. A project Web site as a one-stop shop for pooled fund resources and business, including the tracking and reporting of relevant state, regional and national efforts.
7. Support of members in their efforts to form and grow regional Transportation Knowledge Networks.
8. Collaboration with the National Transportation Library, the new AASHTO RAC Task Group on TKNs and others, including retired transportation librarians, to enhance communication between transportation librarians and the transportation research community and to build broader support for and funding of a national network of transportation libraries among top-level transportation administrators at the state and federal level.
9. Facilitation of payment of OCLC and TLCat subscriptions for eligible pooled fund members.
10. Implementation of focused research and technology projects, as proposed by members, on specific topics, such as: promotion of the value and importance of transportation library and information services to top-level transportation administrators, collection analysis tools, collaborative approaches to developing strong specialized collections, digital collection development efforts among member libraries and collaboration with university and industry initiatives.

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**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

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**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

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n/a

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**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of participation)**

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n/a

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\*The original authorized total budget amount of the study

\*\*The authorized total budget amount as revised, if applicable

\*\*\* The project life to date expenditure

\*\*\*\*The current fiscal year's original budget amount

\*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
TRANSPORTATION POOLED FUND STUDY  
ANNUAL REPORT  
FISCAL YEAR 2008**

STUDY TITLE: Evaluation of Test Methods for Permeability (Transport) and Development of Performance Guidelines for Durability

FUNDING SOURCE:  SPR, Part II (100%)  FHWA (\_\_\_\_ %)  MFUNDS(\_\_\_\_ %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

TECHNICAL CONTACT:

TPF #	TPF-5(179)	MDOT START DATE	10/01/2008
JOB NUMBER	104228	MDOT COMPLETION DATE (Original)	09/30/2011
ORBP NUMBER		COMPLETION DATE (Revised)	
LEAD AGENCY	Indiana DOT		
PROJECT MANAGER	John Staton		
CONTRACTOR	Purdue University		

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$87,000.00	TOTAL		\$25,000
	(Revised)**				
EXPENDED FUNDS TO DATE***			SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$25,000.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$25,000.00	OTHER		
PERCENT COMPLETE (By Budget)		25%	PERCENT COMPLETE (By Work)		25%

**PARTICIPATING STATES**

ABBREVIATE THE PARTICIPATING STATES. IF MDOT IS THE LEAD AGENCY, ALSO LIST THE CONTRIBUTION PERCENTAGE PER STATE.

(\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %),

**PURPOSE AND SCOPE**

The Evaluation of Test Methods for Permeability (Transport) and Development of Performance Guidelines for Durability will study/improve current test methods as well as develop new tests or procedures to evaluate the permeability of concrete and relate to anticipated performance with the use of exposure conditions.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Literature review of concret permeability test procedures and models that link tests with performance. Explored promising concrete permeability tests and make recommendations for future use.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Utilized findings to establish direction toward developing a useful test procedure that can be correlated to performance.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Continue development of new test procedures and protocol. Initiate correlation of new test procedures with existing test methods.

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of participation)**

\*The original authorized total budget amount of the study

\*\*The authorized total budget amount as revised, if applicable

\*\*\* The project life to date expenditure

**OFFICE OF RESEARCH and BEST PRACTICES  
TRANSPORTATION POOLED FUND STUDY  
ANNUAL REPORT  
FISCAL YEAR 2008**

STUDY TITLE: Transportation Research Program Management Database

FUNDING SOURCE:  SPR, Part II (100%)  FHWA (\_\_\_\_ %)  MFUNDS(\_\_\_\_ %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

TECHNICAL CONTACT: Angie Nelson

TPF #	TPF-5(181)	MDOT START DATE	10/01/2007
JOB NUMBER	104229	MDOT COMPLETION DATE (Original)	09/30/2009
ORBP NUMBER		COMPLETION DATE (Revised)	
LEAD AGENCY	Washington State DOT		
PROJECT MANAGER	Tim Carlile (carlilt@wsdot.wa.gov) Phone: 360-705-7975 Fax: 360-705-6911		
CONTRACTOR			

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$26,000.00	TOTAL		\$13,000.00
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$13,000.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$13,000.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$13,000.00	OTHER		
PERCENT COMPLETE (By Budget)		50%	PERCENT COMPLETE (By Work)		50%

**PARTICIPATING STATES**

ABBREVIATE THE PARTICIPATING STATES. IF MDOT IS THE LEAD AGENCY, ALSO LIST THE CONTRIBUTION PERCENTAGE PER STATE.

AK (\_\_\_\_ %), CA (\_\_\_\_ %), IN (\_\_\_\_ %), NE (\_\_\_\_ %), NY (\_\_\_\_ %), WA (\_\_\_\_ %), MI (\_\_\_\_ %),

**PURPOSE AND SCOPE**

There is no standard database among state transportation departments to track and monitor research projects. Many states use electronic spreadsheets and other manual systems to meet these needs with varying degrees of success. A few states, including Caltrans, have developed fairly sophisticated databases to manage their research projects. Some states are interested in adopting an existing database. Caltrans is willing to make their RPMD database available for this purpose. State research program business needs vary. Some business needs are consistent across the country but others, while similar, differ due to accounting structure, reporting needs or other factors. To use the Caltrans RPMD, some modification will be required. In addition, a module will be developed to manage information for the TPF projects. Other modifications will also be considered but will require additional funding.

Scope of work:

Identify the research program management database needs of the states partnering in this TPF project, accommodate the system modifications needed for implementation by the Washington State Department of Transportation (WSDOT), and enhance the RPMD to add new functions to meet additional research program management business needs of participating states including management of the Transportation Pooled Fund Module (TPF). It is intended that this work will be contracted through the University of California, Berkeley. Tasks in the study will be to:

- 1) Review the RPMD and identify general modifications needed by participating states to use the RPMD as currently developed in FileMakerPro.
- 2) Develop modified RPMD System based on needed modifications identified by Washington State and consideration of needs of other participating states.
- 3) A summary of business needs necessary to manage TPF projects.

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4) Develop the TPF module.

5) Testing and modification: Partner states will test the beta version and necessary changes will be made to provide a functional module.

6) The development team will work with WSDOT to scope the level of effort and cost to convert WSDOT's existing data into to the new system. Caltrans existing data will be converted to the new system as needed.

Task 3 will focus on meeting the needs of Washington State. Other participating states may wish to have a version of the RPMD that has been modified to meet their unique needs, as described in the scope described in Task 3. The cost estimate for Tasks 3 is approximately \$68,000 per participating state based on a general work plan and assumptions about the level of work needed by the states. The option for states who may not need all the services or items listed in Task 3, or have needs for different or additional support can work with the selected vendor to develop an agreed upon scope of work and cost. Funding based on the negotiated scope of work can be contributed to the pooled fund effort to obtain contractor support.

The longer term vision for this project may include additional activities, depending upon the needs of the pooled fund participants.

Additional mid-term activities can include:

1. Adding additional functions and capabilities to the RPMD, as jointly requested, with the goal of keeping a common base for all participating states.
2. Using the RPMD as a base application, tailoring the database to meet unique needs of specific participating states.

Longer term activities can include:

3. Migrating the RPMD to a different technology platform such as Oracle/Java or SQL/.Net.

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**FISCAL YEAR 2007 ACCOMPLISHMENTS**

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**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

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No quarterly reports available at this time.

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**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

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**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

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**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of participation)**

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\*The original authorized total budget amount of the study

\*\*The authorized total budget amount as revised, if applicable

\*\*\* The project life to date expenditure

\*\*\*\*The current fiscal year's original budget amount

\*\*\*\*\*The revised fiscal year budget amount, if applicable

**OFFICE OF RESEARCH and BEST PRACTICES  
TRANSPORTATION POOLED FUND STUDY  
ANNUAL REPORT  
FISCAL YEAR 2008**

STUDY TITLE: Performance Guidelines for the Selection of Hot-Pour Crack Sealants

FUNDING SOURCE:  SPR, Part II (100%)  FHWA (\_\_\_\_ %)  MFUNDS(\_\_\_\_ %)  NCHRP (\_\_\_\_ %)  OTHER (\_\_\_\_ %)

TECHNICAL CONTACT: Kevin McGhee

TPF #	TPF-5(045)	MDOT START DATE	10/01/2007
JOB NUMBER	104231	MDOT COMPLETION DATE (Original)	09/30/2008
ORBP NUMBER	N/A	COMPLETION DATE (Revised)	
LEAD AGENCY	Virginia DOT		
PROJECT MANAGER	Michael Eacker		
CONTRACTOR	Imad Al-Qadi, University Of Illinois		

**BUDGET STATUS**

Total Budget			FY 2009 Estimated Budget		
TOTAL COST	(Original)*	\$80,000.00	TOTAL	N/A	
	(Revised)**				
EXPENDED FUNDS TO DATE***		\$80,000.00	SALARIES		
FY 2008 Budget			EQUIPMENT	(Expendable)	
FY FUNDS	(Original)****	\$80,000.00	EQUIPMENT	(Non-expendable)	
	(Revised)*****		TRAVEL		
FY EXPENDITURE		\$80,000.00	OTHER		
PERCENT COMPLETE (By Budget)		100%	PERCENT COMPLETE (By Work)	100%	

**PARTICIPATING STATES**

ABBREVIATE THE PARTICIPATING STATES. IF MDOT IS THE LEAD AGENCY, ALSO LIST THE CONTRIBUTION PERCENTAGE PER STATE.

(\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %), (\_\_\_\_ %),

**PURPOSE AND SCOPE**

Produce laboratory tests that can be used to evaluate the effectiveness of various crack sealant materials.

**FISCAL YEAR 2007 ACCOMPLISHMENTS**

Project was completed and final report submitted.

**FISCAL YEAR 2008 ACCOMPLISHMENTS TO DATE**

Project is complete.

**FISCAL YEAR 2009 PROPOSED ACTIVITIES**

Project is complete.

**JUSTIFICATION(S) FOR REVISION(S) (List the approval date for the revision(s))**

It was discovered that Virginia had not received Michigan's funds that were committed when this project was initiated. We modified our existing program to allocate funds, which were then sent to Virginia to complete our commitment. August, 2008

**SUMMARY OF THE IMPLEMENTATION RECOMMENDATION (Required the last year of participation)**

\*The original authorized total budget amount of the study  
 \*\*The authorized total budget amount as revised, if applicable  
 \*\*\* The project life to date expenditure  
 \*\*\*\*The current fiscal year's original budget amount  
 \*\*\*\*\*The revised fiscal year budget amount, if applicable