**IMPLEMENTATION PLAN AND PROJECT PROPOSAL**

Version 2/15/2017

**TITLE OF PROJECT:**
Installation & evaluation of new dowel bar retrofit configurations to determine if there are bar reduction combinations that will provide adequate load transfer for short-to-moderate term ride improvement

**PROJECT PROPOSED BY:** Dan Labo

**POSITION AND MNDOT OFFICE OR DISTRICT:** Resident Engineer; District 3 – St. Cloud

**TOTAL BUDGET $ 150,000**

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MnDOT State Research Funds…</td>
<td>$150,000 FY2017</td>
</tr>
<tr>
<td>Office or District Funds………</td>
<td>$</td>
</tr>
<tr>
<td>Federal SP&amp;R………….(__%)</td>
<td>$</td>
</tr>
<tr>
<td>LRRB……………………………</td>
<td>$</td>
</tr>
<tr>
<td>Other:</td>
<td>$</td>
</tr>
</tbody>
</table>

**OVERALL PROJECT SCHEDULE**

DATE PLAN COMPLETED: March 2017

(allow time for review, approval and contract process)

PROJECT START DATE: April 2017

PROJECT LENGTH (MONTHS): 3 (complete by June 30)

**PROJECT OVERVIEW AND GOALS**

MnDOT currently has a standard dowel bar retrofit configuration that will provide adequate long term load transfer in concrete panels where the original dowel bars are no longer functional. Given the vast concrete pavement needs in the state, there are instances where the ride quality will become unacceptable before funds are available to rehab/replace the concrete pavement; though it is not cost effective to perform a full dowel bar retrofit prior to the ultimate fix being performed.

The implementation project idea is that it may be possible to utilize new configurations, with less total bars, to extend the ride quality of the pavement for the short/medium term with less interim costs.

The project goals are to install and evaluate multiple test sections, which utilize less total dowel bars, in order to determine if there are configurations that are more cost effective to improve ride quality in the short/medium term than the existing standard configuration for retrofits.

**MnDOT PROJECT MANAGER OR TECHNICAL LIAISON**

Dan Labo  
D3 - St. Cloud  
Resident Engineer  
St. Cloud, MN 56303  
dan.labo@state.mn.us  
320-223-6605

**APPROVALS**

**OFFICE DIRECTOR OR DISTRICT ENGINEER**

Office or District: District 3  
I hereby certify sufficient staff time will be scheduled for the Project Manager and staff to complete the project as outlined in the attached work plan, and commit any Office or District funds as listed above.  

Signature of Office Director or District Engineer:  
__________________________  
Date:  
Dan Anderson  
Date:

**DIRECTOR OF RESEARCH SERVICES SECTION**

Approval of work plan and any MnDOT State Research Program funds as listed above.  

Signature of the Director of Research Services:  
__________________________  
Date:
### IMPLEMENTATION PLAN AND PROJECT PROPOSAL

#### INNOVATION ROADMAP INFORMATION

1) **What are the expected benefits to MnDOT from implementing the results of the project? What is the impact on the department?**

The expected benefits include:
- Construction Savings (Materials, labor, equipment, time, quality) – less costly dowel bar retrofits
- Decrease Lifecycle Costs
- Increase Lifecycle – improve ride until programmed improvements
- Road User Benefits (Time, dollars) – improved ride on NHS

I believe that quantitative benefit values are easily obtainable. This data can be collected through the use of several available methods: falling-weight deflectometer (measures load transfer), IRI testing (standard measure of smoothness), annual RQI calculations (gather from Pathway data), and a traditional cost/benefit analysis (compare cost of new configurations with associated benefit vs. old configurations with associated benefit).

This work could pave the way for a new application of dowel bar retrofit methods to be used for short/medium term repairs that are more cost effective than the standard configuration for this service life window.

2) **What transportation problem is this project solving? What has been attempted in the past to solve this problem and what remains to be solved?**

The transportation problem is to provide an acceptable ride on concrete highways in the short-to-medium term, using less costly dowel bar retrofits.

The proposed test section is I-94 from Clearwater to Monticello, which is programmed for 2021-2022; however, the road is heavily faulted to the point where a concrete diamond grinding project is slated for the fall of 2017 with the goal to improve ride quality until the larger fix. However, the root cause of the poor ride quality is due to non-functioning load transfer between the concrete panels. As this road is programmed for replacement in roughly 5 years, this represents a perfect opportunity to push the envelope of dowel bar retrofits on this section of pavement. As this 13 mile roadway has only 1 interchange in the middle, it also allows for apples-to-apples comparisons of test sections with identical traffic patterns on a roadway that was originally built at the same time.

Previously tried on this specific stretch of roadway: Microsurfacing (pre 2009, failed), concrete pavement rehabilitation & diamond grind (2009, right lanes now unacceptable ride), concrete diamond grind (2017 fall).

For the reduced dowel bar configurations: unknown, though the standard configuration is meant for long term repairs per the best of my understanding.

3) **Additional information about the project and goals:**

Please see above.

4) **How does the proposed project build upon previous research? If further research is proposed, why does similar previous research not solve the Minnesota transportation problem being addressed and why is further research needed?**

I am unaware of research available or otherwise planned to address these short-term performance needs in pavements via dowel bar retrofits. According to MnDOT concrete pavement researchers, the previous research has established reliable dowel bar retrofit guidelines for long-term performance.
5) How will the results of the completed project be put into practice and deployed by MnDOT? Who needs to make a formal decision to implement and deploy, and who would be responsible for implementation and deployment?

A decision to deploy rests with the Concrete office / State Concrete Engineer.

The project will develop the following end-user products:
- Best practices guidance
- Improve or modify an existing design method
- Life-cycle costs or B/C ratio of investments
- Decision-making process or framework
- Provide materials engineer with a modified existing design for dowel bar retrofits. Additional information such as a Decision-making framework, B/C ratio, and best practices guidance will help materials engineers determine if this type of repair is cost effective and how to go about deciding if it is a good fit for their particular situation. This modified design would, in theory, provide a repair option for a present void or lack of an effective short-to-moderate term repair.

Technical advisory panel or project steering committee:
- Dan Labo
- Adam Ahrndt (D3 Maintenance)
- Darren Nelson (D3 Materials)
  Maria Masten

MnDOT specialty offices:
- Concrete Office (OMRR)

MnDOT Districts and District functional groups:
- District 3 Materials

Additional key practitioners or management champions:
- Gordy Bruhn

Management group:
- CMG, informed by Dan Labo

Practitioner committee:
- Materials Engineer Group
- Design Engineers Group

Other cooperating program or agency:

Other stakeholders:
- CPAM
- IGGA

Others who may be interested, not listed above:
- The traveling public, if it is successful

MnIT involvement (software, data management, or technology devices): N/A

Items for State contract or Approved Products list: N/A

Intellectual Property or licensing: N/A

6) What future efforts or steps will be needed to derive full benefits from the expected results of this project?

MnDOT is committed to the following future steps:
- Concrete office to provide alternate standard plan sheet for dowel bar retrofit
- Concrete office to produce guidance for when to use modified design
7) Communication Plan

Catch phrase for marketing: Low cost RQI improvements for faulted concrete

Target audience for early communication (in addition to those named above):
- MnDOT Concrete office,
- Concrete rehab industry group

Early Communication plan:
- Small group discussions
- Brainstorming meeting
- Set up a meeting with dowel bar retrofit contractors, the concrete office, and Dan Labo to finalize the test section configurations.

Target audience for rolling out the innovation:
- District Materials Engineers,
- District Maintenance Engineers

Roll-out message, methods and activities:
- Overall message: low cost RQI improvement method for faulted concrete roads (delivered by Concrete Engineer). The best way to convince them is with a simple report summarizing how this modified method can be useful/used.
- Presentation to a conference (CPAM, IGGA, Concrete Conference)
- Presentation to a technical group
- Powerpoint slide show
- Brochure or one-pager

Roll-out timing and responsibilities:
- Disseminate information at annual meetings and conferences
- Concrete Engineer (Maria Masten),
- Gordy Bruhn,
- Dan Labo
- Maria is normally invited to speak in regards to concrete, she can incorporate the findings when she speaks to many of these industry groups with very limited lead time.

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PROJECT WORK PLAN INFORMATION

**SCOPE:** Briefly summarize the scope of work of this project. This includes an overall description of how the project will be conducted. Please summarize coordination with other projects or other work that is necessary for completion of this project, such as specialized help or input including data, materials, equipment, facilities, etc.

Budget: $150,000.

Procurement: Dowel bars to be installed under a maintenance 161 contract prior to 6/30/2017. Diamond grinding & striping to be completed by the District in the Fall of 2017 (district funded diamond grinding).

Equipment needed: None.

Work to be performed by a dowel bar retrofit contractor for installation (via 161 maintenance contract).

Scope: The scope of the work will be constrained to the right lane of I-94 westbound between TH 25 and CSAH 8; and there will be multiple short test sections of each configuration (to include a control section of the standard configuration). Data collection will need to be obtained with assistance of other groups; though this is simple data to collect. The final report would require heavy assistance from the concrete office, it is anticipated that Gordy Bruhn would generate the final report.
<table>
<thead>
<tr>
<th>TASKS: List the major tasks in the sequence necessary to complete the project, including the elements listed below.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scope:</strong> For each task, give a task title, describe the work that will be included in the task and who will perform the work (consultants, contractors, university researchers, MnDOT personnel, or others). Purchase orders for equipment can be included here as a task to be completed by MnDOT. For each task there should be at least one deliverable, such as a report, test results, equipment, software, etc.</td>
</tr>
<tr>
<td><strong>Schedule:</strong> Indicate a realistic duration for each task, and proposed start and end dates. The contract execution date will be unknown at the time this work plan is prepared, so it is important to note any “hard schedule” requirements for task start or ending dates, such as for seasonally-dependent work.</td>
</tr>
<tr>
<td><strong>Budget:</strong> For each task, provide the total cost to complete the task. Tasks performed by MnDOT personnel may have zero-dollar budgets for the purpose of this work plan.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><em>Obtain budget (from TRIG)</em></th>
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</table>
| *Finalize plan*
  - who will perform: work with Concrete office, industry, Dan Labo
  - estimated length 1 week
  - cost: none
  - deliverable: final plan to bid |

| *Install dowel bars*
  - who will perform: Contractor
  - estimated length 3 weeks
  - cost: $150,000
  - deliverable: installed dowel bars |

| *evaluate initial IRI (2017)*
  - who will perform: Contractor/MnDOT via separate diamond grinding contract (programmed)
  - estimated length 4 weeks
  - cost: NA
  - deliverable: initial IRI values |

| *evaluate IRI (2018,2019)*
  - who will perform: MnDOT
  - estimated length 1 week per year
  - cost: NA
  - deliverable: IRI values |

| *assemble final report*
  - who will perform: MnDOT (Gordy Bruhn?)
  - estimated length 3 months
  - cost: NA
  - deliverable: final report |

**SCHEDULE SUMMARY:** List each task, start and end dates, or attach a Gantt chart.

*Work to be completed for payment by June 30, 2017*
# Detailed Budget for Entire Project

<table>
<thead>
<tr>
<th>DOLLAR AMOUNT (OMIT CENTS)</th>
<th>FY 2017</th>
<th>FY 2018</th>
<th>FY 2019</th>
<th>TOTALS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DIRECT COSTS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consultant, Contractor and Testing Costs (list each contract and its expected cost)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contractor TBD via 161 Maintenance contract</td>
<td>$150,000</td>
<td></td>
<td></td>
<td>$150,000</td>
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<tr>
<td>Equipment (itemize by vendor)</td>
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<tr>
<td>Supplies</td>
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<td><strong>Total Direct Costs</strong></td>
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<tr>
<td><strong>Total Project Costs</strong></td>
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<td></td>
<td>$150,000</td>
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<td>$150,000</td>
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</table>

## Budget by Summary Task and Consultant/Vendor:

(List task number and dollar value for each task in the work plan. If the project includes consultant contract or vendor P.O., provide breakdown of task budget. Insert additional rows as necessary.)

<table>
<thead>
<tr>
<th>Task Number</th>
<th>Task Description</th>
<th>Consultant, Vendor or Contractor Name</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Finalize Plan</td>
<td>Dan Labo</td>
<td>$0</td>
</tr>
<tr>
<td>2</td>
<td>Install dowel bars</td>
<td>Contractor TBD</td>
<td>$150,000</td>
</tr>
<tr>
<td>3</td>
<td>Evaluate ride 2017</td>
<td>Diamond grind contractor TBD</td>
<td>$0</td>
</tr>
<tr>
<td>4, 5</td>
<td>Evaluate ride future years, write final report</td>
<td>MnDOT</td>
<td>$0</td>
</tr>
<tr>
<td></td>
<td><strong>Total Project Costs</strong></td>
<td></td>
<td>$150,000</td>
</tr>
</tbody>
</table>

## Comments/Justification
