North Central Pavement Research and Implementation Coordination Partnership ("Frozen Four")
Summary of Activities
July 28, 2009

Mission Statement

The North Central Pavement Research and Implementation Coordination Partnership is dedicated to improving the roads in the region by delivering thoughtful and timely research findings for implementation. This will be done by integrating and coordinating the research efforts of the member agencies in order to reduce research duplication, to engage the best research teams, to optimize the use of research dollars, to expedite research solutions, and to effectively communicate research results and issues.

Partners

- Wisconsin Department of Transportation (lead state)
- Michigan Department of Transportation
- Minnesota Department of Transportation
- Illinois Department of Transportation

Focus Areas

- Flexible Pavements
- Rigid Pavements
- Soils, Geology, and Foundations
- Pavement Design, Management, and Maintenance

Objectives and Related Pooled Fund Activities

1. **Share research problem statements from individual partner agencies.**
    a. North Central Pavement established a database of problem statements approved by each partner for FY 2006 through FY 2008 for each focus area. This database was used to create a transportation synthesis report (TSR) summarizing the problem statements and identifying potential areas of overlap (6).

2. **Establish common short and long-term research objectives in specific areas.**
    a. The partnership summarized the mission statements developed by the partner states for each focus area.
    b. A TSR was created for the Flexible Pavements and Rigid Pavements focus areas that compared completed research projects since 2000 and in-progress research activities

of each partner state to the research tracks defined in the National Asphalt and Concrete Pavement Roadmaps (7, 8).

c. A similar effort was undertaken for the Soils, Geology, and Foundations focus area. Currently, however, the area does not have a roadmap. Contractor CTC & Associates worked with experts from the state agencies and academia to define research tracks for a roadmap. A TSR was then created to compare the research activities of the partner states to the tracks defined by the roadmap (4).

3. Assess and prioritize common research objectives.

a. A TSR was developed that synthesized partner states' recently approved problem statements and past research efforts to identify opportunities for collaboration. Such opportunities were defined as at least two partner states sharing a common research interests (6). Following are the collaboration opportunities identified for each focus area:

i. Flexible Pavements. Mix design; damage; overlays; use of recycled materials
ii. Rigid Pavements. Jointed plain concrete pavement (JPCP) damage repair and mitigation; overlays and whitetopping
iii. Soils, Geology, and Foundations. Pile design
iv. Pavement Design, Management, and Maintenance. Profiling

4. Identify means (including pooled funds) to initiate and monitor priority research projects of common interest.

a. A final report from the 2007 Workshop titled *Laboratory Resilient Modulus Test Methods For Subgrade Materials* provides specific recommendations for two cooperative research efforts to be administered by North Central Pavement. One project involved investigating differences in the resilient modulus test procedures and recommending a unified procedure. The other focused on field measurement of subgrade and base stiffness (3, 5). Funding and oversight of these projects, or others, was intended to be a Phase II activity for this pooled fund.

b. The final report was distributed to the WisDOT Pavement Section to be used in discussions for pooled fund TPF-5(177), Improving Resilient Modulus (MR) Test Procedures for Unbound Materials.

5. Share and review the results from research projects of common interest.

a. The previously referenced TSR titled *Research Collaboration Opportunities: Four States' Problem Statements and Related Research* (6) was used to generate a prioritized list of discussion points for the partnership. It was decided that workshops would be the best forum to share research results and discuss implementation activities. One-day workshops included presentations from both academia and state agencies with considerable time built into the agenda for discussion.

b. Phase I activities involved two workshops

i. Laboratory Resilient Modulus Test Methods for Subgrade Materials – 2007 (3)
ii. Underlaying Pavement Stabilization Methods and follow-up literature search on soil stabilization methods – 2008 (1, 2)

c. Phase II potential workshops

i. Overlays, whitetopping, and pre-overlay repair

ii. Implementation of research: results, processes, challenges, and identification of project champions
iii. Materials characterization for design and construction

6. **Collaborate on the implementation of research results of common interest.**
    a. Both workshops had an implementation theme. However, specific collaboration opportunities were not pursued. Based on partner comments, there was significant interest in making implementation a focus area of Phase II and addressing research applications on a regional level.

7. **Transfer technology to improve highways.**
    a. All information generated by the pooled fund will remain available online at www.northcentralpavement.org
    b. Workshop proceedings include links to the academic articles/research reports and standards related to the information presented in the workshop.
    c. Presentations of the 2008 workshop were videotaped and made available for viewing on the Web site.

8. **Share issues, research needs, data, and solutions on an ongoing basis.**
    a. Quarterly meetings were held using a combination of conference calls and face-to-face meetings. There was a half-day business meeting after each workshop.

9. **Fund and execute short-term research and technology transfer activities as needed and as able.**
    a. Workshops were primarily technology transfer activities. It was decided that Phase II would continue with the workshops and possibly expand to other technology transfer opportunities.

Lessons Learned

1. The pooled fund identified completed research projects with implementation potential and problem areas that might benefit from joint research. However, difficulty in coordinating the partner states' administrative cycles prevented joint funding of new research projects through their respective research programs. An alternative mechanism for funding joint research projects was proposed for Phase II that would have involved increasing each state's commitment to the pooled fund to allow for direct funding of joint research efforts.

2. The pooled fund resulted in several synthesis products that compared partner efforts to national research roadmaps in three of the focus areas (flexible pavement, rigid pavement and geotechnical). These documents highlight regional research gaps against national goals and provided states with input for their individual research efforts.

3. Pooled fund partners contributed to development of a regional database of recently completed projects, research in progress and research needs in each of the focus areas. This valuable database covering several years of activity by the partners presented opportunities for collaboration and implementation, but was found to be too labor intensive to update on an ongoing basis.

4. The original pooled fund concept of discussing and coordinating research of common interest by the partner states was a worthy goal but too broad in scope to be sustained. However, the concept became a launching pad for two successful workshops. The sharing of research findings and implementation ideas during the workshops (documented and preserved on the study Web site) proved to be highly valuable products of the pooled fund.

5. Future regional collaboration activities should be narrower in scope and focus on implementation of research results. There is still a clear opportunity to define promising new technologies and share results of pilot projects and draft specifications/procedures to reduce unnecessary duplication and promote implementation on a regional level. It is hoped that WisDOTs participation in the Transportation and Engineering Road Research Alliance (TERRA) will advance these efforts.

Next Steps – Plan for Phase II and Incorporation into TERRA

The following interest areas defined in Phase I of the North Central Pavement Research Collaboration Partnership are consistent with the major trends identified in the Transportation Engineering and Road Research Alliance (TERRA):

- Materials characterization and impacts on performance
- Pavement rehabilitation
- Automation of construction (specifically, intelligent compaction)

The following is a summary of TERRA's strategic directions and how the proposed Phase II activities of the North Central Pavement Research Collaboration Partnership can be integrated into TERRA. For reference, the North Central Pavement Phase II work plan included the following activities:

- Facilitating meetings and information sharing: continued development and maintenance of the Web site and coordinating business meetings and conference calls.
- Hosting workshops related to topics identified as high priority by members.
- Develop a mechanism for providing funding and oversight of pilot projects.

TERRA Strategic Directions

1. **Defining and launching a bold, synergistic research program:**
    a. TERRA leads highly collaborative research
        i. Individual TERRA members support research projects through resource commitments.
        ii. Delivery model that addresses the needs of all partners and defines the party's role in research projects.

    - **Relationship to North Central Pavement:** The partnership developed a table summarizing research administration employed by the four partner states. This table could aid in identifying the administrative issues related to collaborative research.

2. **Implementing research results "on the ground"**

   a. Research results are put into practice through a rubber meets the road approach
      i. Research implementation produces short-term results in new products, services, and practices.
      ii. Implement innovations that demonstrate how research costs pay off in benefits.
      iii. Demonstrate the benefit of shared leadership among industry, academia, and government.

- **Relationship to North Central Pavement:** Phase II identified implementation as a potential workshop item. A focus area of the proposed Phase II was selecting and providing oversight to pilot projects with the intent to promote implementation of technologies through field trials, harmonization of test methods, or other means.

3. **Setting up activities that enhance TERRA's role as a dynamic forum for research interchange - continuous learning and sharing that enables members to educate each other.**
   a. TERRA serves as the "Go To" group for: communication and exchange of research results and progress to target audiences and new and innovative ideas.
   b. Active technology transfer.
   c. Marketing of implementation plans.

- **Relationship to North Central Pavement:** The pooled fund has the most overlap with this TERRA strategic direction. Both the Web site and workshops established a framework for successful communication exchange and technology transfer.

4. **Expanding TERRA's membership proactively –** new members identified, recruited, and invited to increase TERRA's research breadth, depth, and resources.
   a. More stakeholders from state, local government, industry, academic/research sectors are included as members.

- **Relationship to North Central Pavement:** Representation from WisDOT's Division of Transportation System Development and the Research and Communication Services Section fits into the strategic direction of including stakeholders who are researchers or practioners.

5. **Developing governance and operating structures that assure a thriving, changing, and sustainable organization**

- **Relationship to North Central Pavement:** The partnership developed bylaws for North Central Pavement. It is possible that these could be used as a starting point for TERRA.

Links to References (Most Recent First)

1. Final Report on Underlying Pavement Layer Stabilization
   October 2008 Workshop Proceedings.

2. Literature Search on Soil Stabilization
   A follow-up to the 2008 workshop, citing 51 studies on soil stabilization methods.

3. Final Report on Laboratory Resilient Modulus Test Methods for Subgrade Materials
   October 2007 Workshop Proceedings.

4. Comparing Frozen Four Soils and Foundations Research Activities to a Geotechnical Research Road Map
   June 2007, PDF File (112 KB)
   A comparison of member states' soils and foundations research projects with a Geotechnical Research Roadmap that outlines past and future geotechnical research directions.

5. Determining Resilient Modulus of Subgrade Materials for Mechanistic-Empirical Design
   July 2007, PDF File (94 KB)
   A report on current research and practice in determining resilient modulus of subgrade, combined with a review of partner state research on the subject.

6. Research Collaboration Opportunities: Four States' Problem Statements and Related Research
   March 2007, PDF File (108 KB)
   An analysis of North Central Pavement member states' recent research problem statements, as well as of related research they are conducting or have completed, to identify opportunities for collaboration.

7. Comparing Frozen Four Rigid Pavement Research Activities to the Concrete Pavement Road Map
   March 2007, PDF File (150 KB)
   A review of the member states' concrete research projects to identify where there are overlaps or gaps with the Concrete Pavement Road Map. The review includes recommendations from the agencies' technical staff members on how to best align the states' research projects with the Concrete Pavement Road Map research tracks.

8. Comparing Research Projects Of WisDOT and Neighboring States To the National Asphalt Roadmap
   March 2007, PDF File (250 KB)
   A comparison of member states' asphalt pavement research projects with the research priorities set forth in the draft National Asphalt Roadmap.