Best Practices in Technology Transfer
Research Peer Exchange
August 15-17, 2007

CONTENTS

INTRODUCTION

The Iowa Department of Transportation held a Research Peer Exchange on August 15-17, 2007 in Ames, Iowa. RAC members from Region 3, along with California, South Dakota, Texas, Washington, and FHWA representatives were invited. Three states (Ohio, Texas and Washington) participated by videoconference. The topic of the peer exchange was "Best Practices in Technology Transfer."

On Wednesday, August 15, the first day of the exchange, participants were asked to provide examples and a short presentation on their state's technology transfer (T2) practices, including print and electronic media from simple to complex and sophisticated. In addition to providing examples, participants addressed three questions:

- How do you ensure technology transfer (T2) occurs?
- What techniques do you use?
- How do you evaluate its effectiveness?

All day Thursday and on Friday morning, August 16 and 17, participants attended the Mid-Continent Transportation Symposium. Friday afternoon was a peer exchange wrap-up meeting to summarize results of the exchange, the final report, and next steps.

PARTICIPANTS

Ahmad Abu Hawash, Iowa DOT
Timothy Barkley, FHWA
Rebekah Bovenmyer, CTRE
Marcia Brink, CTRE
Patty Broers, Illinois DOT
Nick Burmas, California DOT
Pat Casey, Wisconsin DOT
Rick Collins, Texas DOT
Carol Culver, Iowa DOT
Mark Dunn, Iowa DOT
Ed Engle, Iowa DOT
Monique Evans, Ohio DOT
Mike Heitzman, Iowa DOT
Becky Hiatt, FHWA Iowa Division
Dave Huft, South Dakota DOT
Sandra Larson, Iowa DOT
Kathy Lindquist, Washington DOT
Dick McReynolds, Kansas DOT
Shashi Nambisan CTRE
Leni Oman, Washington DOT
Alan Rindels, Minnesota DOT
Bob Younie, Iowa DOT

PHOTOS

Iowa Participants at CTRE Front row: Mike Heitzman, Carol Culver Timothy Barkley, Patty Broers, Dave Huft. Back row: Sandra Larson, Ed Engle, Alan Rindels, Dick McReynolds, Mark Dunn, Becky Hiatt.

Rick Collins, Texas DOT, addresses the group via video conference.

PRESENTATION SUMMARIES

Timothy Barkley – FHWA

- DVD: *Ideas Into Action*. Contact Timothy or Mark Sandifer to borrow
- End users may need more information. Need to tailor to customer needs.
- Definition: Technology transfer is the process of moving the results of research and development from the laboratory into practice.
- T2 includes training, demonstration, outreach tools.
- T2 essentials: research (idea or experiment), development (prototype, finished product), implementation (application and marketing), effectiveness (benefits of use)
- Go to www.trb.org/studies/publications/specialreport.asp to learn more about FHWA's strategy for technology transfer. Contact Mark Sandifer at resource center.
- Highways for Life is a good funding source for innovation technology

Patty Broers – Illinois DOT

- Overview of research program, Illinois Center for Transportation
- Now program includes academia, industry and consultants
- Technical Advisory Group (TAG) for each area determines research needs and priorities. ITC determines overall priorities w/ at least one for each TAG. There are 7 regular TAGs plus ad hoc
- Dashboard of status on research project www.ict.uiuc.edu/idotprojects.asp
- Patty sends TAC chair questions about how successful the research was.

Monique Evans – Ohio DOT

- In Ohio, T2 is addressed throughout life of project
- When needs are addressed, proposers are asked to consider implementation up front, including collaboration for deploying results. Can be speculative early on.
- Final implementation recommendations are required at project completion. Plans are then responsibility of offices.
- Working on an annual implementation report with one page synopsis of every project including performance measures. Measures are often qualitative but still developing. Hope to follow Wisconsin examples.
- Techniques include newsletters, web sites, collaboration w/ library.
- Want to work on how to get deployment beyond the area that requested the research in the first place, particularly the field.
- *Communication Strategies for State Research Programs* is available on web site Part of *NCHRP Synthesis 280 - Seven Keys for Robust Research Programs.* *http://trb.org/news/blurb_detail.asp?id=3279* Has template for other states to use as basis for program.

Dick McReynolds – Kansas

- How you organize research is almost as important as doing the projects.
- Communication is open throughout. Research Program Council, Area Panels. Research is part of strategic plan. Output measure is benefit to cost ratio.
- Why is policy research important? Opens communication to top management and builds trust. Define policy research as what legislature or management wants to know that isn't typically part of the program., results in policy change
- Research implementation responsibilities assigned (see handout). RIP is completed for each project, prepared by project monitor w/ assistance. Research staff may provide examples to help them create an RIP.
- Intrinsic rating- rate 0-10 in each of 5 categories. Overall 5 rating deemed successful. On long term projects, implementation is tracked periodically.
- Document Management System is repository and lib catalog for pdf files of publications. Web based search engineer provides access. (Attachment 6)

Pat Casey – Wisconsin

- T2 is incorporated w/ as many stakeholders as possible at beginning, middle and end of research process. Collaborate and create a culture of innovation.
- Has there been a difference made? Evaluated on a program basis and project by project. Send 4 question survey to customers to see if needs were met and how can be improved.
- Question: What is balance between research and applied research? Must there always be a result and implementation? A: Most DOTs relate only to applied research because we need results.
- Also can look at "families of projects" where there are building blocks with defined steps and expectations. There is benefit to pure research because it eventually results in technology changes (like new Pavement Design Guide) but it is hard to convince DOTs to support it. AASHTO had LTPP program for long term research but it is fading.
- Research office sponsors peer exchanges for various areas of dept, pd by SPR. Viewed as tech transfer activity, helps serve areas that don't often have research but do want infusions of new ideas.
- Tech briefs picture PI on front and DOT project manager on back.
- Outreach to regional offices.

Rick Collins – Texas

- Three short videos (Attachment 11). Comments: lots of info packed into short time. The audience is primarily field and internal TX DOT staff, could be external or legislative as well. The three shown are pilots but will do more.
- Send monthly emails to keep staff up on developments.
- What it takes to implement research is to get the office of primary responsibility behind that research. Very hard to get implementation in field if it hasn't been blessed by central office.

- Plan to create annual report card on how implementation goes in each research area = number of projects implemented to number of projects completed.
- Very focused on what are problems that need solving versus what is research that needs a problem.

Nick Burmas – CalTrans

- Powerpoint shows how tech transfer occurs (Attachment 12)
- New technology comes at opportunity, for example the Laser Point Cloud used to rebuild freeway bridge
- Hierarchy: Research and Deployment Steering Committee (RDSC), Research and Deployment Advisory Committee (RDAC), Program Steering Committee (PSC), Technical Advisory Panels (TAPs).
- TAPs generate needs, PSC fleshes out problem statements and funding needs, set priorities within areas, RDAC set overall priorities and identifies champion, RDSC district directors buy off.
- Ex: Shake Cast system notifies bridge maintenance supervisors which bridges are susceptible to damage. Visual map w/ red, yellow, green, hot spots give specifics on bridge.
- Ex: Balsi Beam for work zone protection
- Recommend TIG effort for tech transfer.
- California uses brownbag lunch sessions to advertise/publicize projects
- Handout: "Roadmap" shows what research is underway and what is planned in various areas along w/ problem statements. (Attachment 13)
- Example of innovation and tech transfer: cone placement truck developed outside and rented short term by CalTrans to demo and improve w/ customer input. Works from cab like video game.

Dave Huft – South Dakota

- Research is defined broadly. Evaluated new materials an methods, develop design and analysis techniques, deploy innovative technology, identify underlying causes of transportation problems. Accountable for results
- Guided by Research Review Board- from DOT director to field, including city and county, academics.
- Technical panels have project manager and variety of people. State agencies, FHWA, academic, industry, tribal governments. TAPs monitor projects, evaluate work, recommend implementation. Obligated to respond to each research recommendation.
- Implementation products must be in usable form. Examples: draft specifications, policies, legislation, ordinances, interagency agreements, pilot projects and training.
- Challenges to implementation – time commitment of panels and board, staff, clear handoff, late objectors, IT constraint, funding constraints, intellectual property challenges.

- Need: more complete implementation plans, more resource to product T2 materials, more regular assessment. Use research performance measurement software. Increase library usefulness and use.
- TIG: funded by state contributions. The role is to promote research that has been successfully demonstrated and pilot states. National promotion can be conference, showcase, workshops, marketing brochures, manuals, videotapes, partnerships.
- States can nominate technologies by October.
- Web pages are generated from project database.

Shashi Nambisan & Marcia Brink – CTRE

- CTRE operates under 3 year rolling agreement with Iowa DOT
- CTRE provides staff for DOT Library under the agreement
- Technical centers:
    - National Concrete Pavement Technology Center
    - Bridge Engineering Center
    - Center for Weather Impacts and Mobility
    - Iowa Traffic Safety Data Service
    - Midwest Transportation Consortium
    - Partnership for Geotechnical Advancement
- Deliverables include students, workforce development, tech briefs, reports
- Outreach and training include LTAP, symposium, library, Roads Scholars
- Tech briefs include implementation readiness. Examples: Attachment 17 or see www.ctre.iastate.edu/research/t2summaries.cfm.
- Champion is necessary for effective tech transfer

Leni Oman – Washington

- Research Executive Committee and four Research Advisory Committees to focus on critical business functions: Project Delivery, Operations, Multimodal, and Information and Finance
- Communications plan identifies audience and messages
- Executive report is about 8 pages with implementation summary. Its use has increased awareness.
- Internet and intranet with listservs parallel to TRB
- Research folios – only three so far but want to do one more on implementation
- "Lessons learned" database still in development
- Developing synthesis reports in-house a la Wisconsin.
- Library produces literature reviews for user groups
- Trying to track awards received for research projects
- Department is getting more interested in research results
- Challenges: time for technical monitors to write research notes/reports;
- Limited resources; lack of review on draft reports.
- Student studies program borrowed from Ohio. Pulls students from colleges across the state, graduate fellowship program for current employees, summer interns

Alan Rindels – Minnesota

- Role – help offices develop research ideas, find researchers, publish results
- "Wall project" shows all projects
- Note that there is no process in place for implementation of NCHRP or pooled fund projects.
- Each project gets closeout memo
- Implementation guide (Attachment 19) application of results should measurably improve performance of investment of transportation resources
- Comment: NCHRP projects are implemented (most effectively by AASHTO committees but not so much by individual states) but not tracked or measured.

Sandra Larson - Iowa

- Research in Iowa DOT is sponsored by several offices and coordinated by Bureau of Research and Technology.
- Quarterly progress reports required on outside projects
- Implementation is part of each final report
- Tech transfer plan is part of final report
- Ed Engle – Secondary Roads Research Coordinator
    - Iowa Highway Research Board is a separate but related entity with state and local funding
- Tom Welch – Safety Engineer
    - ½ % Safety funding helps meet research needs, develop staff, fund CTRE, and build reputations of researchers across state
    - Emphasize listserv value
    - Identify research needs via annual safety forum
    - Example of research usefulness: change of 4 lane to 3 lane roads (see Attachment 22)
- Ahmad Abu-Hawash – Chief Structural Engineer
    - Iowa has several Innovative Bridge Research and Deployment projects
    - In-house research facilitated by "shared faculty" position - CTRE bridge engineer works half time on DOT projects
- Mike Heitzman – Asphalt Pavement Engineer
    - For successful tech transfer: always offer free lunch!
    - Need champion or external pusher
    - Results could be specifications change, training and workshops
    - Shared faculty for materials
- Bob Younie – State Maintenance Director
    - Winter operations research is a specialty of the department
    - 20-30 in-house research projects each winter test materials, methods and equipment
    - Winter Maintenance Expo introduces operator to research results
    - Successful pilot projects extended to other areas

BEST PRACTICES NOTED FROM PRESENTATIONS

- High quality publications from Wisconsin – array of documents for different purposes
- Variety of communication tools presented – most memorable way to tell the story, not only the dollars and cents
- Short video clips are very useful new idea
- Podcasts available on TIG site
- FHWA and NCHRP webinars
- Lots of similarities among programs so it's interesting that we have trouble recognizing research accomplishments
- Users are generally not going to search out research so we have to push it
- Intellectual property issue is becoming a big roadblock
- Experience of one user to demo new technology (Balsi beam) can create word of mouth excitement
- Go where the managers and users congregate to find your champions
- RSS feeds (really simple syndications) as possible delivery tool
- Important to index information and make it readily findable/available
- Need better finding tools
- Need more support for networking so we know what's going on

THOUGHTS ON SYMPOSIUM AND PEER EXCHANGE

Dick McReynolds

- Good topics, interesting sessions, good learning experiences
- Helpful to hear about teen driver project to be able to prompt more interest in own state
- Good to find out about ways to analyze and measure safety
- Suggest offering scholarships to surrounding states to get wider range of participation.

Timothy Barkley

- Tech transfer approach of symposium was impressive – collaboration among departments and university researchers.
- Turner-Fairbank reps should have been here to make presentations.

Mike Heitzman

- Symposium is mini TRB. For us it is an opportunity to hear and dialogue on research. The challenge is how to get more practitioners to the symposium – so more states and local agencies can be involved and get more learning. Travel assistance may be needed
- May need to explore webcast and videoconference options to involve more states.

Mark Dunn

- Good discussions after presentations, better than previous years.

Becky Hiatt

- Could tell difference between pure research and applied – implementation of projects w/ DOT champions seemed to flow.

Bob Younie

- TRB level papers presented.
- Discussion w/ staff after presentations to see how they can be of benefit to Iowa DOT.

Alan Rindels

- Learned Iowa is ahead in several areas.
- Didn't see as much influence of UIowa vs ISU.
- Environmental and stormwater issues needed more emphasis.
- Biggest key to effectiveness of tech transfer is champion.
- How to be sure it occurs? Do the right research.
- How can it be evaluated? Check if you are getting fresh research ideas.
- Going to work harder to be more involved w/ university at home.
- Wants to know more about foamed asphalt.
- New idea – use of cell technology to relieve congestion and improve freight management.

- TZD conference has been effective in MN getting all areas involved. (Toward
- Zero Deaths)

Sandra Larson

- Got opportunities to promote Iowa researchers to AASHTO and other states.
- Generated new research ideas.
- Will have statewide newsletter article soliciting research ideas.
- Raised possibility of having peer exchange around symposium every 2 yrs. (Good response to this idea)

Patty Broers

- Good learning experience, diversity of presentations.
- Impressed by collaboration and acknowledgement of all involved in research projects.
- May want to use speakers for Illinois conference.
- Can't always see how research is implemented, so this is helpful.
- Will disseminate info from CD to other areas of department.

Dave Huft

- Attendance of more states might dilute interest for Iowa attendees, change character of the symposium.
- Hadn't thought he could afford the time but was worthwhile.
- Great to provide opportunity for students to get involved on professional level.
- We have created a community that is interested in research, both on academic and DOT side as well as consultants. People know each other and know what each other are doing – developing a cross pollinated culture for research.
- Not sure he can emulate at home with smaller audience.

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Pat Casey

- Features speakers got him thinking about long term ideas.
- Will peel papers by topic and distribute to interested staff at WDOT.
- Relaxed atmosphere encouraged discussion.
- Some moderators engaged in additional discussion spontaneously – would have liked to see more of it.
- Wisconsin will interested in joining teen driver project.

SUMMARY

What makes tech transfer effective?

- Need to know what we're talking about
- Need for technology (people have to want it)
- If it's too big a job, maybe people didn't want or need it.
- Champion is not enough unless they can make it happen – needs to be properly placed in organization.
- Takes dedicated resources and management support.
- Streamlined processes for transfer, not cumbersome
- Technology must be ready with caveats already worked out
- Bringing in locals makes them more accepting of outcome and willing to apply.
- Bringing in skeptics helps avoid groupthink and broadens ideas.
- We often don't anticipate the questions that may be at the back of people's minds. We need to extract them in one to one relationships.

How to ensure it will occur?

- Get results
- Measure and report at highest level of agency
- Develop report card for each research area
- Must start at state level to get locals to follow
- Key factor of communicating and coordinating normally starts at the top
- Key to implementation is comfort – people must be comfortable with the ideas. This can come with familiarity and trust of collective office and of individuals.
- Need meetings to create handoffs from research to implementation, identifying who will do what, where resources will come from. This is not something that can be done with paper forms.

How can it be evaluated?

- Subjective measures of if it is working
- Survey – do people know about new technology or process?
- Recognize that not all technologies are universal. You may not see constant use due to varying needs.
- If the research confirms that what you're' already doing is correct, it counts as being implemented.

What will you take back?

- May need to dedicate a full time person to tech transfer to get it done.
- More videos
- Agency-wide newsletter solicitation of research ideas
- Solicit new research ideas at big conferences
- Emulate documents from Wisconsin

- Try the symposium concept at home
- Video clips from Texas
- FHWA Division coordinates very well w/ Iowa DOT
- Collaboration of transportation "community"
- Illinois dashboard measures
- Timeliness graph from Wisconsin going back a couple of years
- Report on communication w/ staff from Monique
- Establish a podcast and video site
- Rick's monthly email to staff
- Be sure to send out reports to staff not just RAC!
- Try to get more time from top management a la S Dakota
- Get an article in every issue of LTAPP newsletter
- Use database to drive web site as S Dakota does.
- Find out about 4 to 3 lane conversion conference and share w/ staff
- Talk to bridge people about getting IBRC/IBRD listings online. More detail than just title would be helpful. Be sure it's in RIP and TRIS.
- Health monitoring for high mast light towers
- Remind management of teen driver project
- TZD conference
- Need to plan t2 and be systematic about it.
- Reader friendly status reports
- Support for operational peer exchanges
- CalTrans video seminars
- Include performance measures in research notes
- Different techniques for different audiences.

Suggestions

- Involve top management in peer exchange
- Integrate Turner Fairbank researchers into symposium
- Cooperative suggestion: MNDOT does synthesis reports, TRB does research digests. Suggest states cooperate on topics for synthesis efforts. Each commit to doing specific topics, post on web site, use common format.

ATTACHMENTS

2007 Technology Transfer Peer Exchange
Agenda

Tuesday evening, August 14

6:00 Dinner & Introductions, Audubon's (Gateway Center)

Wednesday, August 15 – CTRE

8:00 – 8:15 Welcome – Sandra Larson

8:15 – Noon Presentation roundtable

How do you ensure tech transfer occurs?
What techniques do you use?
How do you evaluate its effectiveness?
Please bring examples to show!

8:15-9:00 – FHWA
9:00-9:30 – Illinois
9:30-10:00 – Ohio (video)
10:00-10:15 – break
10:15-10:45 – Kansas
10:45-11:15– Wisconsin
11:15-11:45 – Texas (video)

11:45 – 12:45 Lunch

12:45 – 3:15 Presentation roundtable continues

12:45-1:15 – California
1:15-1:45 – South Dakota
1:45-2:15 – CTRE
2:15-2:30 – break
2:30-3:00 – Washington (video)
3:00-3:30 – Minnesota
3:30-4:00 – Iowa

Research & Technology
Iowa Highway Research Board
Maintenance
Traffic & Safety
Bridges & Structures
Materials

4:00 – 4:30 Best practices discussion

6:00 Dinner at Lucullan's 400 Main Street

Thursday, August 16

8:30 – 5:00	MidContinent Research Symposium at Scheman Center
6:00	Symposium Banquet at Gateway

Friday, August 17

8:30 – 12:00	MidContinent Research Symposium at Scheman Center
12:15 – 1:15	Lunch at Scheman Center Presentation: *Use of Video Feedback for Teen Drivers*
1:30 – 4:00	Report Completion What makes tech transfer effective? How can we ensure appropriate tech transfer will occur? How can tech transfer be evaluated? What practices will you recommend putting in place at home?
6:00	Dinner (for those still in town)

Attachment 2

Participant Contact Information

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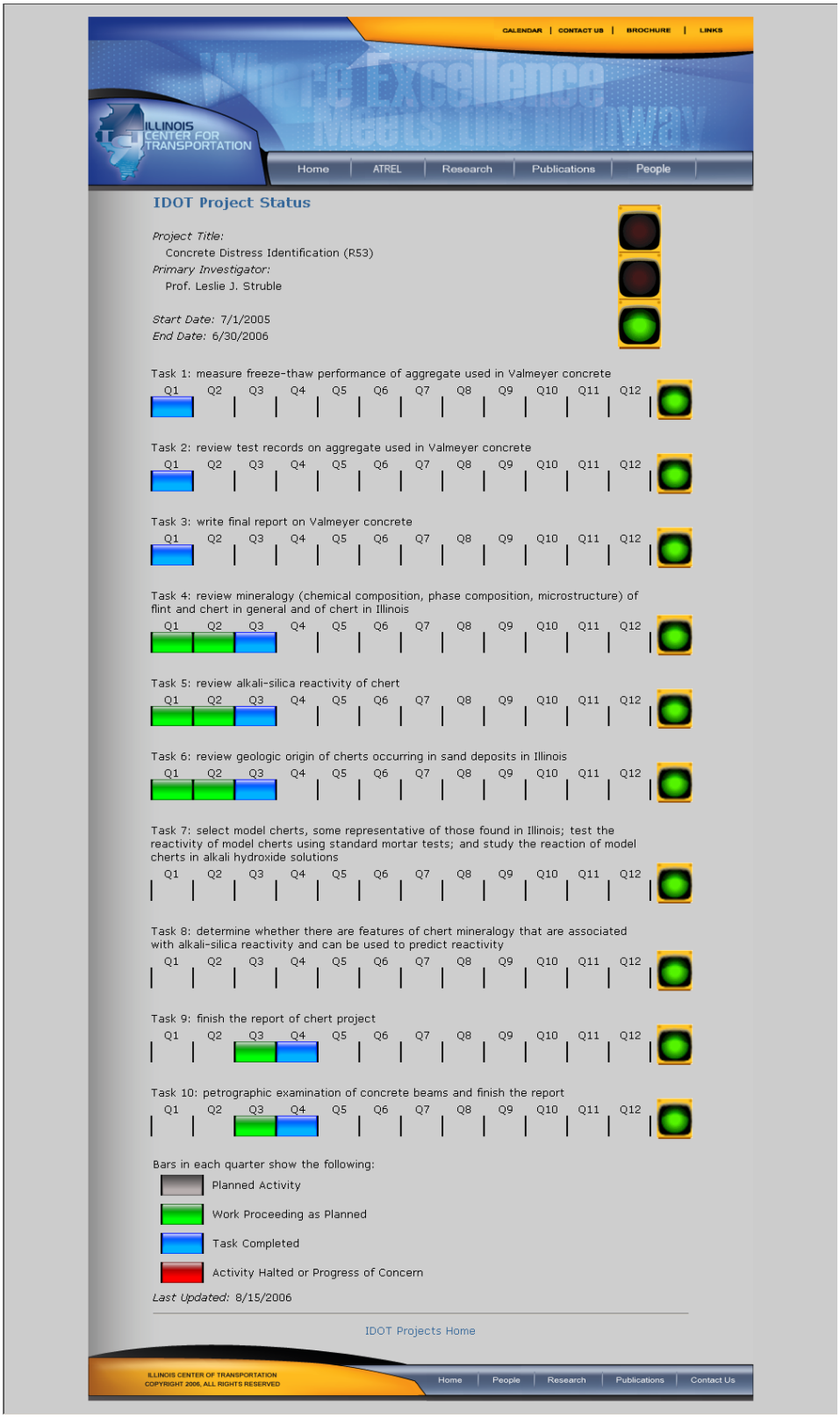
Illinois "Dashboard" for Project Status

To view live, go to http://www.ict.uiuc.edu/idotprojects.asp



Ohio DOT Research Assessment Plan

OHIO DEPARTMENT OF TRANSPORTATION
RESEARCH IMPLEMENTATION ASSESSMENT

SJN:	Y/N	SUPPORTING DATA	COMMENTS
BENEFITS			
Reduced overall cost			
Reduced cost/time ratio			
Increased performance/cost ratio			
Decreased cost/lifetime ratio			
Reduced overall time			
Increased overall performance			
Increased public safety			
Improved environmental conditions			
Supports ODOT's strategic initiatives			
Addresses customer's needs			
Wide scope of application			
Easily adaptable			
Supported by reliable, reproducible test data			
EFFECTS			
Changes needed with ODOT's existing structure			
Possible risks associated with the use or change in processes			
Departments or users that will be affected			
Legal or regulatory concerns			
Implementation costs for labor, materials, or overhead			
Funding sources			
OTHER			
Equipment from research project that should be retrieved for implementation			
Who should implement - internal staff or PI?			
FINAL IMPLEMENTATION CONCLUSION			

Figure 5.2

Kansas DOT Research Procedures and Implementation

KDOT Research Procedures and Research Implementation System

Iowa DOT
Research Peer Exchange Meeting
August 15, 2007

KDOT Organization

- Secretary of Transportation
- Asst. Sec. Of Transportation and STE
- Director, Division of Operations
- Chief, Bureau of Materials and Research
- Engineer of Research

Research Unit Organization

- Unit in Bureau of Materials and Research.
- 7 Sections.
- 26 FTE's plus temporary employees.
- Research staff oversees most internal agency RD&T activities including administration of university research program plus some planning and materials support functions.
- Staff from other bureaus also serve as project monitors on university research projects in their area of expertise.

KDOT Research Oversight

- Our research committee structure and wide involvement of other agency staff in monitoring the research program contribute to our success:
  - Research Program Council
  - Research Technical Committee
  - 7 Area Panels
  - Project Monitors

Research Committee Structure

- Research Program Council
  - Sets policy and approves annual K-TRAN program.
- Research Technical Committee
  - Based on input from APL's, evaluates proposed projects, prioritizes and recommends annual program.
  - Recommends policy.
- Area Panels (7)
  - Evaluates preproposals received and determines which to recommend and priority.

Research Program Council

- Secretary of Transportation, Asst. Secretary and STE, KSU and KU Deans of Engineering, 3 private sector members, FHWA Division Administrator & Research Director.
- Set policy and approve annual K-TRAN university research program.
- Establishes awareness, creates involvement, provides communications opportunities, allows inputs on potential policy needs.

Research Technical Committee

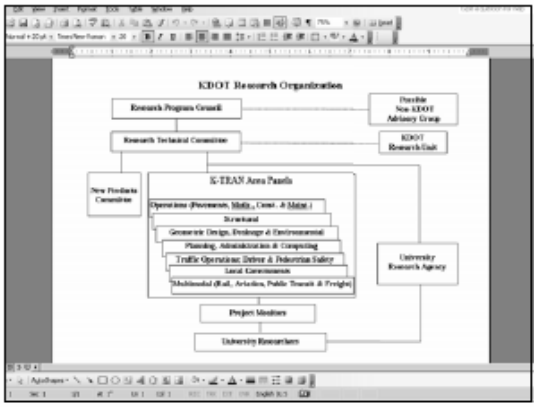
- 16 members: KDOT-6 bureau chiefs, 4 asst. bur. chiefs, T² Engineer, 4 faculty and 1 FHWA.
- 7 of 11 KDOT members are also Area Panel Leaders (APL).
- RTC develops list of prioritized candidate projects from APL recommendations
- Involves key staff interested research results that can be implemented

Area Panels (7)

- 4 fixed members each (KDOT-APL, FHWA, KSU, KU).
- Review research project statements assigned to their area panel and recommend candidate projects for funding to RTC.
- APL's assign project monitors typically from their bureaus, approve final reports for publication and assist with implementation efforts.

Area Panels

- Operations (Pavements, Materials, Construction & Maintenance)
- Structural
- Geometric Design, Drainage & Environmental
- Planning, Administration & Computing
- Traffic Operations; Driver & Pedestrian Safety
- Local Governments
- Multimodal (Rail, Aviation, Public Transit & Freight)



Strategic Management Plan

- Strategic Goal 5: "KDOT will optimize its use of technology to improve the efficiency and effectiveness of the department's operations."
- Objective: "Continue the research and development of technological applications to improve transportation and transportation related processes in Kansas.
- Strategy: "K-TRAN Program: Implement improvement efforts offered through the use of the K-TRAN Program/Continue K-TRAN projects. Obtain a beneficial return."

Strategic Management Plan

- Management Goal 5: "To preserve the condition of the SHS in its as-built or improved condition."
- Management Strategy--New Technologies and Techniques: "To research, review, evaluate and implement new technologies, techniques, and practices that continually improve transportation in Kansas."
- Output Measures: "Benefit to Cost ratio of K-TRAN projects"

NCHRP Synthesis 280-Seven Keys to Building a Robust Research Program

1. *Found it on trust*
2. *Market boldly*
3. *Root it in economics*
4. *Make deals unabashedly*
5. *Insist on accountability*
6. *Embrace policy research*
7. *Empower the staff*

Why is policy research important?

- Better factual information on policy issues available to top management
- Opens communications between top management and research director/staff
- Builds trust that can lead to support of traditional research

How we get policy research included in our program "without really trying"

- Established a research policy committee with top level managers and include senior managers on other research committees
- Solicit ideas widely on all topics
- Adopted procedures that allow/encourage policy and soft-side research
- Established a research program with access to outside experts to complement in-house staff
- Produce usable results in timeframe needed on critical policy issues

KDOT Keys

- Open communications policy and TQM principles overcome potential organizational issues
- Willingness to encourage and include all potential research topic areas
- Support of a university research program that provides access to experts as needed
- Research committee structure and university research administration policy increases number of persons involved with "research"

KDOT Keys (cont.)

- Flexibility: Needs that arise later in the process can be included at any step up until the final K-TRAN program is approved and funded
- Fast track option: Policy, TPF or emergency needs that have management approval are funded on an ad hoc basis.

Ad hoc University & Other Research

- In state university research projects are approved as needed for emergencies or special needs with approval of the Asst. Sec. and STE. (use interagency transfer funds)
- Out of state university, contractor and consultant research has to be funded from OOE budget. Much tougher to accomplish. Some OOE funds budgeted each year.

In House Research

- Focused primarily on applied research, development and implementation.
- Primarily ad hoc addressing agency needs as they arise with re-prioritization as needed.
- Track experimental features, test sections.
- Address construction problems (brushfires).
- Provide materials and planning support functions.
- Provide T2, technical training, library, LTAP admin.
- Administrative functions-tech. panels, committees.

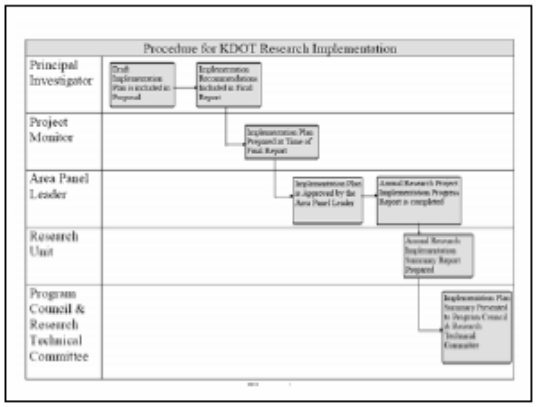
Transportation Pooled Fund Projects

- Solicitation requests are evaluated as received by technical area Bureau Chief(s), myself, Chief of Transportation Planning and Asst. Sec. and STE.
- Typically reviews and approvals of funding are completed within a week or less of initial receipt.
- Annual set aside budget of $700K.
- With KS as lead state: Work plan and overall cost estimate are prepared and posted on the TPF web site. Same approvals are required before solicitation is posted.

Research Implementation System

Implementation

- Implementation is now formally considered at each stage of project development.



Benefits Reporting History

- Our formal implementation plan is only used K-TRAN Program projects.
- K-TRAN Annual Assessment and Implementation Reports used 1993 through 1997 (all projects).
- K-TRAN Research Implementation Plans and Annual Progress Reports: since 1998 (all completed projects).

Research Implementation Plan

- A RIP is completed for each published K-TRAN project
- RIP is prepared by the Project Monitor with assistance from the PI and KDOT Technology Transfer Section staff
- Reality: Tough to get documentation from PM's since many findings are implemented before the final reporting stage

Research Implementation Plan

- Topics addressed:
  - Description/ID information
  - Summary of research findings
  - Implementation potential
  - Strategies for implementation
  - Task schedule for implementation
  - Implementation cost estimate
  - Project assessment using multi-objective criteria

KDOT RESEARCH PROJECT IMPLEMENTATION PLAN

RESEARCH STUDY NO.: K-TRAN:KU-03-4 KDOT PROJECT NO.: RE-0371-01

TITLE: Survey of Hydrologic & Hydraulic Design Criteria for Culverts and Bridges

PRINCIPAL INVESTIGATOR: McEroy

PROJECT MONITOR: Richardson

AREA PANEL LEADER: Brewer

CONTRACTING AGENCY: University of Kansas

STUDY COST: $50,000

A. SUMMARY OF RESEARCH FINDINGS - Enough detail should be given to provide a basic understanding of the project and does not containing reading the final report

B. IMPLEMENTATION POTENTIAL - Explain how the research study solved the problem, specify the types of changes being recommended, and describe the expected benefits of implementation (see Part F of this Form). Determine if implementation is warranted or further research or development is needed

C. IMPLEMENTATION STRATEGIES - The goals and scope of implementation, any potential problems or constraints, and the tools needed to achieve implementation. Include any approvals required.

D. TASK SCHEDULE - Describe tasks and assign responsibilities to functional areas and a time schedule for completion of activities

E. BUDGET ESTIMATE - Detail the expected costs of implementation as well as the anticipated benefit saving from implementation (See Part F of this Form)

F. PROJECT ASSESSMENT USING MULTI-OBJECTIVE CRITERIA - In the following Table, rate the project on the basis of the extent to which the project, if implemented, would result in a benefit in each of the assessment categories. Rate benefits 1 to 10, with 10 being the most successful. Rating Guide: N/A = factor does not apply to this project, 0 = absolutely no benefit, 1 = minimal benefit but the project has some slight benefit, 5 = no clear evidence but strong subjective feeling that the project has a significant benefit, 10 = clear evidence of

Assessment Category	Subjective Rating	Triennial Benefits ($)	Comments
Construction Savings (materials, Labor, equipment, time, quality)			
Operation and Maintenance Savings (materials, labor, equipment, time)			
Increase Lifecycle			
Decrease Lifecycle Costs			
Safety (Reduction of work zone injury, Reduction of crash severity)			
Decrease Bugs/Animals Costs (planning/design costs, paperwork)			
Environmental Aspects (pollution, hazardous waste reduction, recycling)			
Technology (technology transfer, new materials, new methods)			
User benefits (time, delays)			
Impact On KDOT Policy			

Prepared by: _____ _____

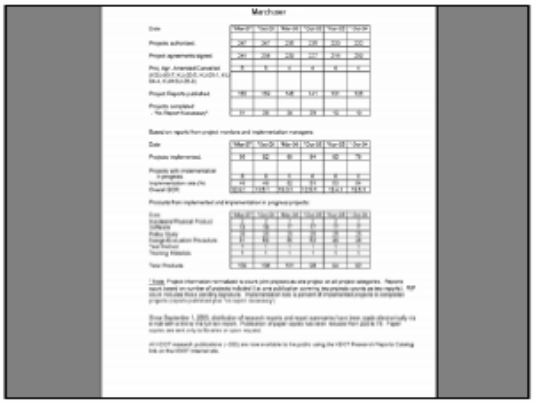
K-TRAN Project Monitor Date

Research Project Implementation Progress Report Form

- Adapted from OK DOT form
- Completed initially with RIP when project report is published, then annually by IM until implementation is completed
- Shows schedule and milestones completed
- Triennial benefits and costs listed with BCR (projected and actual)

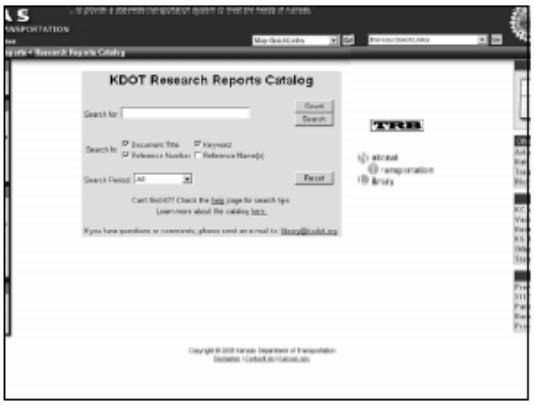
K-TRAN Products/Benefits March 2007(18 yrs.)

- 247 projects authorized, 199 completed, remainder in progress or authorized.
- 101 projects have products or findings implemented or in progress of implementation.
- 109 products documented.
- Benefit Cost Ratio—12.9:1

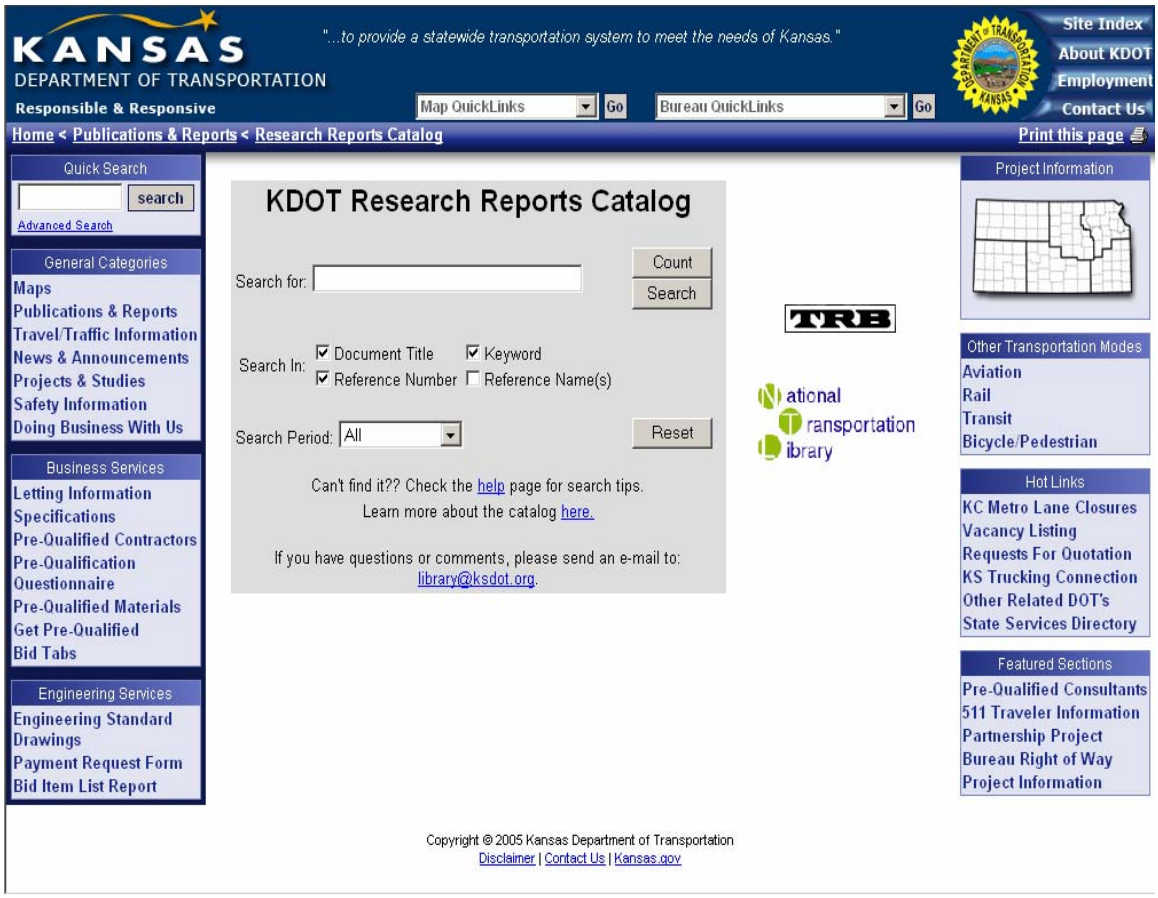


KDOT Electronic Library

- KDOT Document Management System is used as repository and "library catalog" for pdf files of full text publications and also those that have not be scanned.
- Web based search engine provides access to documents using KDOT intranet.
- 44,962 "documents" now entered into DMS.
- Estimate about 70% of documents are full text.
- About 371 full text research reports and 105 report summaries are available on the internet via the KDOT Research Reports Catalog.



Kansas DOT report search engine



Getting the Answers You Need

Identify need → Contact research staff → Select a service → Review results → Apply results → Measure impacts

Research and Information Services Timeline

	Regional and National Research			Wisconsin Research		
	Pooled Fund/ UTC Projects	NCHRP Synthesis Projects	NCHRP Projects	WHRP and Policy Projects	Ongoing Services	Evaluation/ Impacts
Nov						
Dec					Research briefs	
Jan						Quarterly reviews
Feb					Synthesis reports	Annual report
Mar					Literature searches	
Apr						Quarterly reviews
May					E-newsletters	
Jun					Peer exchanges	
Jul					Internet training	Quarterly reviews
Aug						
Sep						
Oct	$$	$$	$$	$$		Quarterly reviews

Legend: Submit problem statements; Select projects; Develop workplans; $$ Funds available

For More Information

State research

WisDOT Research and Library: www.dot.wisconsin.gov/library/index.htm
Wisconsin Highway Research Program (WHRP): www.whrp.org
Traffic Operations and Safety Lab (TOPS): www.topslab.wisc.edu
Construction and Materials Support Center: http://cmsc.engr.wisc.edu

Regional research

Transportation Pooled Fund Program: www.pooledfund.org
Midwest Regional University Transportation Center (MRUTC): www.mrutc.org
National Center for Freight and Infrastructure Research and Education (CFIRE): www.wistrans.org/cfire

National research

Transportation Research Board (TRB): www.trb.org
National Cooperative Highway Research Program (NCHRP): www.trb.org/crp/nchrp/nchrp.asp
Transit Cooperative Research Program (TCRP): www.trb.org/crp/tcrp/tcrp.asp
Airport Cooperative Research Program (ACRP): www.trb.org/crp/acrp/acrp.asp
National Cooperative Freight Research Program (NCFRP): www.trb.org/crp/ncfrp/ncfrp.asp
Hazardous Materials Cooperative Research Program (HMCRP): www.trb.org/crp/hmcrp/hmcrp.asp

Produced by CTC & Associates LLC
www.ctcandassociates.com

WisDOT Research and Information Services

WisDOT's Research & Library Unit manages a $3.5 million research program focused on applied research—research to develop usable solutions to specific problems. From multiyear research projects to rapid-response information gathering, we provide services to customers across the entire department. Through innovation and exceptional service, we help create transportation solutions.

Contact Us!

Whether you're interested in a full-scale research project or a quick-turnaround synthesis of information, we can help you develop your ideas and get a project under way.

(608) 261-8198
research@dot.state.wi.us

Jim McDonnell, Director
DBM Bureau of Business Services

Nikki Hatch, Chief
Research and Communication Services Section

Ann Pahnke, Program Analyst
Research & Library Unit

Peg Lafky, Program Analyst
Research & Library Unit

Pat Casey
CTC & Associates LLC

Kim Linsenmayer
CTC & Associates LLC

We're here to help

WisDOT Research and Information Services

Research and Implementation

Every year, WisDOT Research selects and funds research and implementation projects across a range of subject areas, from highway materials and construction to multimodal policy research. We manage research projects within our state, participate in regional pooled fund projects with other states and contribute to national research efforts. WisDOT also supports collaborative research activities, such as the Traffic Operations and Safety Lab and the Construction and Materials Support Center. Please contact us anytime. We'll work to find the program that best meets your research needs.

Wisconsin Highway Research Program

In action since 1998 and managed by UW-Madison, WHRP carries out research in five subject areas: asphalt pavement, concrete pavement, geotechnics, structures and data integration. Every fall we solicit research ideas from WisDOT staff in statewide bureaus and regional offices.

WisDOT Policy Research Program

This new research program will fund policy-related projects across a range of subjects. The projects will focus on evaluating the technical merit of current policies and the impacts of those policies on safety, operations, the economy and more. New projects will be selected based on the top priorities of the department.

Pooled Fund Program

This FHWA-sponsored research program allows states to pool their money to fund larger research projects of common interest. Every spring, the Research Program asks staff to nominate projects that WisDOT should help fund. See all current and completed pooled fund projects at www.pooledfund.org.

Research Impact

A bridge inspection guide produced through WHRP identifies 24 typical problems and visual indicators of deterioration in concrete and steel structures in Wisconsin, linking these signs to 40 deterioration mechanisms and 42 appropriate non-destructive evaluation methods for assessment. WisDOT distributed the guide to its bridge inspectors, saving engineers time and maximizing treatment impact.

Research Impact

A WisDOT-funded study compared the benefits of transit systems with the costs of operating them. Researchers found that investing in transit will produce a return of over $3 for each dollar spent at all potential state funding levels evaluated. They concluded that investing in transit in Wisconsin is economically worthwhile.

Information Services

WisDOT Research can help you quickly and effectively access the information you need to do your job. From synthesizing available research and best practices to training WisDOT staff on finding information on the Internet, we're focused on providing you with quick-turnaround services to save time and money.

Transportation Synthesis Reports

TSRs are brief reports that capture recent research and best practices on requested transportation topics. They help WisDOT staff learn from the experiences of other state DOTs, avoid duplicating research, identify new technologies and practices, make better investment decisions, and monitor federal guidelines and key transportation trends. Request a TSR on any subject anytime.

TSR Impact

In a survey of WisDOT staff who had requested and received TSRs, 83% of respondents indicated they "had applied or anticipated applying information in a TSR to improve processes, make decisions, implement technology, or make changes."

Training: Finding Transportation Information on the Internet

Our one-day, hands-on class will give you the tools you need to find transportation information online related to your professional responsibilities. Participants in our customized training sessions have included policy analysts, pavement engineers, environmental specialists and planners. Contact us to schedule a training session with your unit, section or bureau.

E-Newsletters

We keep WisDOT staff informed about research results, practical applications of research in the field and related technology transfer opportunities. Contact us to receive an electronic or print version of our newsletters.

Literature Searches

WisDOT's Research Program and Library both conduct targeted keyword searches to identify completed research on topics requested by WisDOT technical staff.

Peer Exchanges

To help WisDOT staff learn from other agencies' best practices, the Research Program provides planning and logistical support, travel expenses, and reporting services for WisDOT-hosted peer exchanges.

What is a peer exchange?

- Two- to four-day conference in Madison hosted by WisDOT
- Gathering of WisDOT staff, peers from other states (five to seven) and FHWA
- Presentations, discussions, roundtables—an intense and rewarding information exchange

Peer exchange topics have included real estate issues, indirect and cumulative impacts of transportation projects, Disadvantaged Business Enterprise programs, and research management.

Contact us to find out how you can take advantage of this valuable service.

Peer Exchange Impact

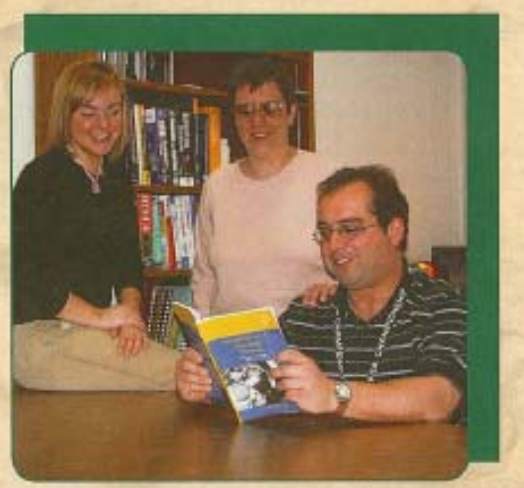
Peer exchanges are great opportunities for gathering new ideas, networking with peers nationally and involving WisDOT managers in strategic planning for your group. Virtually all of the participants surveyed about their peer exchange experiences have rated them "extremely valuable."

Home to one of the largest collections of transportation-related information in the country, the WisDOT Library Information or "iCommons" offers easy access to the latest published research materials, periodicals and daily newspapers along with transportation videos, DVDs and CDs. Publicly-available computer terminals and trained library staff can help you search the vast resources of the Internet to locate the specific information you need. Featuring a convenient location and comfortable seating, the WisDOT Library iCommons provides transportation professionals, the academic community and the general public a common area to find information and answers to virtually any transportation question.

The WisDOT Library iCommons is a central collection point for transportation materials on bicycling, pedestrians, railroads, waterways, public transit, airports and highways, along with motor vehicle and public safety issues. Since joining the Online Computer Library Center in 1984 — the largest global library cooperative in existence — the library has also become a member of the Midwest Transportation Knowledge Network and the Transportation Library Connectivity Study, providing access to a wealth of transportation information of all types from libraries throughout the world.

WisDOT Library iCommons

Open 8:30 a.m. — 4:30 p.m.
Monday — Friday



Hill Farms State Office Building
4802 Sheboygan Ave.
Room 100 P.O. Box 7957
Madison, WI 53707-7957

Phone: (608) 264-8142
Fax: (608) 261-6306
E-mail: library@dot.state.wi.us

Web:
http://www.wisconsin.dot.gov/library/

Intranet:
http://dotnet/dotlibrary/

4/07

Wisconsin Department
of Transportation

WisDOT
Library

Library and Information Commons

Hill Farms State Transportation Building
Madison, Wisconsin

Services offered at the WisDOT Library iCommons:

WisDOT Library iCommons staff provides assistance to DOT employees, private-sector partners and citizens to help incorporate cutting-edge transportation research and techniques into everyday job duties. The library iCommons can also assist with computer training, career development and much more! DOT employees may borrow materials directly from the WisDOT Library or other libraries using Interlibrary loan. The general public may also borrow items from the WisDOT Library by placing a request through their local public or academic library.

Other services include:

- Literature searches and other research assistance
- Searching in-house collections with online catalogs
- International Interlibrary loans
- Internet access at computer stations
- Online training and tutorials
- Photocopying and scanning
- Periodical routing
- Collection check-out
- Web casting (for DOT employees)
- A quiet, comfortable place to read and study

No time to visit? Take advantage of these other options:

- Telephone, fax or e-mail us your questions
- Search WisDOT Library collections from home
- Have items sent through Inter-Departmental mail

Resources available:

- Over 33,000 books and technical reports
- 300 periodical titles
- 450 videos and cassettes
- 250 CD-ROM titles
- Six daily newspapers
- Reference collections including atlases, maps and tourist information from the 50 states, phone books, transportation manuals, civil service exam study guides, income tax forms, computer books and popular magazines
- Resource sharing with other transportation libraries
- A comprehensive Web site including links to a wealth of transportation resources (*http://www.dot.wisconsin.gov/library/*)

Wisconsin DOT Research Links

Transportation Synthesis Reports -
http://www.dot.wisconsin.gov/library/research/reports/newreports.htm#tsr

Research Briefs

Asphalt paving - http://www.dot.wisconsin.gov/library/research/reports/asphalt.htm
Concrete paving - http://www.dot.wisconsin.gov/library/research/reports/concrete.htm
Geotechnics - http://www.dot.wisconsin.gov/library/research/reports/geotechnics.htm
Structures - http://www.dot.wisconsin.gov/library/research/reports/structures.htm

Research Videos - http://www.dot.wisconsin.gov/library/research/reports/video.htm

WisDOT Annual Research Report (right-hand side of page)-
http://www.dot.wisconsin.gov/library/research/reports/index.htm

WisDOT Research & Library E-News - http://www.dot.wisconsin.gov/library/research/reports/enews.htm

WHRP E-News - http://whrpnews.org/06-07.htm

Research Digest

FORWARD ALL REQUESTS TO:

The University of Texas at Austin
Center for Transportation Research
LIBRARY
3208 Red River • Suite 115
Austin, Texas 78705-2650
Phone: (512) 232-3126 and (512) 232-3138
Fax: (512) 232-3088
Email: ctrlib@uts.cc.utexas.edu

Research and Technology Implementation Office July 2007

Research Digest

Item 1

Developing a Stabilized Public Transportation Revenue Source

ARIZONA DEPARTMENT OF TRANSPORTATION

FHWA-AZ-07-620 • 2007

The objective of this research was to explore new dedicated funding mechanisms for public transportation for the State of Arizona. The research work began with a search of the existing literature on the subject to determine what other studies had been done about this topic and what innovative financing methods had been discovered. A great deal of information was found addressing public transportation funding and unique funding methods used around the country.

Most of the research indicated that various taxes, especially motor fuel tax, provided the majority of funding for public transportation thus far. One report in particular, the Survey of State Funding for Public Transportation 2005, published by the American Association of State Highway and Transportation Officials (AASHTO), proved to be particularly informative. This report is published annually and surveys all 50 states and the District of Columbia for their public transportation funding methods. The literature review was followed by a survey that was sent to each of the 49 other state departments of transportation to further investigate the topic, determine if any programs were in use that were not included in the AASHTO survey, and if any other states had conducted studies on public transportation funding not discovered in the literature review. The survey also inquired about legislation that other states have used to secure funding for public transportation.

The survey results were disappointing with very few responses regarding innovative programs or sources of funding. However, between the survey results and her own personal search, the researchers identified 23 pieces of relevant legislation, any of which could potentially serve as a model for future Arizona legislation. It would appear that innovative funding sources across the nation are very rare and often very personalized to the state affected. However, the researchers investigated the programs and legislation provided by the survey, along with what was found by their own research, in order to provide the most comprehensive report possible based on the limited response. The population and transportation needs for the State of Arizona will continue to increase significantly into the future. Finding a dedicated revenue source is the most effective way of ensuring adequate funding for public transportation that will serve the needs of users. Researchers believe that implementation of one or more of the above potential options will lead to more revenue dedicated to public transportation for the State of Arizona.

Full-text PDF of this report is available for free download from

http://www.azdot.gov/TPD/ATRC/publications/project_reports/PDF/AZ620.pdf

Item 19

Managing Pedestrian Safety I: Injury Severity

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

WA-RD 671.1 • 2007

This study focused on the severity of injuries and fatalities incurred by pedestrians colliding with motor vehicles. The report includes a thorough review of the literature and a description of new research carried out on correlates of injury severity and measures of their relative effects on fatal or high injury collisions. The correlates consisted of both individual-level factors and attributes of environments at or near pedestrian collision sites.

The study focused on state routes in King County, Washington. Data came from police records processed by the Washington State Department of Transportation (WSDOT) from 1999 to 2004. They included objective and modeled data in GIS on road characteristics, traffic conditions, and land uses at or near collision sites.

The results of binary and ordinal logistic models showed that fatal and high injury collisions were strongly and significantly associated with (1) a pedestrian crossing at an unsignalized intersection (versus crossing at all other locations or walking along the roadway); (2) the vehicle moving straight ahead on the roadway (versus all other types of vehicle actions). There was a lack of association between injury severity and collision frequency, suggesting that safety programs intended to reduce the number of collisions and those intended to reduce the risk of severe injury and death should use different approaches. The latter should focus on individual factors such as driver or pedestrian actions and behaviors, as well as on road environment factors such as speed limits and intersection signalization. Finally, better reports and data on vehicular speed at the time of collision, and on the type of vehicles involved in pedestrian collisions, would help to inform effective future safety programs, policies, and standards.

Full-text PDF of this report is available for free download from

http://www.wsdot.wa.gov/research/reports/fullreports/671.1.pdf

Item 20

ITS Backbone

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

WA-RD 676.1 • 2007

In this brief report, we provide a description of the activities in each of the areas to which the Backbone contributes, and we provide supporting statistics for each of these contributions. The form of these statistics varies by application area: (1) potential viewers, in the case of TrafficTV, (2) page views, in the case of MyBus, (3) data stream use, in the case of Busview, (4) number of downloads, in the case of the Self Describing Data (SDD) Toolkit and, (5) use of the Web services.

The ITS Backbone has been financially supported by WSDOT to provide a level playing field to distribute detailed real-time and historical data to the public, private, and research sectors.

Full-text PDF of this report is available for free download from

http://www.wsdot.wa.gov/research/reports/fullreports/676.1.pdf

Research Digest

The University of Texas at Austin
Center for Transportation Research
LIBRARY
3208 Red River • Suite 115 • Austin • Texas • 78705-2650
Phones: (512) 232-3126 and (512) 232-3138 • Fax: (512) 232-3088
Email: ctrlib@uts.cc.utexas.edu

July Issue 07-07

Please check the box for the item(s) you want to borrow.

❑ 1	FHWA-AZ-07-620	❑ 11	VTRC 07-R20
❑ 2	FHWA/MT/06-012/8117-31	❑ 12	VTRC 07-R21
❑ 3	FHWA/MT-06-016/8117-27	❑ 13	VTRC 07-R25
❑ 4	FHWA/MT/07-002/8117-34	❑ 14	VTRC 07-R26
❑ 5	FHWA/MT/07-005/8117-33	❑ 15	VTRC 07-R29
❑ 6	FHWA/MT-07-007/8117-28	❑ 16	WA-RD 647.1
❑ 7	FHWA/NC 2004-18	❑ 17	WA-RD 665.1
❑ 8	LTRC 419	❑ 18	WA-RD 669.1
❑ 9	MS 7978	❑ 19	WA-RD 671.1
❑ 10	VTRC 07-CR10	❑ 20	WA-RD 676.1

These items are available on a **two-week** loan basis.

Please fill out form completely and use other side of this page to mail in order. Thank you.

NAME_____

D/D/O_____

MAILING ADDRESS_____

_____

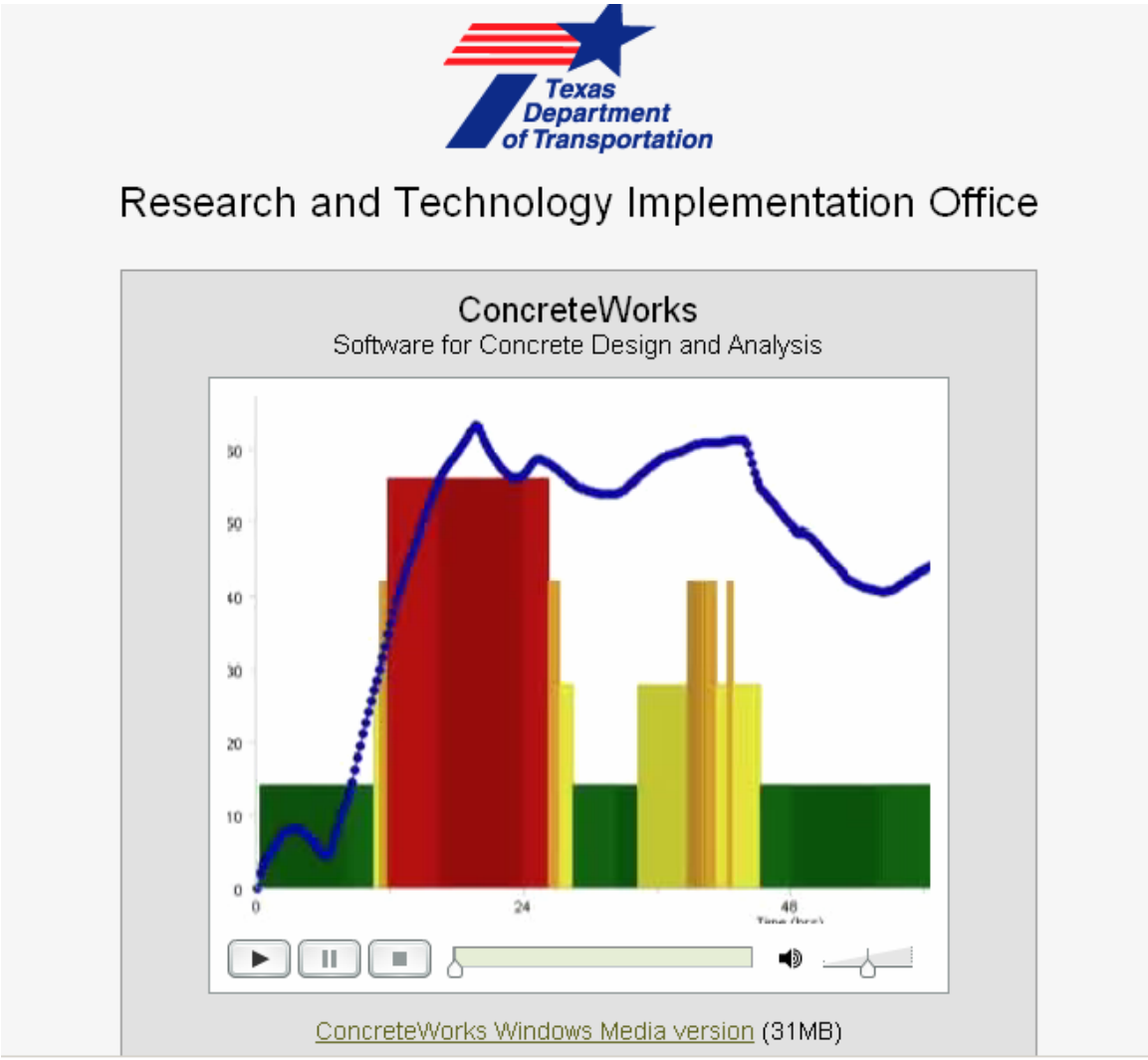
_____

EMAIL_____

Attachment 11

Texas DOT Video Clips

View these at http://dmgdemo.tamu.edu/RTIvideos/



California Department of Transportation

Division of Research and Innovation (DRI)

Nick Burmas

Office Chief, Office of Materials and Infrastructure

Caltrans

1

How do you ensure Tech Transfer Occurs?

- Technology Push
- Champions
- Senior Management Support
- Pilot Projects and Demonstrations
- Early Involvement of Users
- Partnerships
- Progress Monitoring and Committed Funding
- Marketing and Communications

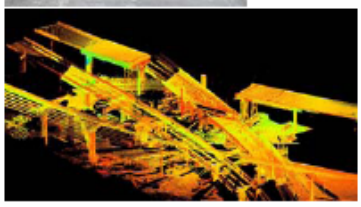
2

TECHNOLOGY PUSH:

Laser Metrology

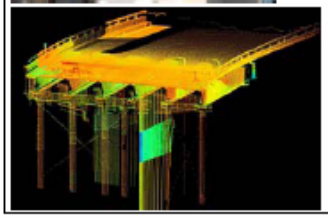
Unexplored tool for rapid damage assessment and alignment data.

Provided a Digital Topographical Map, Super Elevation and trajectory diagram of I-580 connector in Caltrans specified coordinates within 6 hours of scanning with absolutely no interference or work stoppage of construction and maintenance personnel on the site.



Real life and Laser Point Cloud Images of MacArthur Maze

Real life and Laser Point Cloud Images of cross-section of reinforced concrete truss (I-580 East side connector)



Research Process Committee Structure

- *RDSC* - Research and Deployment Steering Committee
- *RDAC* – Research and Deployment Advisory Committee
- *PSCs* - Program Steering Committees
- *TAPs* - Technical Advisory Panels

5

ShakeCast – A Tool for Post Earthquake Bridge Inspection

Division of Research & Innovation

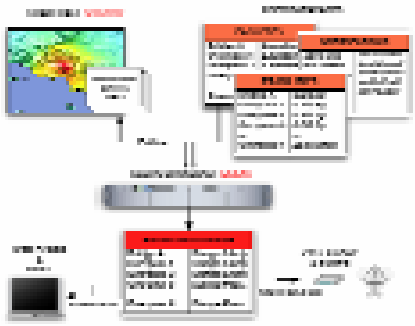
Office of Materials & Infrastructure

6

Project Details

- Contract with the United States Geological Survey (USGS) initiated in March 2006.
  - 3 years
  - $200,000
- Scope of Contract: Develop ShakeCast system that provides:
  - Automated earthquake and bridge performance analysis
  - Produce maps and bridge inspection priority lists.
  - Web-based interface to administer system and provide products to users.

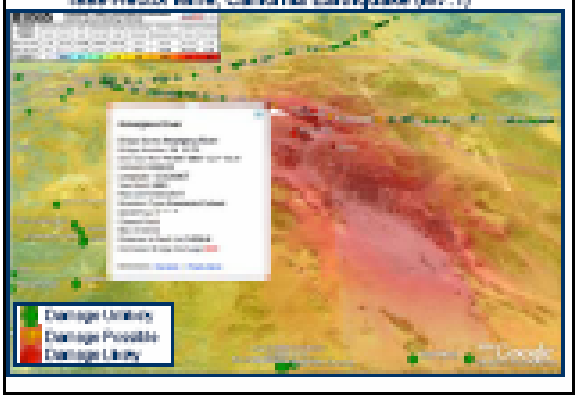
ShakeCast System



Example ShakeCast Notification (Caltrans)

Facility Damage Estimates from ShakeMap

1999 Hector Mine, California Earthquake (M7.1)



Balsi Beam

Increased National Involvement

- NCHRP
- TRB
- TIG
- POOLED FUNDS

What Techniques do you use?

- Roadmaps
- Video Conferences (Research Connection)
- LTAP
- Demonstration Projects
- Newsletters
- 2-Page Informational Document
- Training
- Showcases
- Internet

Video Teleconference – Research Connection

Partnered Pavement Research Center* - Road Map for Research (July 2007 *draft*)
Aligned with Pavement Program Steering Committee's Research Priorities and Objectives

***PPRC is a contract between the University of California Pavement Research Center (UCPRC) and the Division of Research and Innovation (DRI)**

Outcome: Policies and business practices that preserve and enhance California's pavement resources and investments through:

1. Improved delivery of pavement projects and services by Caltrans through new and improved methods and specifications
2. Optimized pavement performance and lower life cycle costs of pavement
3. Finding ways to design and build pavements with longer service lives to reduce congestion from recurring maintenance and rehabilitation
4. Finding ways through pavement research to make the transportation system in California the safest in the nation for travelers and workers through smoother pavements and more efficient maintenance and construction

Research Areas & Problem Statements								
	1. Pavement Management System	2. Smoothness	3. Preservation	4. Quiet Pavements	5. Construction Practices	6. Mechanistic-Empirical Design	7. Long Life Pavements	8. Recycling
Problem Statements	Problem #1: Information and data on the pavement infrastructure and highway network within California are not readily accessible or available to all possible end users.	Problem #2: Perception by the public that pavements as currently constructed and maintained within California provides unacceptable poor ride quality.	Problem #3: Pavement preservation techniques are not well understood within the transportation industry and state-of-the-art standards are nonexistent.	Problem #4: Perception by the public and FHWA that pavements as currently constructed and maintained within California result in unacceptable levels of noise.	Problem #5: Highway networks have reached near capacity and construction activities have increasingly negative impacts on the traveling public. Ways to increase construction efficiency and decrease time of lane closures need to be investigated.	Problem #6: With the advent of computers and algorithms it is possible to develop a more scientific approach to the design and analysis of pavement performance and to accurately predict the life of pavements and to determine as well the associated life cycle cost.	Problem #7: Congestion, increased travel times, and accidents associated with frequent construction and maintenance activities have become more prevalent with increase in population.	Problem #8: High quality sources of materials for constructing pavements are becoming more and more scarce relative to the location of construction projects. The scarcity of materials has created a need to find ways of reusing or recycling sound, in-place materials.
Overview - PPSC Objectives	Develop the ability to track pavement structural sections, related pavement performance, and pavement innovations over time by creating an Enterprise Pavement Management System.	Smoother pavements and higher ride quality.	Pavement preservation techniques, guides, and decision trees and the development of a center of excellence for training and research.	New and better maintained pavements that produce decreased levels of noise.	Faster construction capabilities through prefabrication, new techniques, new materials, composite pavements, and software.	Mechanistic-Empirical (ME) software applications that can be integrated within an enterprise-wide Pavement Management System.	Proven structural designs and construction practices that result in significantly increased service life of pavements.	Proven techniques of recycling in-place materials and a well trained and equipped industry workforce.
	Status: • This objective will be coordinated with PPSC objectives 2 thru 8. • PMS project: At the direction of the Directorate the State Pavement Program Manager (SPPM) has prepared an action plan to build a first generation pavement management system (PMS). UCPRC Work: • Pilot Project for Visual Segmentation of the avement Network. Report completed by UCPRC in 2006. Determined the feasibility of defining fixed highway network segments and determined data	Status: • Incentive / disincentive specification was developed and put in use in 2005. One year of data (2003) was analyzed and a protocol needs to be developed so that researchers can have access to smoothness data. • Comparison and Verification of Equipment. Comparisons among manual, retrofitted, and computerized road profilographs and bridge profilographs were made. Verification among different inertial	Status: • Various industry/CT groups have been established for pavement preservation issues under Pavement Preservation Task Group (PPTG) umbrella. • A Pavement Preservation Center has been set up at CSU, Chico and will do tech transfer from research and coordinate with other PP work being conducted by Caltrans. UCPRC will coordinate with CSU Chico and PPTG. UCPRC Work:	Status: • An initial roadmap and approach to understanding sources of noise has been completed in a cooperative effort between Caltrans and UCPRC (Work Plan for: "Investigation of Noise, Durability, Permeability and Friction Performance Trends for Asphaltic Pavement Surface Types", 20 June 2005). This road map is being reviewed by FHWA as a Quiet Pavement Research plan. In the meanwhile testing is being performed by DRA	Status: • A software application (CA4PRS) has been developed by UCPRC to determine optimum construction scenarios that result in minimal impacts on the traveling public has been developed and demonstrated. UCPRC Work: • Calibration of HiperPav for California Conditions. Hiperpav is FHWA software for analysis of early-age PCC cracking. A comprehensive review was completed and 4 projects were instrumented and analyzed. (PPRC SPE3.1.1) • Evaluation of Concrete Maturity	Status: • Caltrans has decided to move to ME design methods (Caltrans Issue Memo, Jan 2005). • First versions of ME software applications have been developed by AASHTO (NCHRP 1-37a) and by UCPRC (CalME). • Bench testing including sensitivity analysis has been accomplished. Additional testing on both is ongoing & will be completed in 2007. • NCHRP periodically sending	Status: • Caltrans/UCPRC have developed and used new Long Life pavement reconstruction designs and specifications. The construction projects completed are being monitored to determine the effectiveness of the specifications and design. UCPRC Work: • Quality Assurance Laboratory Testing for AC Long Life Pavement Mix Designs, 1710 (PPRC SPE 3.1.4) and 1-710 Phase 2 Support (PPRC SPE 3.2.11). Developed structural section and mix design, QA lab testing, long-term monitor-	Status: • Asphalt concrete using recycled waste tires has been used by CT for more than 20 years. Half thickness overlay design was verified by UCPRC in 1990s. There is a recent legislative mandate to use more recycled tires. There are opportunities to use them in additional asphalt products. • Deep in-situ recycling pilot projects using recycled asphalt pavement as unbound base and as

CALTRANS DIVISION OF RESEARCH AND INNOVATION

DRI GOODS MARKETPLACE

FRESH IDEAS IN TRANSPORTATION - DAILY!

VOLUME 1, ISSUE 1 MAY 2007

VII California To Contribute to National Program

The US Department of Transportation recently added Caltrans' Vehicle Infrastructure Integration (VII) California testbed to the national VII effort, providing Caltrans and its partners the opportunity to go online with "standardized" or common hardware and software to conduct experiments that both translate into and scale with US DOT experiments in Michigan and Washington DC.

What is VII?

The VII vision is that every car manufactured in the U.S. would be equipped with a communications device and a GPS unit so that data could be exchanged with a nationwide, instrumented roadway system. Data transmitted from the roadside to the vehicle could warn a driver that it is not safe to enter an intersection. Vehicles could serve as data collectors and anonymously transmit traffic and road condition information from every major road within the transportation network. Automobile manufacturers could more quickly notify drivers of warranty or recall needs. These and many more outcomes can be realized through the Vehicle Infrastructure Integration initiative. The National VII Coalition has been established to determine the feasibility of widespread deployment and to establish an implementation strategy. The Coalition consists of automobile manufacturers, AASHTO, ten State Departments of Transportation, and the US DOT.

The Caltrans Component

Recognizing the value of VII as a potential solution to transportation challenges that effect mobility, Caltrans established the VII California Testbed. Through the collaborative efforts of Caltrans, Metropolitan Transportation Commission (MTC), BMW North America, DaimlerChrysler Research, Engineering and Design North America, Toyota InfoTechnology Center, and Volkswagen of America Electronics Research Laboratory, the testbed would test VII feasibility to "pave the way" for VII implementation.

Currently, the VII California Testbed consists of approximately 60 miles of roadway (including freeways and arte-

(Continued on page 3)

Today's Specials

Research Connection Explores Human Behavior

On Thursday, May 24th, DRI's Research Connection Event featured Dr. Delphine Cody. Delphine Cody is a Psychologist at the California PATH program at UC Berkeley. Her role is to apply her knowledge of drivers' cognition and behavior to transportation safety issues.

Since joining California Partners for Advanced Transit and Highways (PATH), she has been involved in driver models development, evaluation of a Cooperative Adaptive Cruise Control, description of driver behavior at intersection supporting the development of driver decision support systems, development of a prototype of a Driver's Situation Awareness Support system.

For more information on Research Connection Events, please visit the Research Connection Website!

Ms. Delphine Cody
Psychologist
California PATH

The Deployment Central Branch

The Deployment Central Branch works with project managers in the implementation of transportation research and innovation including products and services that improve the efficiency, safety, and security of the transportation system and that support the Department's strategic goals.

Here you will find a sampling of deployed, soon to be deployed and commercialized products developed through the Division of Research and Innovation.

For more information on these and other products, please visit Deployment Support

Balsi Beam

Deployed

Over the years many Caltrans employees have been seriously injured or lost their lives while working on or near the California State highways. The Caltrans Division of Equipment developed a truck-mounted, expandable beam that will provide work zone protection comparable to a concrete barrier. The system consists of a tractor-trailer combination, where the trailer extends and transforms into a 30-foot long work zone protector. The Mobile Work Zone Protection Device is now deployed in the field by the Caltrans Maintenance Division to gain experience in its operation and evaluate its performance.

The Balsi Beam was accepted by the American Association of State Highway and Transportation Officials (AASHTO) Technology Implementation Group (TIG). The TIG helps develop a process to prioritize and select technologies on which to focus implementation efforts and solicit potentially ready to implement technologies.

For more information on Balsi Beam visit Click Here.

Deployed

Construction Analysis for Pavement Rehabilitation Strategies (CA4PRS)

CA4PRS is designed to identify optimal rehabilitation solutions that balance on-schedule construction production, traffic inconvenience, and agency costs.

An additional benefit is attained when CA4PRS results are integrated with macroscopic and microscopic traffic simulation tools for estimating road user delay costs that arise from construction.

During the design and construction phases of highway rehabilitation projects, CA4PRS helps transportation agencies, contractors, and consultants develop staging construction plans , establish CPM schedules , estimate cost (A) + schedule (B) contracts and calculate incentive/disincentive specifications .

For more information on CA4PRS Click Here.

Current DRI Research Reports

Research Summaries

AHMCT

ATMS Testbed

California PATH

California Center for Innovative Transportation

Cooperative Vehicle-Highway Automation Systems

Intelligent Vehicle Initiative

Institutes of Transportation Study

UC Berkeley

UC Davis

UC Irvine

UCLA

University Transportation Centers

Metrans

Mineta

UCTC

UC Davis

UCPRC UPDATE

Field and laboratory work under the Partnered Pavement Research Program — managed by Caltrans Division of Research and Innovation (DRI) and performed by the University of California Pavement Research Center (UCPRC) — continues to bring results that support the Pavement Research Roadmap. The program has recently produced a variety of publications based on its work, including Design Guides, Research Reports, and Technical Memoranda.

The Roadmap includes projects that improve the understanding of the diverse pavement problems related to corrosion resistance of steel dowels and that develop tools to help test and monitor pavement preservation innovations. In support of this, UCPRC published a research report and two guides:

Laboratory Evaluation of Corrosion Resistance of Steel Dowels in Concrete Pavement (UCPRC-RR-2005-10)

A full version and a summary version of the *Pavement Preservation Studies Technical Advisory Guide* (UCPRC-GL-2005-01 and UCPRC-GL-2005-02).

Another problem identified in the Roadmap is the impact on roadway traffic associated with frequent construction and maintenance activities. To address problem, UCPRC performed tests using the Heavy Vehicle Simulator (HVS) to identify structural designs and construction practices that significantly increase the service life of pavements. Results are presented in the report:

Construction and Test Results on Dowel Bar Retrofit HVS Test Sections 554FD, 555FD, 558FD, and 559FD: State Route 14, Los Angeles County at Palmdale (UCPRC-RR-2006-02).

The UCPRC supports the Department's adoption (in 2005) and long-term implementation of the mechanistic-empirical design method. Research is adding knowledge and will produce software tools that will rely on engineering mechanics for design and analysis of pavement performance. The ability to predict pavement life and associated life-cycle costs also will support the Department's Pavement Management System. Evaluations and design tools are documented in these publications:

Sample Rigid Pavement Design Tables Based on Version 0.8 of the Mechanistic Empirical Pavement Design Guide. (UCPRC-TM-2006-04)

Calibration of Incremental-Recursive Flexible Damage Models in CalME Using HVS Experiments. (UCPRC-RR-2005-06.)

Sensitivity Analysis of 2002 Design Guide Rigid Pavement Distress Prediction Models (UCPRC-DG-2006-01).

These items can be obtained from the UCPRC web site or from Caltrans Contract Manager Michael Samadian .

DRI FEEDBACK

Question, comment, concern:

PLEASE PRINT

DROP YOUR COMMENTS IN FEEDBACK BOX AT FRONT RECEPTION DESK

THANK YOU

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Why DRI?

The purpose of the California Department of Transportation (Caltrans) Division of Research and Innovation (DRI) is to stimulate innovation by performing applied, customer-developed and focused transportation research that yields tangible products and improved processes that enhance mobility across California. Innovations in methods, materials, technologies, policies, and practices enable Caltrans to effectively use and manage public facilities and services, protect public investment in transportation infrastructure, and enhance and expand mobility options. The DRI is responsible for administering Caltrans' research program and is comprised of six offices: Materials and Infrastructure; Management Support; National Liaison; Planning, Policy, and Innovation; Technology Applications and Traffic Operations Research.

DRI seeks to take full advantage of strategic opportunities to find low-cost, public, and private solutions that substantially increase the value of taxpayer dollars invested in present and future public infrastructure, and make California's technological industries competitive in emerging global transportation technology markets. With direction from Caltrans' Research and Deployment Steering Committee (RDSC), a committee comprised of District Directors and Deputy Directors, DRI:Establishes and facilitates the process to identify, select, program, manage, and implement research; meets all federal-aid program requirements, including the preparation and maintenance of Caltrans' Research Manual and the State Planning and Research (SPR) Part II, Annual Work Program; sets the research agenda based on the involvement and participation of its internal and external customers; performs and develops applied transportation research for all modes of transportation; provides technical assistance to its customers to deploy transportation research products; engages in both short- and long-term research; manages research projects and obtains funding for the research.

South Dakota Department of Transportation
Research Implementation Report

Study Number: SD98-02 — Research Review Board Action: 12/3/93
Title: Maintenance Painting of Older Structures — Secretary of Transportation Direction: 12/3/93

#	Research Review Board Recommendation	Secretary's Direction	Responsible Division	Responsible Office	Action To Date	Date Completed
1	The Division of Operations, with concurrence of the Division of Engineering's Office of Bridge Design, should eliminate the use of epoxy multicolyurethane maintenance painting systems.	Approved	Operations Engineering	Maintenance Support Bridge Design	Done - Maintenance Standard changed and issued. We have not used epoxy mastic primers since 1991. Switched to alkyd paint system in 1993. This activity is complete	7/23/94 12/93
2	The Division of Operations, with assistance from the Division of Engineering's Office of Bridge Design and the Division of Planning's Office of Research, should develop new specifications for surface preparation and maintenance painting of older structures. In noncorrosive environments, VOC- compliant alkyds should be used. In corrosive environments, a surface tolerant inhibitive epoxy and polyurethane system should be used. Surface preparation should employ biodegradable water-based cleaners, 4000 psi power wash, abrasive sandblasting and power tool cleaning	Approved	Operations Engineering Planning	Maintenance Support Bridge Design Research	Done - Maintenance Standard changed and issued. We have let several projects which used non-lead based alkyd systems, as per the consultant's report. Our paint construction specifications are to be revised in Spring 1995. Project inspectors need a paint inspection manual which tells them how to use equipment, what to inspect, and how to document the inspection. Some inspection equipment is on hand and some is on order.	7/23/94
3	The Division of Planning's Office of Research should purchase, at a total cost of approximately $4200, one paint adhesion tester for each Region's use in evaluating the condition of existing paint.	Approved	Planning	Research	Adhesion testers were purchased and delivered to each region and to the Office of Materials & Surfacing.	6/13/95

National Concrete P

Effective Construction Training Program for Hispanic and American Supervisors and Craft Workers

tech transfer summary

An effective training program can increase worker productivity in multilingual crews by reducing unnecessary conflicts and tensions between Hispanic and American construction workers.

July 2007

RESEARCH PROJECT TITLE
Effective Construction Training Program for Hispanic and American Supervisors and Craft Workers, Phase IV

SPONSORS
Iowa Department of Transportation (CTRE Project 05-132)

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The mission of the National Concrete Pavement Technology Center is to unite key transportation stakeholders around the central goal of advancing concrete pavement technology through research, tech transfer, and technology implementation.

ctre Center for Transportation Research and Education

IOWA STATE UNIVERSITY

conducted by Dr. Jaselskis at Iowa State University, the project team determined that language was not the sole issue; rather, the problems were related to differences in culture and relationships.

The training course developed as part of this project—the Toolbox Integration Course for Hispanic workers and American supervisors (TICHA)—consisted of nine modules covering basic terms in English and Spanish (words, colors, body parts, and numbers), as well as terms related to safety and the workplace. These materials were presented in a unique fashion centered on developing and nurturing personal relationships between workers and supervisors.

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The training session would usually occur on the job site, prior to the start of the work day. A typical day's training session would begin with a brief review of previous material. Next, the current session's material would be presented, followed by a question and answer session between the workers and their supervisor. For example, the workers would ask the supervisor to say the word for "trowel" in Spanish (paleta), often by pointing at the picture in the training material. The supervisor would then ask one of the workers how to say "chaleco" in English (safety vest). The cultural aspect to this process lies in educating the workers that it is acceptable to ask questions and that a question is preferable to a mistake. The supervisor thus learns that the workers are not accustomed to asking questions of their bosses. By encouraging questioning in a non-threatening environment (one in which there is no penalty for asking), relationships are improved and differences are reduced and understood.

Sample of training material

Research was also conducted, using nine experimental and four control groups, to measure the effectiveness of the training.

Handing out training material

Key Findings

- The TICHA course resulted in quantifiable improvement in English (on the part of the workers) and Spanish (on the part of the supervisors) language skills in the experimental groups when compared to the control groups.
- Supervisors felt that productivity and safety had improved in their teams as a result of the training.
- Training given by a native Spanish speaker, also fluent in English, provided a better connection to the workers; this trainer was better able to understand and ameliorate the cultural differences between the workers and supervisors.
- Safety improvements, although not statistically significant, were seen. A review of relevant literature suggests that two to three years of safety data are required for an adequate analysis of safety benefits.

Implementation Benefits

- An integrated program of language and cross-cultural training can improve interpersonal relations and communications, yielding improvements in work quality, safety, and employee retention.

Implementation Readiness

- Additional training and testing will be performed as a part of a project extension, planned for the fall of 2007.
- The method can be applied to workers in other industries, although in some cases the training material would need to be modified to match the needs and skills of the new industry group.

Reviewing training material

ctre
Center for Transportation Research and Education

Testing HMA Density with Electromagnetic Gauges

tech transfer summary

Electromagnetic gauges offer nondestructive testing of in-place HMA with real-time results for effective QC/QA decision making.

May 2007

RESEARCH PROJECT TITLE
Investigation of Electromagnetic Gauges for Determining In-Place HMA Density

SPONSORS
Iowa Highway Research Board (TR-541)
Iowa Department of Transportation (CTRE Project 03-233)

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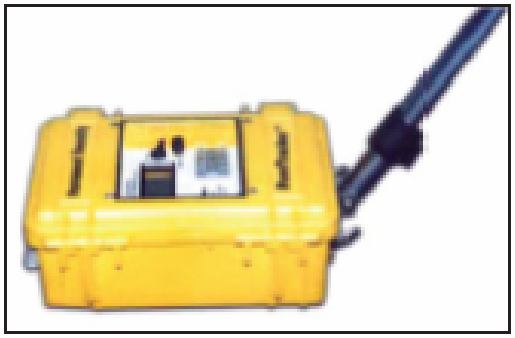
Objectives

- Compare the accuracy and precision of two electromagnetic gauges—the Pavement Quality Indicator (PQI) model 301 and the PaveTracker model 2701—to that of core density testing of hot-mix asphalt (HMA) pavement.
- Determine which gauge, if either, should be considered for quality control and quality assurance testing.

Problem Statement

Density is a critical factor that directly influences HMA pavement quality and long-term performance, as well as contractor incentives and disincentives. The coring process traditionally used for obtaining density is time-consuming, costly, and can create imperfections in new pavements—even though the sample locations are properly repaired.

Nuclear density gauges are an alternative to coring, but they involve other complications, including the risk of exposure to radiation and strict licensing, record-keeping, usage, and storage requirements. Consequently, there is demand for a density-measuring device that is reliable, easy-to-use, rapid, nondestructive, and nonradioactive.



PaveTracker gauge manufactured by Troxler Electronics Laboratory

Research Description

Test data were collected in the field during and after paving operations as well as on field mixes compacted in a laboratory for PaveTracker, PQI, and cores. PQI density readings were collected both in single mode and multi mode.

Data were analyzed and grouped by variable to determine which of the following tested factors affected density readings:

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- Fifteen different sites
- Two conditions (wet and dry HMA pavements)
- Seven different contractors
- Two nominal maximum aggregate sizes (NMASs) (12.5 mm and 19.0 mm)
- Five traffic levels (ranging from 300,000 to 30 million ESALS)
- Three aggregate types (limestone, slag/limestone, and quartzite)
- Three separate roller passes

Key Findings

Analysis revealed the following with regard to specific gauges and operational modes:

- The statistical analysis of PaveTracker density readings implied that condition (i.e., wet or dry), contractor, aggregate type, NMAS, traffic level, and roller pass were all significant variables affecting density measurements.
- For the single-mode PQI operation, the statistical analysis revealed that station, pavement width, distance across pavement width, and temperature are significant.
- Statistical analysis of multi-mode PQI data revealed that site, station, pavement width, contractor, aggregate type, binder content, roller pass, and distance across pavement width were significant variables.

Analyses of both electromagnetic devices, the PaveTracker and PQI, indicate that both are sensitive to density changes due to roller passes, which suggests that these devices could be used for quality control. Other results from this research include the following:

- As the application of quality indices reveals, quality assurance conclusions based on PQI data would be equivalent to those based on cores in most cases. If used for determination of payment, PaveTracker densities in this study would result in contractor penalties more often than PQI densities.
- According to the statistical analysis, no variables are considered statistically significant for all three electromagnetic gauge data sets. However, two out of three data sets (i.e., PaveTracker and multi-mode PQI readings) are significantly affected by contractor, aggregate type, binder content, and roller pass.
- The location of a core across the width of a pavement can result in significantly different density readings for the same pavement. The PQI's variability tends to be greater than both the PaveTracker and extracted cores.
- In laboratory tests, analyses indicate that only the condition (i.e., wet or dry) and density-reading device affect density results. This implies that mixes with slag can be evaluated with either device and not yield significantly different results than a non-slag mix compacted to the same air void level.
- The newer PQI algorithm was found to be more accurate than the older algorithm with about the same level of precision on laboratory-prepared samples.

Implementation Benefits

The substantial reduction in testing time that results from employing electromagnetic gauges rather than coring makes it possible for more readings to be used in the QC/QA process, offering real-time information without increasing the testing costs. Since electromagnetic gauges offer nondestructive testing, the new pavement does not incur imperfections due to core sampling. Electromagnetic gauges do not require the extensive licensing and record-keeping necessary for nuclear density gauges, nor do they involve the potential radiation hazards.

Implementation Readiness

Using test strips to determine an appropriate adjustment factor is critical for effective QC/QA testing with electromagnetic gauges. Because several different mix- and project-specific factors affect the readings, implementation of these gauges will likely need to rely on test strips for each new project and mix.

To ensure the appropriate implementation of electromagnetic gauges, there is a need for additional research that considers the following elements:

- Increased electromagnetic gauge testing frequency
- Analysis of new electromagnetic gauges that have come onto the market

Further research should be conducted on the PaveTracker and PQI to establish guidelines. It is recommended that the latest algorithms be employed when conducting future research with electromagnetic gauges.

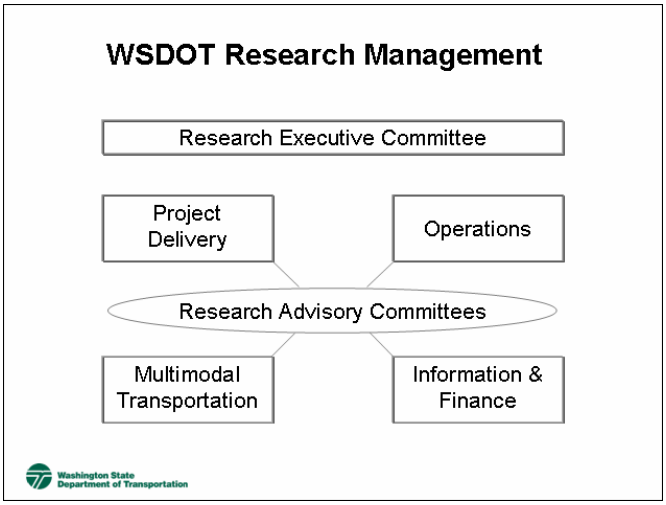
TransTech Systems' Pavement Quality Indicator

Technology Transfer at WSDOT

2007 Technology Transfer Peer Exchange
Iowa Department of Transportation
August 15, 2007

Organization of WSDOT Research Committees

WSDOT has five Research Committees. The Research Executive Committee (REC) provides sets strategic goals for the WSDOT Research Program. Four Research Advisory Committees (RACs) were created by the REC to focus on critical business functions of the department. These four committees are chaired by members of the REC. The RAC members are Office managers responsible for functions of the department (State Materials Engineer, State Maintenance Engineer, Planning Director, etc.). The RAC facilitates the identification of research needs from within the department, prioritize these needs, and forward recommendations to the REC. They also review project status and outcomes. The involvement of senior managers in the identification of needs and oversight of projects helps facilitate implementation of research results.



The following are ways that WSDOT communicates about research activities and results.

Increasing Program Awareness

- A Communication Plan has been developed to identify key audiences the Research Program is trying to reach and messages we seek to convey. The WSDOT Communications Office provides templates and support to develop communication plans.
- An Executive Monthly Report is prepared each month for the Chief of Staff and distributed to agency executives, the Federal Highway Administration Division contact for research, members of the Research Advisory Committees, and university TRAC Directors. The monthly report summarizes completed research projects, new starts, key project progress, program news, and library activity. http://www.wsdot.wa.gov/Research/
- The WSDOT Research web site is includes a description of the research program, copies of recent research reports (older reports are being digitized to

load on the web site), a form for submitting research proposals, copies of the quarterly newsletters, information about the WSDOT library and access to the library catalogue. The web site includes the Research Procedures Manual, office newsletter and a collection of standard forms, white papers and links to a variety of useful sites and other information. http://www.wsdot.wa.gov/Research/

- The TRAC Biennial Report is prepared every two years and summarizes many of the research activities conducted at the University of Washington and Washington State University – primarily but not exclusively with funding from WSDOT. http://depts.washington.edu/trac/otherpubs/index.html
- Research folios are prepared as a means to give a brief overview of aspects of the WSDOT Research Program. Folios have been prepared to describe Transportation Research, WSDOT Research Management, and Transportation Research Programs. Audiences vary for each folio but may include the Congressional Delegation, agency employees, university professors, and the public. http://www.wsdot.wa.gov/Research/AboutUs.htm
- Open House: A WSDOT Research Open House was conducted in 2006. It included displays of the research process and research results, a videoconference about TRAC and TransNow, and visits by faculty. The response to the open house was very positive. Many employees appreciated information about this 'little known' program. http://www.wsdot.wa.gov/NR/rdonlyres/769BEEC4-497E-47C8-8E69-13E5D8A7AD68/0/WSDOTInvestigatesResearchattheOpenHouse.doc

Project Specific Tech Transfer Tools

- Transportation Synthesis Reports are developed on topics of importance to senior managers within the department. The synthesis reports are modeled after those conducted by Wisconsin DOT and CTC and Associates. The reports provide summaries of literature, web pages, surveys and other state of the practice information.
- Project Status Reports are provided to the REC and RACs so that they are aware of project progress. The status reviews are being modeled after quarterly project reviews of the agency's construction projects. A status is provided for all projects but discussion focuses on those that are deviating from planned schedule, budget or scope expectations.
- All Research Final Reports are distributed to all state research programs, national libraries, repositories and other interested entities. WSDOT publishes research findings in a consistent publication format and distributes to a wide audience of potential users. The summary of project implementation is reported in the Monthly Executive Report as well as the Biennial Implementation Report. All reports are entered into the Washington State Library and WSDOT Libraries where they are accessible through WorldCat and TLCat. They are also available through a searchable online database. http://www.wsdot.wa.gov/Research/Reports/
- Research Notes provide the end user with a summary review of a research project and describes how to implement the work in the field. They are designed to help the lay person understand how to use the research through photographs and more instructional details. http://www.wsdot.wa.gov/Research/Working/Notes.htm

- Workshops/Seminars: At the conclusion of selected research projects, a workshop or presentation may be conducted to explain the research and discuss the findings.
- LTAP Newsletter: The WSDOT Technology Transfer (T2) Center quarterly newsletter includes a section from the Research Office in each publication. The articles are prepared by Research Managers and Technical Monitors and focus on projects that may be of value to local government. http://www.wsdot.wa.gov/TA/T2Center/T2Bulletin/2007Summer.pdf
- A Research Listserve is in development and will be used to push information about research program activities and research results to interested employees.
- The WSDOT Lessons Learned Database may be a mechanism to distribute new methods to the user community. This is currently an internal-only database but may be made available to a broader community in the near future.
- Awards received for research projects are documented and shared through the Executive Monthly Report and web page.

How do we ensure Tech Transfer occurs?

- Encourage a culture of innovation (see additional attached information)
- Involve Division and Office Directors in the evolution and selection of research projects.
- Require Technical Monitor and Researcher to think of implementation needs, including technical transfer, when the project is developed.
- Include training in the research project scope when appropriate.
- Encourage the inclusion of technical staff in the conduct of the research project to foster interest in and use of the products.
- Provide "excuse-remover" funding as needed
- Build and facilitate relationships with WSDOT customers and researchers.

How do you evaluate the effectiveness of Tech Transfer?

- Developing awareness of implementation plans and technical transfer needs within Research Advisory Committees
- Work to capture stories of the use and value of research reports
- Testing the Research Performance Measures database

I'm very interested in learning how others evaluate their programs.

Challenges to Technical Transfer

- Technical Monitors do not have adequate time to develop implementation plans and information for Research Notes.
- Many technical staff targeted to review of draft reports do not review them. This can lead to "late objectors" to use South Dakota's phrase. In accurate information can end up in published documents that are challenging to retract.

- Resources within the Research and Library Services Office are not adequate to maintain and develop material to push research results to user communities as much as needed.

Ideas picked up from the Peer Exchange

- More graphic/reader-friendly status reports. (WisDOT)
- Providing support for peer exchanges through the Research Office (WisDOT)
- The Project Status websites (Illinois)
- Using short targeted video clips (TxDOT)
- Video seminars (Caltrans)
- Investigate inclusion of performance measures in Research Notes (OHDOT)

Supporting a Relevant Research Program

Telling the stories of success is key to maintaining the relevance and effectiveness of research. If research is understood to be valuable, it is more likely the culture to maintain and improve support for research will follow.

That's not to say this is easy. We're busy people. Short, focused messages that convey the benefits of work are important. Look for appropriate forums to share informatio. Use a variety of formats and delivery methods.

WSDOT has looked at why research is so successful in our State Materials Lab. They have a reputation, both internally and externally, for conducting very useful research. In their view, items that support their success are:

A work culture that supports investigation

- Business plan goals identify research objectives
- Position Descriptions include work tasks in support of research and testing
- Workload is managed to include research activities
- Management expects research project completion and monitors progress
- Research activities are results oriented and results are quickly and obviously incorporated into agency work methods/policy
- Research results are actively marketed through written summaries and advocacy in discussion
- Research benefits are captured and used as justification for additional resource devoted to investigation

An environment of innovation

- Experimental approaches are encouraged (New Products, Experimental Features, Literature Searches/Investigation, Lessons Learned)
- Employees are encouraged to participate in national research conferences to identify potential solutions and leverage the synergy possible with other innovators

A strong network geared to problem solving

- Relationships with researchers are developed and maintained beyond individual projects
- Connections with other states foster sharing of research results and partnering to address knowledge gaps
- Research results are used to influence national guidance through participation in national meetings

Certainly, support by the leadership of the department can help increase the expectation to use research as a tool in addressing agency challenges. And being an innovative agency can help attract new employees.

Lastly, it's important to be nimble, to think outside of traditional research and help investigate new areas of need. Programs should also be flexible – quick turn around research, synthesis studies, surveys may help meet the needs of the department. Research Programs should flex as the needs of the organization change.

Technology Transfer at WSDOT

[redacted]

Two Focus Areas

1. Increasing awareness of the research program and services.
2. Increasing awareness of research results and facilitating their use.

Increasing Program Awareness

- Executive Monthly Report
- WSDOT Research web site
- TRAC Biennial Report
- Research folios
- Open House

Executive Monthly Report

- Prepared each month for the Chief of Staff and distributed to agency executives, the Federal Highway Administration Division contact for research, members of the Research Advisory Committees, and university TRAC Directors.
- Summarizes completed research projects, implementation of research results, new starts, key project progress, program news, and library activity.

http://www.wsdot.wa.gov/Research/

WSDOT Research Web Site

- Includes a description of the research program, ongoing activities; access to all WSDOT sponsored research reports; and much more.
- Always a "work in progress".

http://www.wsdot.wa.gov/Research/

TRAC Biennial Report

Prepared every two years and summarizes many of the research activities conducted at the University of Washington and Washington State University – primarily but not exclusively with funding from WSDOT.

Research Folios

- Prepared as a means to give a brief overview of aspects of the WSDOT Research Program.
- Current Folios describe Transportation Research, WSDOT Research Management, and Transportation Research Programs.
- Audiences vary for each folio but may include the Congressional Delegation, agency employees, university professors, and the public.

Research Open House

- A WSDOT Research Open House was conducted in 2008. It included displays of the research process and research results, a videoconference about TRAC and TransNow, and visits by faculty.
- The response to the open house was very positive. Many employees appreciated information about this "little known" program.

How do you ensure Tech Transfer Occurs?

- Involve District and Office Directors in the evolution and selection of research projects.
- Require Technical Monitor and Researcher to think of implementation needs, including technical transfer, when the project is developed.
- Include training in the research project scope when appropriate.
- Encourage the inclusion of technical staff in the conduct of the research project to foster interest in and use of the products.
- Provide "lessons-learned" funding as needed.

Tech Transfer Techniques

- Final Research Reports
- Research Notes
- Workshops/Seminars
- LTAP Newsletter
- Research Listserve

Opportunity
- To link to the Lessons Learned database

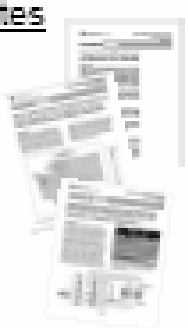
Research Final Reports

Distributed to all state research programs, national libraries, repositories and other interested entities.

http://www.wsdot.wa.gov/Research/Reports/

Research Notes

- Provide the end user with a summary review of a research project and describes how to implement the work in the field.
- They are designed for the lay person to help increase awareness of the project results and implementation plans.



http://www.wsdot.wa.gov/Research/Publications/Notes.htm

Workshops/Seminars

- At the conclusion of selected research projects, a workshop or presentation may be conducted to explain the research and discuss the findings.
- Conducted at the discretion of Research Managers and Technical Monitors.

LTAP Newsletter

- The WSDOT Technology Transfer (T2) Center quarterly newsletter includes a section from the Research Office in each publication.
- The articles are prepared by Research Managers and Technical Monitors and focus on projects that may be of value to local government.

Research Listserve

- Is in development and will be used to push information about research program activities and research results to interested employees.

Evaluating the effectiveness of Technology Transfer

- Developing awareness of implementation plans and technical transfer needs within Research Advisory Committees
- Work to capture stories of the use and value of research reports
- Testing the Research Performance Measures database

Contact Information

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Director, Office of Research and Library Services
Washington State Department of Transportation
OmanL@wsdot.wa.gov
360-705-7974

Mn/DOT Technology Transfer 8/14/07

Alan Rindels
Research Program Development Engineer
Research Services Section,
www.research.dot.state.mn.us

What is RSS role?

- Help the offices
  - Develop research ideas
  - Find individuals to perform research
  - Publish research results
  - Manage financial aspects of projects
  - Assist and fund the implementation of the research

Carol's Request

- How do you ensure Tech Transfer Occurs?
- What Techniques do you use?
- Please bring examples.

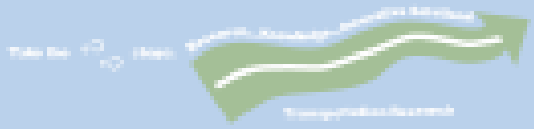
Definitions:

Research:

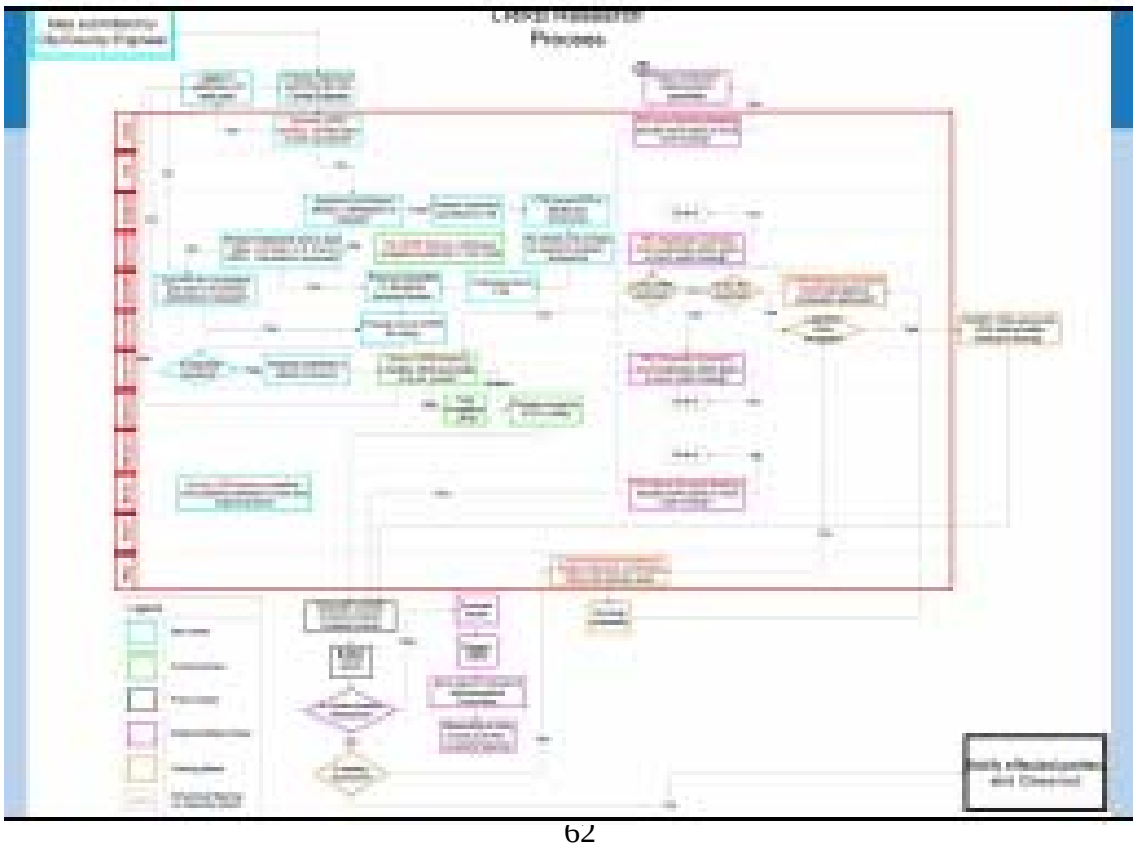
- basic, applied, desktop

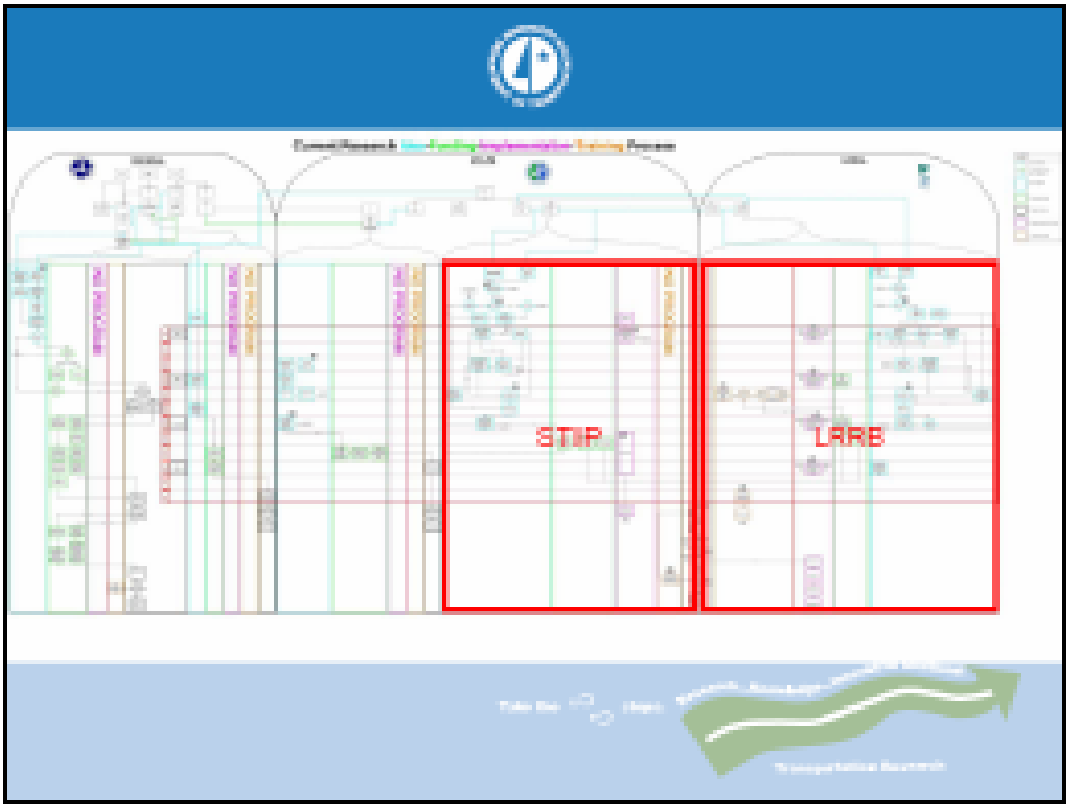
Implementation:

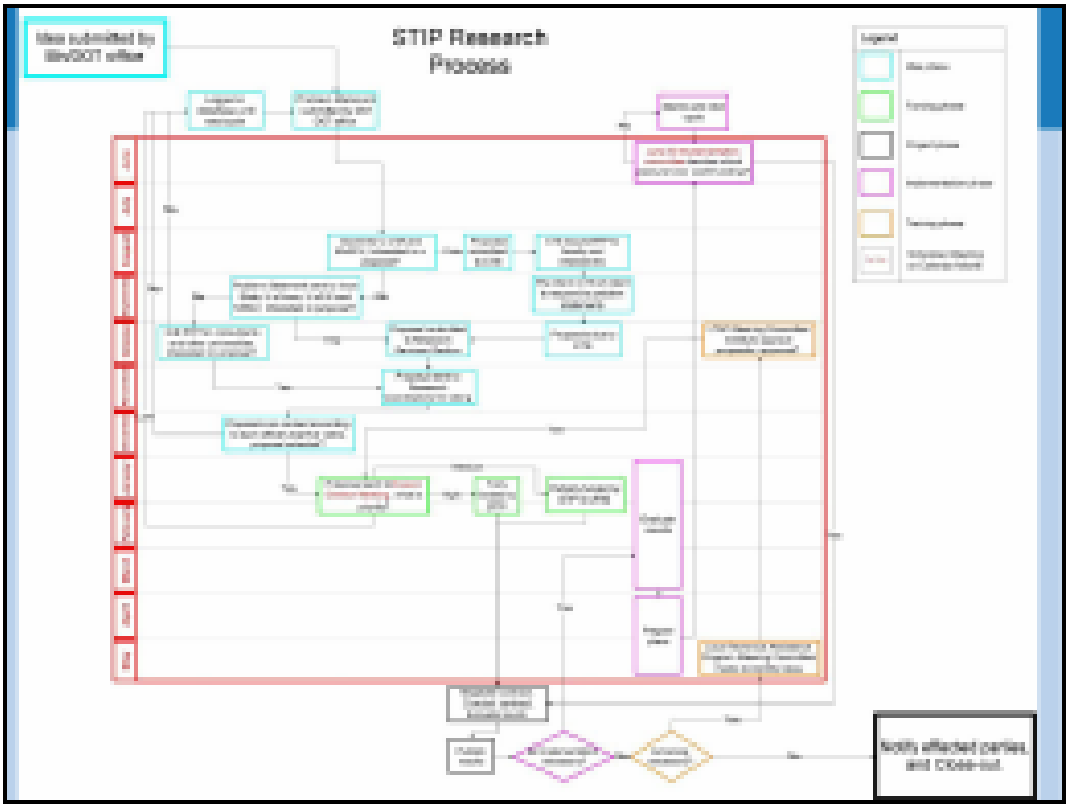
- is the process of putting the results of research into practical use in order to realize a measureable return on an investment in research.



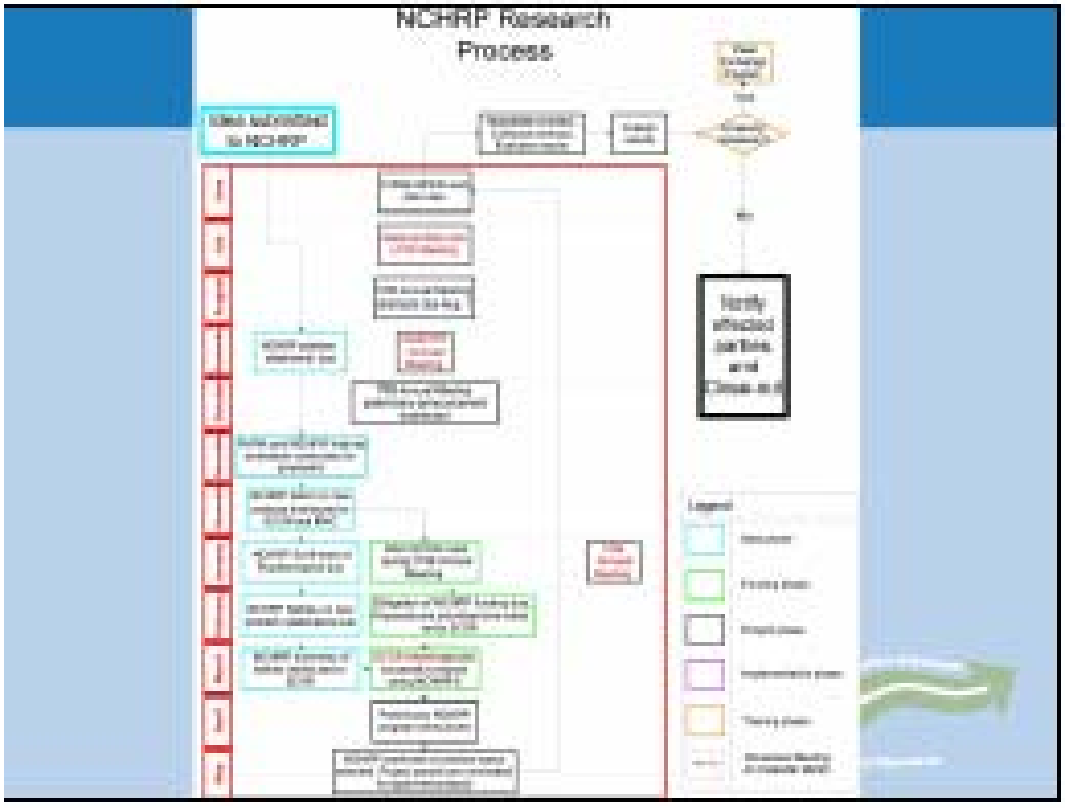

LRRB

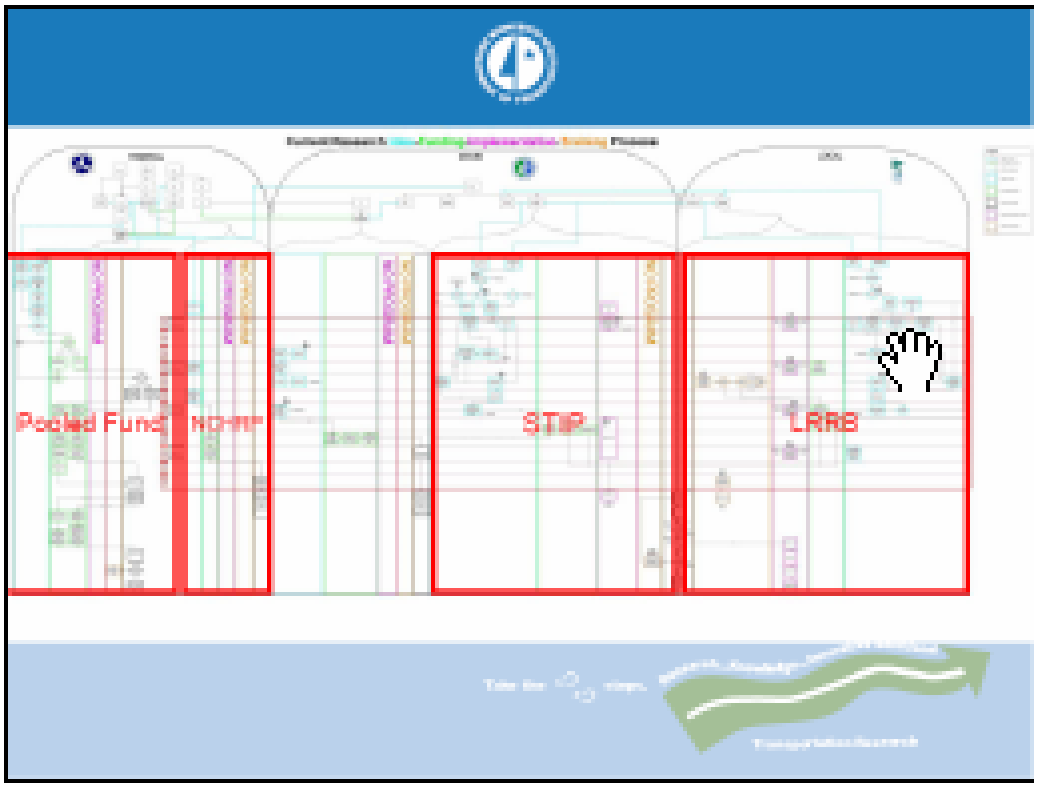


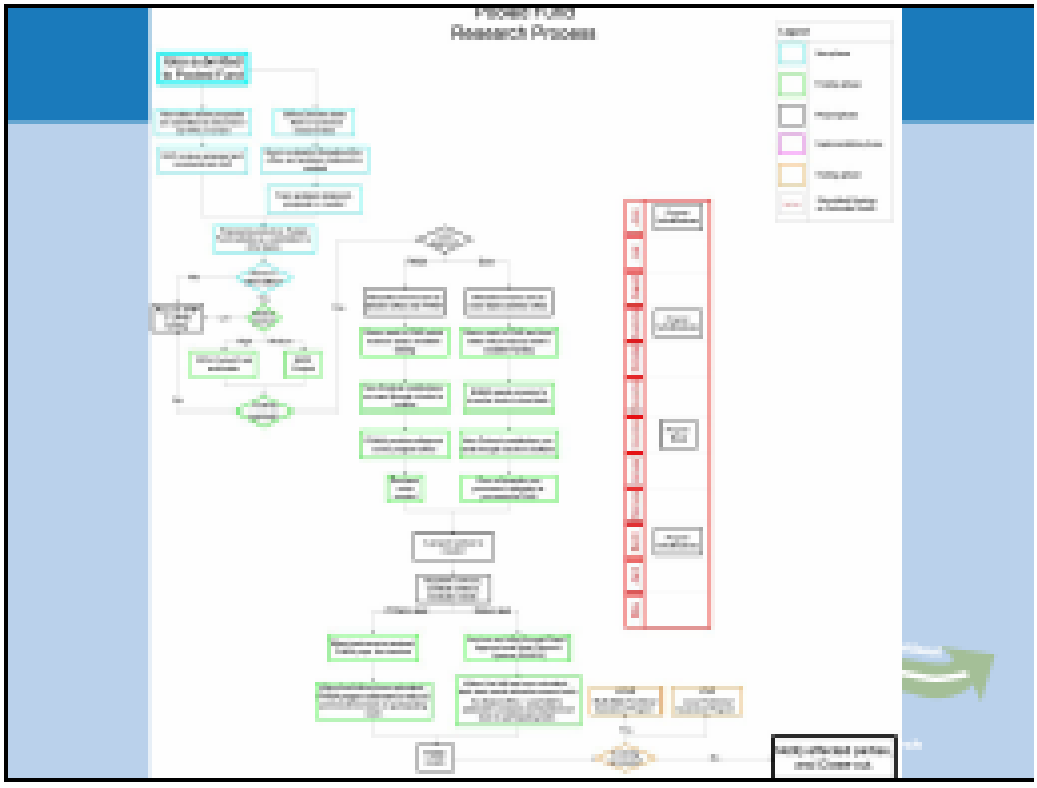

STIP
LRRB

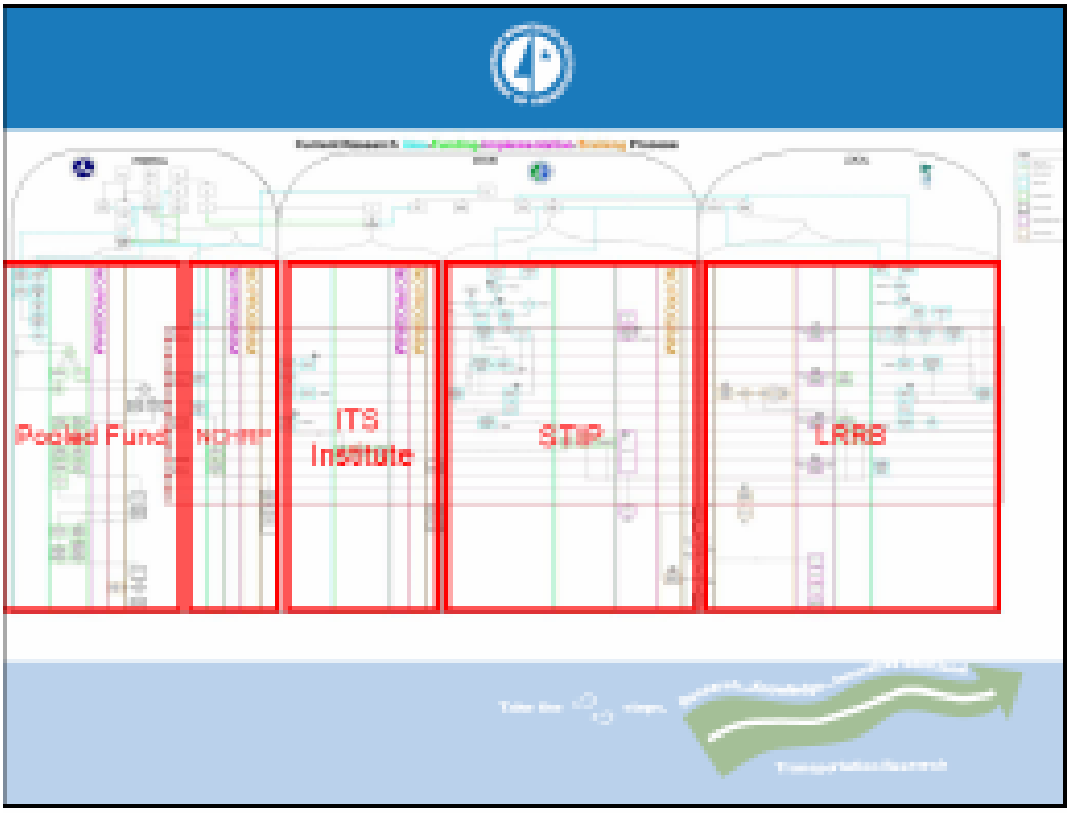

STIP Research
Process

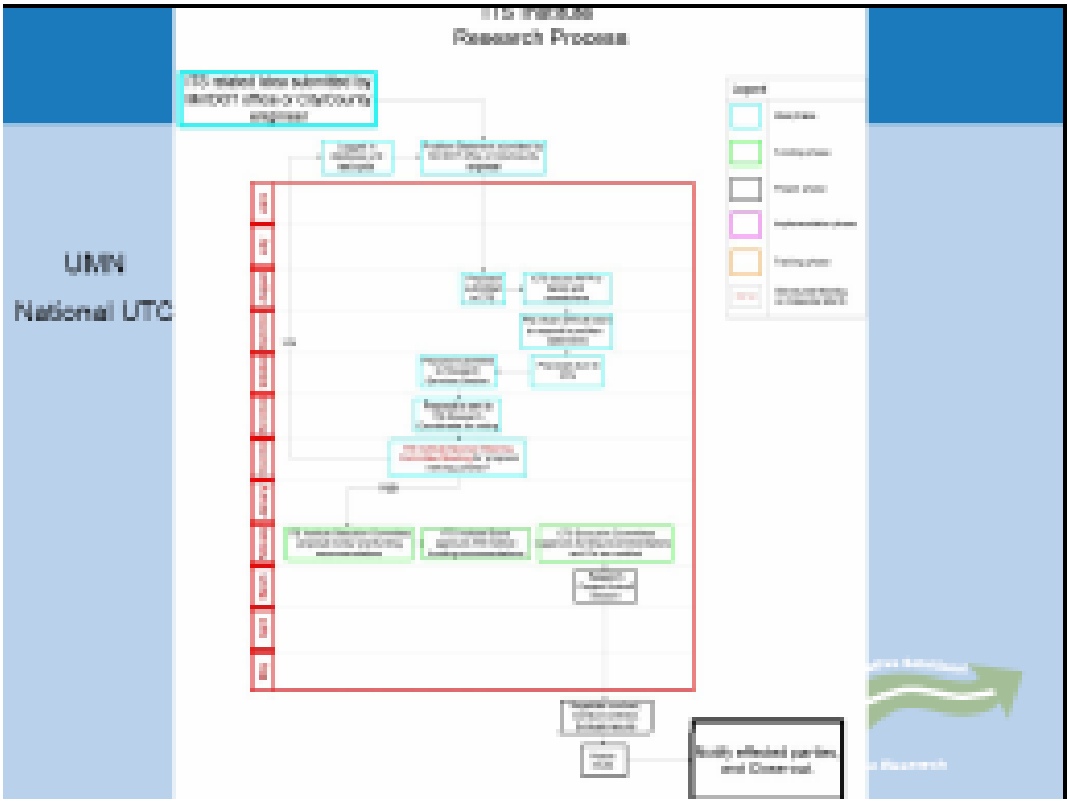

NCHRP
STIP
LRRB

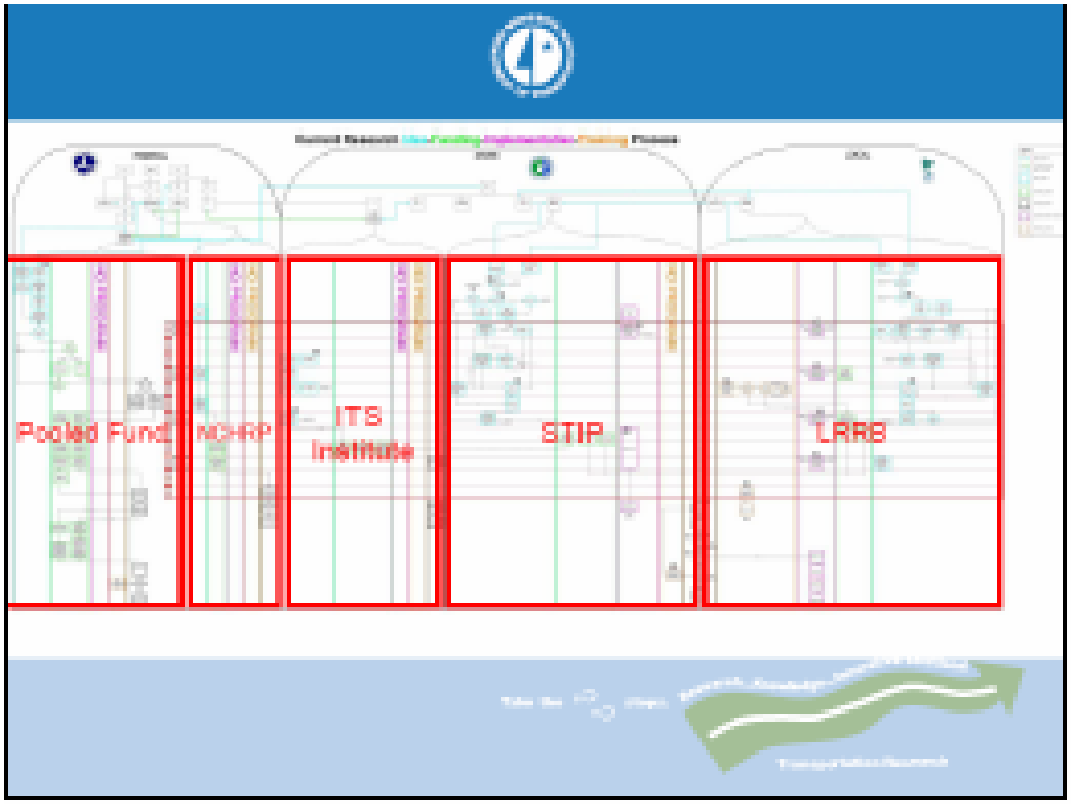

NCHRP Research
Process


Pooled Fund
NCHRP
STIP
LRRB


Pooled Fund
Research Process


Pooled Fund
ITS Institute
STIP
LRRB


Research Process
UMN
National UTC



- How do you ensure Tech Transfer Occurs?
- Prepare close out memos
- Follow the Research Implementation Guide
  - Interview PI
  - Interview TL and others
- Fund the implementation of research… Implementation RFP

Goal Mn/DOT's Research Implementation Funding Program

- This program was established to encourage and support activities that assist in bringing Mn/DOT research results to application
- Application of these results should measurably improve the performance of Mn/DOT's investment of Transportation Resources

Research Implementation RFP

1. Request Ideas for Implementation
2. Develop costs to Implement
3. Select Proposals to Fund
4. Other allow for flexibility in Research RFP.

Research

Tech Transfer

Implementation of Steel Bridge Maintenance Planning

This proposal implements the results of previous research into steel bridge components by gathering data from as-builts and adding new data fields to the Pontis bridge management system so that the data can be provided to the bridge inspectors and others responsible for managing Minnesota's bridges.

Research is Also Implementation

- Example
  - Developing and Implementing Enhanced Pavement Marking Management Tools for the Mn/DOT. CTRE

Questions?

Research Implementation Guide

TEN STEPS TO TURN THE BEST OF RESEARCH INTO PRACTICE

Comments or questions may be directed to:

Mn/DOT Office of Investment Management /Research Services Section
Transportation Bldg. 1st Floor N, MS 330
St. Paul, Minnesota 55155
Phone (651) 282-2473 FAX (651) 297-2354

IMPLEMENTATION OF RESEARCH RESULTS

Implementation of research results does not follow a straight line. In fact, implementation may take many turns, and this guide could be described as a “work-in-progress”.

As a participant in research implementation activities, you will make a series of decisions that will impact the success of implementation projects. As a practitioner, you know the helpfulness of new ideas and tools in improving day-to-day operations.

This guide offers a framework for finding solutions that work. It outlines the ten most important steps in the implementation decision-making process. These steps are intended to make it easier to shape and monitor implementation projects.

Depending on the specific project, the implementation process may lead members in different directions. A solution that first looks attractive may not be possible without laying the groundwork with additional actions. The steps that follow will help you to avoid missteps and lead you to the most effective solutions.

STEP 1. THINK ABOUT THE END RESULTS

Every beginning has an end. Be sure to know what you hope to gain from your project when you are done. Work with your committee to spell it out in concrete terms.

Questions: What actions do you want to occur as a result of the project?
Do you want practitioners to adopt a new practice?
Do you want to increase awareness about a new project?
What kind of impact do you hope the project will have?
How can you measure that impact?
What specifically will you measure to determine the impact of implementation? How will you know when you are done?

STEP 2. UNDERSTAND THE ENVIRONMENT

No project exists in a vacuum. Gather as much information as possible about the whole picture. List at least three major barriers.

Questions: What do you see as barriers to successful adoption of the results?
What needs to happen to overcome those barriers?
Are there competitors? How might they influence the project?
Is there a need for further research before implementation?

STEP 3. FIND THE OPPORTUNITY

Talk about the potential benefits of the project and match those potential benefits with what you know about the need. The greater the benefits, the greater the need and the larger the opportunity.

Questions: What need does the project address?
How large is that need?
Is the need being currently met by other means?
Are there other organizations that might benefit by meeting this need?
Should one or more of those organizations be approached as a potential partner for the project?

STEP 4. KNOW THY CUSTOMERS

List everyone who might benefit from the project, and include others who may influence those who benefit. Divide the list into two categories — those who benefit most and others. You will want to spend more time reaching out to the first category.

Questions: Who will benefit most from this project?
What do they currently know about the project or issue?
What do they need to know?
Will the people who benefit support the project or idea?
If not, what would it take to persuade them?
What are the perceptions of those who benefit most?
What demographic information do you know about those who benefit most?

STEP 5. INVOLVE THE RIGHT PLAYERS

Do not go too far without making sure that you have got the right team. You will want to have representatives of the groups who benefit the most helping you plan your course of action. If they are not on your committee, you might want to expand your group, or figure out another way to gather their ideas.

Questions: How will you gather input from those groups who might benefit?
Do you need to conduct a focus group to learn more about their thoughts and perceptions?
Do you have members of your own group who can speak with some knowledge of those groups?

STEP 6. EXPLORE THE MOST APPROPRIATE TOOL

The tools of technology transfer range from workshops to publications to one-on-one outreach efforts. Steps 1-5 help you in gathering information about what tool might be most effective for the project.

Questions: What tasks will be the most effective in ensuring implementation?
What tool will best reach the groups that you need to reach?
Do different tools seem appropriate for different groups?
What will be the method of distribution?
Who will be responsible for distribution?

STEP 7. MAKE STRATEGIC USE OF RESOURCES

Now that you know what needs to be done, it is time to figure out the details, such as cost and required effort.

Question: How much will the project cost in total?
How much does each activity or task cost?
Who will pay for direct implementation costs?
Will the implementation result in indirect costs?
If so, who will pay for these costs?
Will project partners finance some costs?

STEP 8. BRING IN THE EXPERTS

You may need further assistance with a number of issues, depending on the project. Consider tapping the expertise of technology transfer specialists form the Minnesota Department of Transportation or the Center for Transportation Studies. It might be time to hire a consultant to work with the committee or project team, or you may want to talk to experts about product development options. Or you may just want a fresh perspective.

Questions: What kind of expertise do you need to do the project well?
Do you need technical support, communications assistance, or help in another area?
Who can help you find the right person or organization to hire?

STEP 9. DEFINE, DEFINE

Time to be specific. As much as possible, write down your expectations of what now needs to happen, how it will happen, when it will happen, and who will be involved.

Questions: What are the tasks involved in the project?
What are the final products?
Is there a need for a pilot as a first step?
What are the major milestones for the project?
Who is responsible for producing the final products?
What is the budget?
Who will pay the costs?
What is the project timeline?

STEP 10. EVALUATE AND CELEBRATE

Continue to monitor the project's process as tasks begin and end. As you evaluate and measure the success of your project during and after its completion, remember to celebrate the successes and make note of the possibilities for next time.

Questions: How is the project progressing?
It is on budget, on time, on task?
Are there new goals to address?
Are there any adjustments to make?
How will you measure success?

LAST THOUGHTS

Implementation of research usually involves acceptance of a new idea or product by users. Research shows that people accept innovations at different rates, which require different strategies depending on individual interest and preference. The five stages of adoption—and possible tools to address those stages—include the following:

Awareness: Learning about the project, but lacking information. Tools for creating awareness—research reports, conference presentations, one-pagers, brochures, articles in trade journals and newsletters.

Interest: Developing an interest in the new product or ideas and seeking additional information. Tools for providing additional information—field demonstrations, workshops, technical summaries, literature syntheses, web sites, library.

Evaluation: Making a decision about whether to try the product or idea. Tools for providing additional information—one-on-one technical assistance, communication plans.

Trial: Applying the new product, method, or idea on a small scale to determine its usefulness. Tools for assisting first-time users—training field guides, new or revised equipment or specifications, product or prototype development, software development, workshops.

Adoption: Using the product or method as part of regular practice. Tools for supporting continued use—software support, new or revised specifications, standards, regulations, policies, procedures, equipment and tool purchase, videos, CD ROMS.

Implementation Tools

Facilitating the Process

The implementation plan outlines the goals, methods, and funding for applying research to transportation problems and issues. In some cases, the plan may involve communication and training. In other cases, the plan may require collaboration or involve product development. Following is a list of potential technology transfer tools for implementation.

Reports. Principle investigators produce research reports, usually as contract deliverables. Reports can take a variety of forms, including a full reports, executive summaries, field manuals, or training guides.

TRAK One-Pagers. These short, one-page reports update a variety of audiences on research in progress, news, or implementation efforts. Administrative Liaisons (AL's) and Technical Liaisons (TL's) can encourage Principle Investigators (PI's) to use one-pagers as vehicles to communicate their research.

Communication Plans. Mn/DOT's communication specialists may assist in the development of a communication plan as part of implementation efforts. The communication plan identifies goals and strategies for the project, primary and secondary audiences, key messages, and tools and tactics.

Videos and CDs. These media can provide training in the most effective and current methods on a variety of technical topics.

Web Sites. Mn/DOT Research Services (RSS) and the Local Road Research Board (LRRB) web sites contain the latest information on transportation-related research and implementation conducted by Mn/DOT and the LRRB. The web sites have monthly feature stories on their home pages. The sites also feature tools that assist in bringing the latest technology to practitioners.

Advanced Technology Transfer Tools. Please see the report (Mn/DOT 1998-05) that outlines the latest in advanced technology transfer tools, including electronic distribution, training through the internet, and other ideas.

Minnesota Local Technical Assistance Program (LTAP). The LTAP is administered by the Center for Transportation Studies (CTS) at the University of Minnesota. The LTAP program offers several technology transfer vehicles aimed at local government engineering personnel. These include *The LTAP Exchange,* a quarterly newsletter targeted to transportation practitioners, training workshops, best practices manuals, conferences and library reference support.

Mn/DOT Communications. The Mn/DOT Office of Communications publishes several internal and external publications, as well as working with the media on potential news and feature stories.

Library/Information Services. Mn/DOT librarians provide assistance with information searches, including articles, research reports, and other publications.

Maplewood Research Laboratory. The research laboratory can assist in physical testing and field testing. The lab also conducts training for some implementation initiatives, writes technical papers and reports, and maintains a web site.

Mn/DOT Specifications and Equipment Changes. Mn/DOT uses a process for specification additions and changes, as well as equipment modifications.

Guidelines. Guidelines exist for video production, software development and distribution, and report production.

Technical Demonstrations and Presentations. Demonstrations and presentations are a way of communicating research results. RSS offers assistance with facilitation of these activities, and also coordinates exhibits for the LRRB that reach representatives from local governments.

Product Development. Private companies are a potential resource for new product developments as a result of research. Government agencies may support product development through economic development programs.

U of M Office of Patents and Technology Marketing (PTM). PTM's mission is the proprietary transfer of U of M technology for commercial use in the public good consistent with the University's mission. PTM seeks to identify and protect “commercializable” University technology, including inventions and copyrightable materials, and transfers these technologies to the private sector through licensing or by participating in starting new companies.

Implementation Funding. Implementation projects receive funding from a variety of sources, including the Statewide Transportation Improvement Program (STIP), the LRRB’s Research Implementation Committee (RIC), the Maintenance Operations Research (MOR) Fund, the Federal Highway Administration (FHWA), and Mn/DOT district and office budgets.

Finding the Right Mix

Most implementation projects require a combination of implementation tools to support their success, from publications to training to appropriate partnerships. RSS provides assistance with selecting the right tools.

Sharing Results of Research: Technology Transfer Practices

2007 Research Peer Exchange

Iowa Department of Transportation

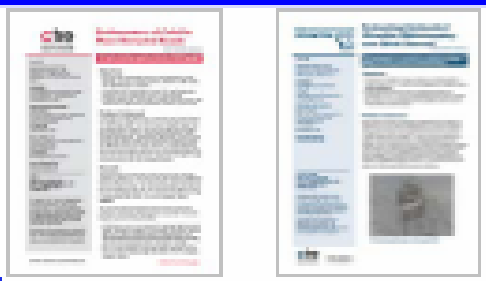
Research Supervised By:

- Bureau of Research & Technology
- Iowa Highway Research Board
- Office of Bridges & Structures
- Office of Maintenance
- Office of Traffic and Safety
- Office of Materials
- Office of Design – Roadside Development

Tech Transfer Methods

- Tech Briefs
- Web sites
- Project Brochures
- Newsletters
- Technical Presentations
- TRISRIP posting
- Training
- Videos
- Marketing
- Annual Report of Research

Tech Briefs

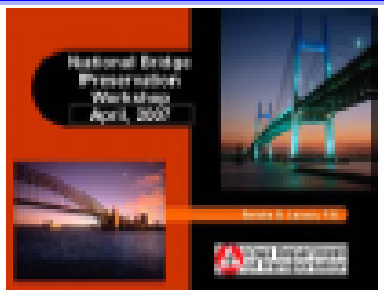


Web Sites

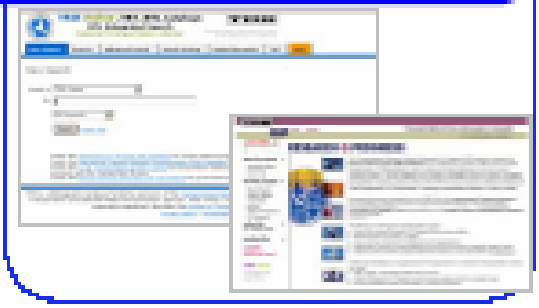
Project Brochure

Newsletters

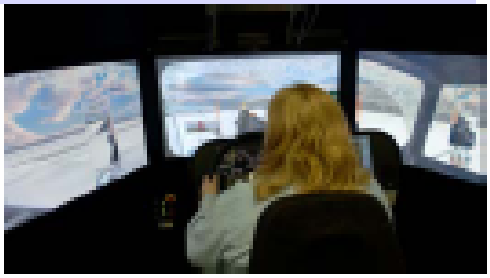
Technical Presentations



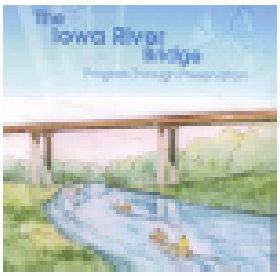
TRIS/RIP Postings



Training



Videos



Marketing

Annual Report

Tech Transfer Ensured By

- Implementation plan required
- Final reports required

IOWA DEPARTMENT OF TRANSPORTATION
RESEARCH news
Iowa Department of Transportation
BUREAU OF RESEARCH AND TECHNOLOGY ◆ SUMMER 2007

When are three lanes safer than four?

When do four- to three-lane conversions on urban roadways increase safety? After 15 conversion sites in cities across Iowa showed lower rates of traffic accidents (see table on page 2), city officials working with the Iowa Department of Transportation's (Iowa DOT) Office of Traffic and Safety decided to find out.

The Iowa DOT sponsored two projects at Iowa State University (ISU) to study safety impacts on four- to three-lane conversions. The first study was conducted by ISU's Center for Transportation Research and Education (CTRE), and the second was done by ISU's Department of Statistics.

CTRE did a classic before-and-after study using 10 years of crash data and compared it to annual crash trends on city streets and similar, unconverted roadways. The Department of Statistics used a Bayesian before-and-after analysis with monthly crash data and estimated volumes for all sites during a 23-year period (1982 through 2004). Both studies started with the same 15 conversion and comparison (unconverted) sites.

Generally, four- to three-lane conversions involve re-marking a four-lane, undivided urban roadway into three lanes—one through-lane in each direction with a two-way, continuous left-turn lane in the center. These studies looked at 15 corridors in Iowa where this conversion was implemented between 1993 and 2003. The conversion sites' traffic volumes ranged from 2,200 to 18,700 vehicles per day; the majority of these sites were located in smaller urbanized areas.

Two study methods produced similar results

- The classical study showed a 21 percent reduction in total crash frequency and 29 percent reduction in total crash rate when compared to overall city crashes. The Bayesian study showed that despite the fact both converted and comparison sites showed reductions in crashes, the converted sites' reduction in crashes was greater—resulting in a 25 percent reduction in crash density and 19 percent reduction in crash rate.
- When compared to crashes citywide, major injury crashes at the converted sites were reduced by 11 percent, minor injury crashes 30 percent and possible injury crashes 31 percent.

U.S. 34 study site in Osceola after conversion

Traditional safety and/or operational improvements for urban four-lane, undivided corridors include constructing a raised median or adding a fifth (center), two-way, left-turn lane. Both of these alternatives involve widening the roadway, which is costly and sometimes impractical. Converting four lanes to three with a center, left-turn lane may improve traffic operations and safety as effectively as traditional improvements at significantly less cost; however, each site should be evaluated thoroughly for successful application.

Conversion guidelines determine the feasibility of converting a four-lane, undivided roadway to a three-lane roadway on a case-by-case basis. From an operational viewpoint, a conversion is feasible when bi-directional, peak-hour volumes are less than 1,500 vehicles per hour (VPH), which typically translates to about 15,000 vehicles per day. For volumes more than 1,750 VPH, operations degrade, delays increase and conversion may not be accepted by drivers. Feasibility determination factors have been published in the CTRE report "Guidelines for the Conversion of Four-Lane, Undivided Roadways to Three-Lane, Two-Way, Left-Turn Lane Facilities," available at www.ctre.iastate.edu/reports/4to3lane.pdf. If a three-lane conversion is considered feasible, it should still be considered along with other alternatives within a detailed engineering study.

Lane conversions, continued on page 2

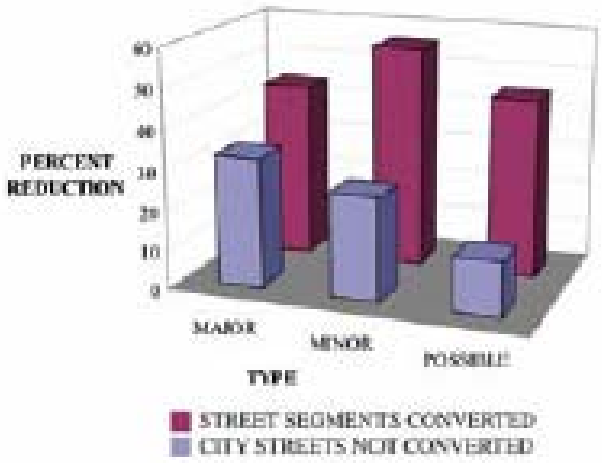
Lane conversions, continued from page one

Both study methods yielded similar results.

- Compared to crashes citywide at converted sites, major injury crashes were reduced by 11 percent, minor injury crashes 30 percent and possible injury crashes 31 percent.
- Crash frequency on the converted sites was reduced by about 24 percent—after accounting for the change in citywide crashes.
- Fewer people younger than 25 and older than 65 (two groups with traditionally higher crash risk) were involved in crashes.
- There were significantly fewer crashes related to left turns and stopping.

For information on four- to three-lane conversion research, contact Reg Souleyrette at 515-294-5453 or e-mail reg@iastate.edu.

Editor's note: Information and images for this article were provided by ISU's CTRE Publications Group, including: "Four-Lane to Three-Lane Conversions" *(Tech transfer summary), April 2006; and* "Three lanes really can be safer than four" *published in the May-June 2006 issue of Technology News, CTRE's bi-monthly newsletter. For more information visit www.ctre.iastate.edu/research/4lanato3lane.htm.*



Before and after comparison of injury crashes

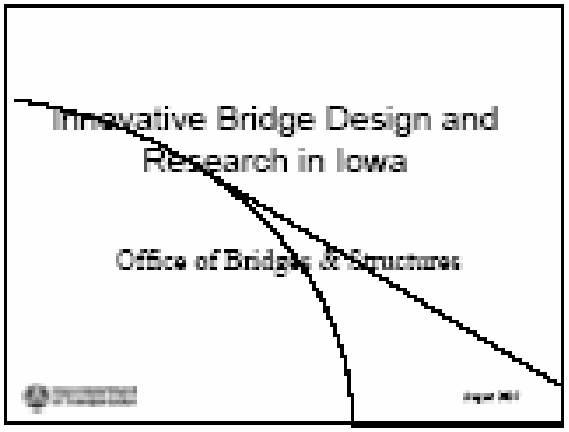
Implementation benefits

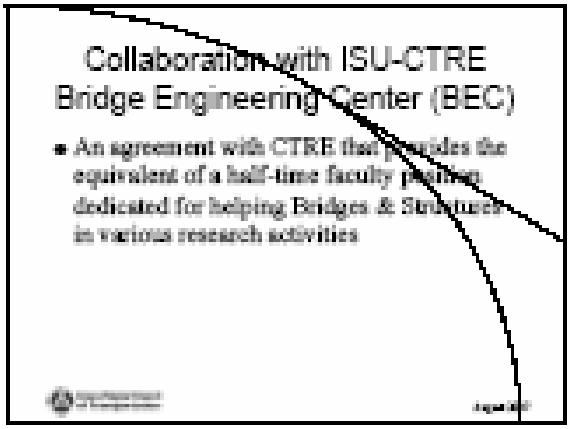
- Potential for a 25 percent reduction in crash frequency per mile and a 19 percent reduction in crash rate
- A 34 percent reduction in the number of all injury crashes and lower severity of the crashes that occur
- Less involvement of age groups traditionally at risk—drivers age 25 and under, and 65 and older
- Significant reduction in the number of crash types related to left turns and stopped traffic

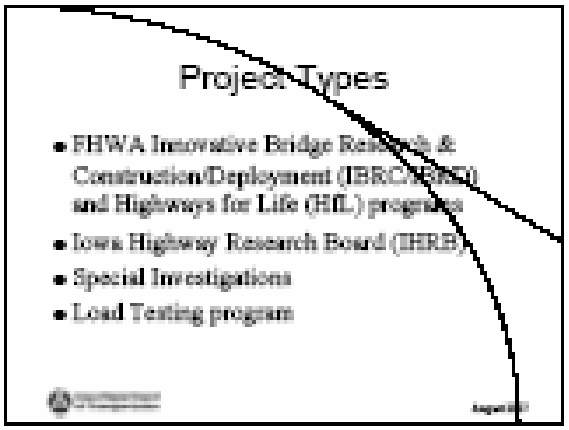
Description of conversion sites

City	AADT*	Population	Length	Land use
Storm Lake	7,333	10,076	1.41	Primarily commercial and industrial
Clear Lake	12,000	8,161	1.51	Mostly strip commercial with some residential remnants
Mason City	7,100	29,172	1.78	Primarily agricultural and industrial
Osceola	6,100	4,659	2.04	Residential, strip commercial and downtown
Manchester	11,200	5,257	.35	Downtown commercial
Iowa Falls	10,422	5,199	1.23	Industrial with some residential street access at one end
Rock Rapids	4,532	2,573	.35	Downtown commercial and office
Glenwood	6,313	5,358	1.09	Strip commercial, residential and transition between them
Des Moines	13,767	198,682	1.19	Mixed-residential and commercial
Council Bluffs	10,900	58,268	.20	Residential (few drives) and open space
Blue Grass	2,218	1,169	.72	Residential with commercial and industrial
Sioux Center	9,231	6,002	1.52	Single-residential through downtown commercial
Indianola	13,069	12,998	1.57	Strip commercial with some residential
Lawton	9,233	697	.84	Residential, access to side streets only
Sioux City	10,650	85,013	.77	Residential, access to side streets or alleys only

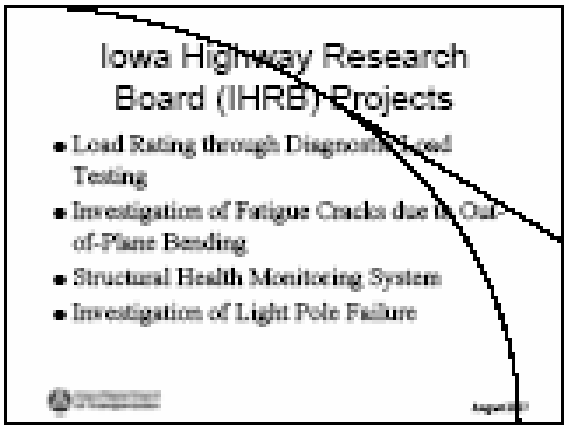
**AADT = annual average daily traffic (AADT and population data from year 2000)*


Innovative Bridge Design and Research in Iowa
Office of Bridges & Structures

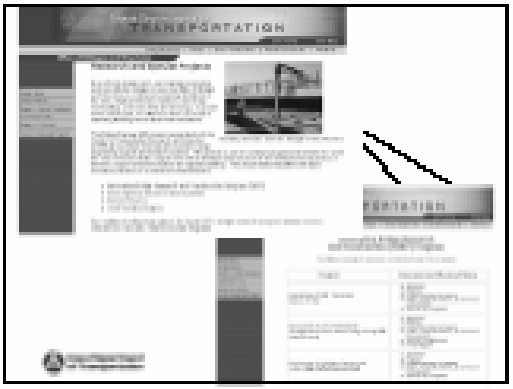

Collaboration with ISU-CTRE Bridge Engineering Center (BEC)
An agreement with CTRE that provides the equivalent of a half-time faculty position dedicated for helping Bridges & Structures in various research activities

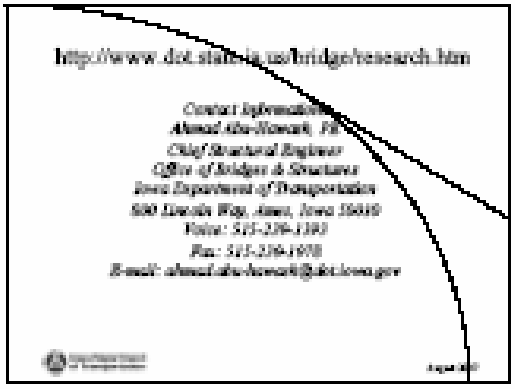

Project Types
FHWA Innovative Bridge Research & Construction/Deployment (IBRC/IBD) and Highways for Life (HfL) programs
Iowa Highway Research Board (IHRB)
Special Investigations
Load Testing program


IBRC/IBRD & HfL Projects
Accelerated Bridge Construction Using Prefabricated Elements
Ultra High Performance Concrete (UHPC)
Fiber Reinforced Polymer (FRP)
Corrosive Resistant Reinforcing Steel (MMFX)
Steel Free Concrete Deck
High Performance Steel (HPS)


Iowa Highway Research Board (IHRB) Projects
Load Rating through Diagnostic Load Testing
Investigation of Fatigue Cracks due to Out-of-Plane Bending
Structural Health Monitoring System
Investigation of Light Pole Failure


Special Investigations
Monitoring of the Iowa River Bridge Launching
Monitoring of Various Structural Elements (drilled shafts, arch hangers, sign support structures, light poles, etc.)
Load Testing of Bridges




http://www.dot.state.ia.us/bridge/research.htm
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