Smart Work Zone Deployment Initiative

A pooled fund study

June 2019
SWZDI History

- Established in 1999
- Four states originally
  - Kansas, Missouri, Nebraska, & Iowa
- Wisconsin joined later (2001)
- Funds pooled for research studies of innovative work zone products and methods
- Approximately $200k annually
Pooled Fund Structure

- Board of Directors (BOD)
  - State DOT Representatives
  - FHWA Representatives
- Project Technical Advisory Committees (TACs)
- Administered by Institute for Transportation (InTrans) at Iowa State University on behalf of the Iowa DOT
- New solicitation currently on www.poolfund.org (#1493) – two new states (TX and IL) currently committed
SWZDI Objective

Evaluate new products and coordinate/promote related research focused on the enhancement of safety & mobility in highway work zones
General Accomplishments

- Projects focused on issues of safety and operations within work zones
- Over 100 studies, evaluations, and syntheses completed
- Reports, etc. accessible at: swzdi.intrans.iastate.edu
General SWZDI Research Topics

- Traditional “products” and technologies
  - Static device evaluations
  - Related policies
  - Stand alone warning systems
  - Real-time integrated systems
  - Miscellaneous


- Smart Work Zone Implementation, Safety, and Operations
Examples of Recent Research

- Analytical Methods for Work Zone Travel Time Reliability (2018)
- Orange Work Zone Pavement Marking Midwest Field Test (2018)
- Understanding the Impacts of Work Zone Activities on Traffic Flow Characteristics (2018)
- Developing a Data-Driven Traffic Impact Assessment Tool for Work Zones (2017)
- Length of Need and Minimum System Length for F-Shape Portable Concrete Barrier (2017, partial)
- Setting Work Zone Speed Limits (2017)
2018-2019 Project Completions

- MASH 2016 Evaluation of a Non-Proprietary Type III Barricade (2018)
- Smart Work Zone Activity App (2019)
Objective: Evaluate the performance of a non-proprietary work zone safety device, such as a work zone sign support or barricade. Evaluated a Type III barricade system.

Findings

- Test 3-71 at a 0-degree and 90-degree impact angle was successful.
- Test 3-72 needs to be conducted under another project for the full MASH TL-3 crash text matrix (recently learned NCHRP Project 03-119 did this).
- Barricade was tested with sign panel and warning lights, which is a more critical configuration – barricades without panels and warning lights would also be acceptable.

- **Objective:** Develop a spreadsheet tool to compare different work zone phasing and scheduling alternatives (done in two phases)


- **Findings**
  - First phase developed work zone crash prediction models for freeway, expressway, and rural two-lane highway work zones and implemented them in a user-friendly safety assessment tool
  - Second phase developed new models for other facility types: urban multi-lane highway, arterials, ramps, 4-leg signalized intersections, and 4-leg unsignalized intersections
  - Data on work zones could be improved by including data for all parts of the work zones and work zone activities
  - Future research could include the use of more advanced statistical models
Objective: Design, develop and deploy SWiZAPP, a cross-platform mobile application for collecting and reporting real time work zone activity information

Findings

- A fully-functioning mobile application for work zone activity monitoring has been developed
- The app can manage an unlimited number of construction work zones across multiple states and agencies
- The app supports automatic work zone geolocation and mapping
- Users of the app can post live activities from construction sites by uploading or taking pictures, pushing the app button alert systems, or text messaging
- Users can view both real-time and historical activities of work zones
Ongoing Projects

- Design of Low-Cost Work Zone Queue Warning System
- Development of Adjustment Factors for HCM Sixth Edition Freeway Work Zone Capacity Methodology
- Guidance on Active Work Zone Data Archival
- An Intelligent Video-Based End of Queue Warning System for Work Zones
- Non-Motorized Accommodations Field Testing
- Investigation of CAV in Work Zones
Questions

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https://swzdi.intrans.iastate.edu
Traffic Control Devices
Pooled Fund Study

June 2019 Update

Co-Chairs:
Kevin Sylvester (FHWA)
Tim Crouch (Iowa DOT)

Technical Liaisons:
Michelle Arnold (FHWA)
Stacy Balk (Leidos)
Bryan Katz (Toxcel)
Purpose

To assemble a consortium composed of regional, State, local entities, appropriate organizations and the FHWA to:

1) establish a systematic procedure to select, test, and evaluate approaches to novel TCD concepts as well as incorporation of results into the MUTCD;

2) select novel TCD approaches to test and evaluate;

3) determine methods of evaluation for novel TCD approaches;

4) initiate and monitor projects intended to address evaluation of the novel TCDs;

5) disseminate results; and

6) assist MUTCD incorporation and implementation of results.
TCD PFS Members

• **State DOTs (28)**
  - Alabama DOT
  - California DOT
  - Colorado DOT
  - Connecticut DOT
  - Delaware DOT
  - Florida DOT
  - Georgia DOT
  - Illinois DOT
  - Iowa DOT
  - Kansas DOT
  - Kentucky DOT
  - Maryland DOT
  - Massachusetts DOT
  - Minnesota DOT
  - Mississippi DOT
  - Missouri DOT
  - Montana DOT
  - Nebraska DOT
  - New Hampshire DOT
  - New Jersey DOT
  - Nevada DOT
  - New York DOT
  - North Carolina DOT
  - Oregon DOT
  - Pennsylvania DOT
  - South Carolina DOT
  - Texas DOT
  - Wisconsin DOT

• **FHWA**
  - Office of Operations
  - Office of Safety
  - Eastern Federal Lands

• **Local Representation**
  - Los Angeles DOT
    (John Fisher, retired)
  - Broward County DOT
    (Lee Billingsley, retired)

• **Organizations**
  - ATSSA
  - IBTTA
Recently Completed Projects

Signing, in Combination with Lane Markings, in Advance of Lane Reduction Transitions

Objectives:

– Assess driver understanding and behavior when faced with new and traditional lane reduction roadway markings and signing.
– Determine the effects of lane reduction signing in combination with lane line transition markings in terms of:
  • Merging behavior (i.e. moving into the adjacent lane) at lane reduction transitions
  • Understanding and time of comprehension of the intended message conveyed at lane reduction transitions (from both the terminating lane and the left adjacent lane)
Results:

• When advanced warning signs were used, early merge behaviors were apparent across all measures, regardless of signing or lane markings (3.2 s faster when an advanced warning sign was present).

• The effect of different warning signs on driver behavior is not significant when an advanced warning sign is present.
Results (cont’d):

• When there was no advanced warning sign present, W4-2 frequently encouraged early merge across all three responses and W9-2 had consistently slower response times across all measures when no advanced warning sign was present.

• W9-2L-DE and W20-X3 warning signs, which include both symbols and text, had response times that fell between those found for W4-2 and W9-2.
Results (cont’d):

- Further research is required to fully substantiate these claims as it is difficult to isolate the ideal warning sign due to a myriad of other external factors that were not accounted for, such as familiarity with the signs or the participant’s native language.
Current Projects

• Guide Signing for U-Turn Intersections

• Evaluating Methods to Enhance Sign Conspicuity
Have Questions? Want to Join?

• Contact Tim Crouch (tim.crouch@dot.iowa.gov)
• Contact Michelle Arnold at FHWA (michelle.arnold@dot.gov)