Smart Arrow Board Deployment Plan

Prepared for the Iowa DOT by

SRF

August 14, 2019
February 26, 2021 updated by Iowa DOT

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Introduction

Timely and accurate information on work zones is becoming increasingly important, not only to road authorities, but to other public and private stakeholders involved with managing road construction and maintenance activities.

Several problems in providing this information are:

- Collecting and reporting timely information is time consuming for staff and completes with other project administration duties.
- Road construction and maintenance activities that require lane or shoulder closures are not always reported to operations staff resulting in inaccurate or no dissemination to traveler information systems and the traveling public.
- Stakeholders desire more detailed records on the start time, end time, and location of lane closures for improved post work zone analysis of the transportation management plan (TMP) and performance measurement.

Given anticipated deployment of connected vehicles, driver notifications of work zone-related lane closures via in-vehicle displays offer opportunities for increased safety, but also increases the need for accurate information about active lane closures.

Solution

Flashing Arrow Boards are routinely used in advance of active work zones to designate lane closures on multi-lane highways. Application of available technology could report the location and operation of Flashing Arrow Boards without requiring significant time of agency staff.

Purpose

This plan provides a guide for the development of communication standards for and deployment of real time smart arrow boards on all Iowa DOT construction and maintenance projects on multi-lane highways.

Scope

This plan focuses on developing a system that provides real-time reporting from smart arrow boards used for construction and maintenance operations to determine the status of lane closures. This plan does not include post processing of this data for applications such as traveler information, project management, project performance, or analysis.

General Needs

All Smart Arrow Boards shall be battery/solar-powered arrow panels that must meet the requirements found in the Manual on Uniform Traffic Control Devices (MUTCD), 2009, Part 6F.61.

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Arrow boards currently used on construction projects must also meet Iowa DOT Specification Article 2528.03.G.3 and be included on the Approved Products are listed in the Materials Approved Products Listing Enterprise (MAPLE).

Detailed needs and requirements are included in Attachment 1 of this implementation plan. There are two options of the Smart Arrow Board Protocol:

1. Option 1 – Smart Arrow Board Protocol – JSON (Attachment 2) which receives data from an intermediary server, and
2. Option 2 – Smart Arrow Board Protocol (Attachment 3) where data is polled directly from the arrow board.

Manufacturers and suppliers are allowed to select either of these protocols for the systems provided on Iowa DOT projects.

ENTERPRISE Transportation Pooled Fund Efforts

The Iowa DOT is a member of the ENTERPRISE Pooled Fund Study that uses the pooled resources of its members to develop, evaluate and deploy Intelligent Transportation Systems (ITS).

The Iowa DOT participated in an ENTERPRISE project that completed a system engineering process for ITS solution that integrates active work zone notifications regarding lane closures from Arrow Boards into agency traveler information dissemination systems. The results of this effort can be found at:
http://enterprise.prog.org/Projects/2015/workzone_notifications_in_travelerinfo.html

Maintenance Operations

Iowa DOT maintenance is working with Iowa State University Center for Transportation Research and Education (CTRE) on tracking maintenance operations using existing Automated Vehicle Location (AVL) capabilities and SkyHawk Telematics. This project includes reporting arrow board status that is the same as the requirements included in this smart arrow board implementation plan.

Maintenance equipment is not required to be included on the MAPLE approved projects list and is not required to meet the same specifications as construction contract devices. This allows for an accelerated program to integrate smart arrow boards into Iowa DOT roadways by contractors.

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Proposed Project Schedule

Year		2018				2019												2020												2021	2022
Month		S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D		
1	Establish Needs																														
2	Develop Architecture																														
3	ATSSA Chapter																														
4	Manufacturers																														
5	Manufacturers Comments																														
6	Select Manufacturers																														
7	Midwest Round Table																														
8	Evaluation																														
9	Maintenance Specifications																														
10	Construction Specifications																														
11	Supplemental Specifications																														
12	Update MAPLE																														
13	Interstate Deployment																														
14	All Multi-lane Deployment																														

Key for color code on schedule:

	Activity Period		Planned Completion

1. ~~Presented and received agreement on system needs from Iowa DOT TCP Working Group at their September 19, 2018 meeting.~~
2. ~~Developed architecture and high-level requirements to meet needs and received agreement from Working Group at November 14, 2018 meeting.~~
3. ~~Provide Iowa DOT with a plan to present in January 2019 to the Iowa ATSSA Chapter members.~~
4. ~~Provide Iowa DOT with information to share with arrow board manufacturers at the ATSSA Traffic Expo February 2019. This information will include both new arrow boards and retrofit kits similar to the Street Smart Rental system demonstrated in Iowa. This should include an invitation to provide smart arrow boards, at no cost to the DOT, for evaluation and approval.~~
5. ~~Review manufacturers comments and make recommendations to Iowa DOT.~~
6. ~~Select manufacturer(s) for 2019 field test and evaluation. Based on response to invitation in task 4.~~
7. ~~Provide information to Iowa DOT for presentation at Midwest Work Zone Roundtable.~~
8. ~~Conduct field evaluation on maintenance and construction operations. Include evaluation on I-80 / I-380 and other projects.~~

9. Develop real-time arrow board specifications for maintenance operations in relation to the SKYHAWK project to integrate data into the smart arrow board effort. (On-going)
10. ~~Develop real-time arrow board specifications for Interstate construction contracts and present to the Iowa DOT Specification Committee at their April 2020 meeting.~~
11. ~~Work with Specification Committee to have Supplemental Specifications approved and published in October 2020.~~
12. Allows contractors and traffic control providers to begin conversion of their inventory to real-time arrow boards and begin deployment. This deployment will be mandatory on Interstate projects in 2021. The RCE should determine the need for a change order on previously let projects with consultation with Traffic Safety Engineer in Construction and Materials.
13. Develop real-time arrow board specifications for adding multilane (Non-Interstate) construction contracts and present to the Iowa DOT Specification Committee at their April 2021 meeting.
14. Allows contractors and traffic control providers additional time to convert entire fleet to real-time arrow boards that will be required on all Iowa DOT projects beginning January 1, 2022. This deployment extends to all projects on multi-lane highways. The RCE should determine the need for a change order on previously let projects with consultation with Traffic Safety Engineer in Construction and Materials.
15. Delete existing solar assist arrow panel MAPLE list October 2022

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