



DEPARTMENT OF  
TRANSPORTATION

RESEARCH SERVICES & LIBRARY

## TECHNICAL SUMMARY

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### Principal Investigator:

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### PROJECT COST:

\$86,966



Designers demonstrated the moving platform that would be used for the new mobile AFAD.

# Self-Propelled AFAD Keeps Flaggers Safely Off the Road

## What Was the Need?

According to [data](#) from the U.S. Bureau of Labor Statistics, 149 roadway workers were killed nationwide from 2003 to 2015 while flagging or directing traffic, and many near misses have been reported with the increase in distracted driving that has come with mobile device use.

In 2014, MnDOT [trained](#) over 60 state and district maintenance workers in the use of an automated flagger assistance device (AFAD). The AFAD has been embraced in Minnesota as a highly visible device that effectively directs traffic in stationary maintenance and construction projects while keeping flagging personnel off the road during operation.

The AFAD does not, however, suit moving operations (like pavement crack sealing) because the device requires towing. Engineers at MnDOT wanted to determine if the AFAD could be made into a mobile device that could be operated by a road crew near, but not on, the roadway.

## What Was Our Goal?

MnDOT funded this research to develop a self-contained, self-propelled mobile AFAD for use on moving work zone roadway projects.

## What Did We Do?

Researchers met with MnDOT engineers to identify the features that would be required in a moving AFAD. They determined that the device would have to be towable to a construction site with standard towing gear, operable remotely through wired or wireless controls, movable forward and in reverse, and able to use rechargeable onboard batteries.

The research team investigated existing self-propelled devices from the United States, Canada and Australia for moving wheeled objects, large and small, to see if they could be adapted to these needs. No suitable device was found.

After further consultation with the Technical Advisory Panel, researchers approached DJ Products of Little Falls, Minnesota, a company that designs and manufactures devices (including battery-operated devices) for moving trailers, dumpsters, shopping carts and aircraft.

Researchers met with DJ Products in February 2015, reviewed its products and agreed that DJ Products would develop a prototype vehicle on which the AFAD could be mounted. In August 2015, after evaluating and modifying designs, DJ Products hosted a demonstration of the prototype vehicle without the AFAD attached. The research team requested modifications, and in April 2016, the company presented a new self-propelled device with the AFAD attached.

*Working with a Minnesota manufacturer, researchers developed a moving automated flagger assistance device (AFAD) that signals traffic at work zones. The AFAD is operated remotely by a worker who can stand off the roadway out of traffic.*

*“Everybody who has used the mobile AFAD has liked it. We love our stationary AFAD unit. These units have really big stop-slow signs—they’re so visible.”*

—Jeremy Gjovik,  
Transportation  
Operations Supervisor,  
MnDOT District 3

*“The AFAD is a one-of-a-kind device. We were able to basically start from scratch and come up with a device that meets all the needs it was designed for.”*

—Edward Terhaar,  
Principal, Traffic  
Engineering, Wenck  
Associates, Inc.

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Minnesota Department  
of Transportation  
Research Services & Library  
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The final device delivered to MnDOT offers large electronic signage, lights and a traffic bar on a movable platform. The unit is easily visible to road users and can be operated remotely from a safe distance off the roadway.

### What Did We Learn?

Initial field testing was delayed due to seasonal weather issues and device operating problems that required the replacement of components. In February 2017, a MnDOT operator tested the mobile AFAD on a crack-sealing project on State Highway 71 south of Sauk Centre.

The moving AFAD can be operated with a wired or wireless controller, as well as with controls on a handlebar mounted on the vehicle. Operators must use one remote for moving the wheeled unit, and the remote from the original AFAD for sign messaging. The new device moves forward and backward, can be towed with a standard hitch, and employs onboard batteries and a charger.

Setup and takedown require more effort than conventional flagging, but this effort is not considered cumbersome. The moving AFAD can be operated by one person standing 400 feet or more off the roadway, and the device is large enough to be easily seen and understood by road users.

The new device was used for only one hour initially. The sealing crew was outpacing the moving AFAD because the crack-sealing project entailed few repairs with greater distance between repair locations than is typical of such projects.

### What's Next?

The moving AFAD device can be used as is, and is still being tested by MnDOT. Further modifications will be requested, including enhancement of the battery-powered unit, as it currently requires a battery change to operate through an entire work shift.

Steering and controller design will likely be modified. Currently, the moving AFAD operates like a rear-wheel-drive vehicle and must be steered from its rear-wheel, traffic-facing axle, forcing the remote operator to guide it up the road as if backing up a boat trailer. MnDOT operators may ask that the device be redesigned to be steerable from the traffic-leading end of the vehicle, as if it were pulling the signage up the road, allowing for more intuitive control.

MnDOT personnel would also like to see the device's controller integrated with the sign controller, eliminating the need for two controllers—one for moving, the other for operating the sign. Nevertheless, the device appears to be a promising option for mobile AFAD use by an operator who need not stand on the road to direct traffic.

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*This Technical Summary pertains to Report 2017-09, “Development of a Moving Automatic Flagger Assistance Device (AFAD) for Moving Work Zone Operations,” published March 2017. The full report can be accessed at [mndot.gov/research/reports/2017/201709.pdf](http://mndot.gov/research/reports/2017/201709.pdf).*