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Synthesis of Iowa Research to Address Rural Safety

tech transfer summary

Information about roadway departures, rural intersections, and rural speed management countermeasures relevant to Iowa was summarized on webpages (www.ctre.iastate.edu/research-synthesis/) to allow agencies to more effectively target specific types of crashes in Iowa.

Roadway Departure Countermeasures

With roadway departure crashes often severe and accounting for the majority of highway fatalities nationwide—including 67 percent of fatal crashes in Iowa—several studies were conducted in Iowa to address lane departure crashes. A number of lane departure countermeasures have been developed.

Chevrons/Oversized Chevrons – Provide additional emphasis and guidance for drivers (see Figure 1)

On-Pavement Signing – A curve sign or other pavement marking symbol (such as the speed limit) in advance of a curve or other problem location (see Figure 2)

Vertical Treatments – Signs and posts that provide drivers with a better appreciation of the sharpness of the curve with continuous tracking information

Dynamic Speed Feedback Signs – Traffic control devices that are programmed to provide a message to drivers exceeding a certain speed threshold

Figure 1. Close-up view of chevron (Shutterstock)

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RESEARCH PROJECT TITLE
Synthesis of Iowa Research to Address Rural Safety

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The mission of the Center for Transportation Research and Education (CTRE) at Iowa State University is to develop and implement innovative methods, materials, and technologies for improving transportation efficiency, safety, reliability, and sustainability while improving the learning environment of students, faculty, and staff in transportation-related fields.

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Rumble Strips – Narrow, linear bands of indentations installed between the travel lane's edgeline and the paved roadway shoulder that provide audible and vibratory alerts to drivers whose vehicles have departed the travel lane

Rumble Stripes – Stripes grooved into the pavement edge for roadways with no paved shoulder that provide audible and vibratory alerts to drivers

Paved Shoulders – Provide additional recovery space for errant vehicles and lateral support for the pavement structure

Safety Edge – A 30 degree sloped edge placed during paving that mitigates the vertical elevation difference between two adjacent roadway surfaces (usually a paved roadway surface and an unpaved shoulder)

Rural Intersection Crash Countermeasures

More than 20 percent of fatalities nationwide occur at intersections, and more than 80 percent of rural intersection fatalities are at unsignalized intersections. Several techniques to reduce rural intersection crashes are being used in Iowa.

Increase Visibility of Stop Signs – Techniques to assist drivers who may have issues at rural intersections due to sight distance or insufficiently visible stop signs. Several strategies have been used to increase the visibility of stop signs:

- Increasing retroreflectivity
- Using double stop signs
- Installing larger stop signs (see Figure 3)
- Adding reflective material to the stop sign post
- Adding light emitting diodes into the stop sign face

Channelization – Painted, raised medians or islands that direct vehicles or pedestrians into specific movements

Advance Stop Sign Rumble Strips – Grooved strips placed upstream of a stop-controlled intersection (see Figure 4)

Flashing Beacons – Overhead or sign-mounted supplements placed at intersections that are intended to reinforce awareness of existing stop signs (see Figure 5)

Lighting – Provides greater visibility of the intersection, signs, and markings

Rural Speed Management and Countermeasures

Many rural communities have developed around highways or major county roads. As a result, the main street through many small rural communities is often part of a high-speed rural highway. The high speeds of highways and county roads outside the city limits transition into a reduced speed section through the rural community. Consequently, drivers passing through the community often enter at high speeds and maintain those speeds as they travel through the community. Several speed reduction countermeasures have been developed.

Horizontal Displacement – A curve or other measure that requires drivers to stray from a straight roadway section and lowers their speed in the process. Various treatments involving horizontal displacement within rural communities can include the following:

- Bulb-outs, neck-downs, chokers, or mid-block crossings
- Chicanes or serpentines
- Transverse rumble strips
- Roundabouts (see Figure 6)

Vertical Displacement – Raised intersections or speed humps that force drivers to slow down to avoid the discomfort created from the treatment

Narrowing – Physical and/or visual installations that reduce the width of the travel portion of a lane and give drivers a feeling of constraint that can influence them to reduce their speed. Several narrowing treatments include the following:

- Center islands
- Vertical centerline treatments
- Shoulder widening
- Four- to three-lane conversion
- Landscaping

Surroundings – Landscaped sign installations that announce to motorists that they are entering a community

Pavement Markings – A variety of pavement marking strategies to encourage drivers to reduce their speeds. Strategies include the following:

- Transverse lane markings
- Surface treatments
- Legends
- Wide edgelines

Traffic Control Signage – Signs that notify drivers that speeds need to be reduced. While not standard, the following signs provide ways to attract more attention from drivers:

- Dynamic speed display
- Photo radar

Figure 2. Example of pavement markings (surface treatment) (Hallmark et al./Institute for Transportation)

Figure 3. Use of larger stop signs (Mississippi DOT, from Amparano and Morena 2006)

Figure 4. Advance stop line rumble strips (Shutterstock 2014)

Figure 5. Overhead flashing beacon for all-way stop (Bob Sperry/Iowa Local Technical Assistance Program)

Figure 6. Example of horizontal displacement (roundabout) (Hillary Isebrands/Institute for Transportation)

Figure 3 Image Reference: Amparano, Gene and David A. Morena. Senior Mobility Series: Article 4 Marking the Way to Greater Safety. *Public Roads*. Vol. 70, No. 1. July/August 2006.

Implementation Readiness and Benefits

More information about each of the countermeasures described in this tech transfer summary, as well as speed impacts, reported crash modification factors, costs, usage within Iowa, and Iowa-specific guidance, is available on the Synthesis of Safety-Related Research web pages at www.ctre.iastate.edu/research-synthesis/.

The project provides Iowa agencies with a resource (both web pages and relevant publications) to address rural safety. The team is coordinating with the Iowa Local Technical Assistance Program (LTAP), the Iowa Highway Research Board, the Iowa Association of Counties, and other groups to explore additional ways to distribute the information to local and county agencies.