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16. Abstract

Many rural communities have developed around highways or major county roads; as a result, the main street through small rural communities is often part of a high-speed rural highway. Highways and county roads are characterized by high speeds outside the city limits; they then 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. Traffic calming in small rural communities along major roadways is common in Europe, but the U.S. does not have experience with applying traffic-calming measures outside of major urban areas.

The purpose of the project was to evaluate traffic-calming treatments on the major road through small Iowa communities using either single-measure low-cost or gateway treatments. The project was partially funded by the Iowa Highway Research Board (IHRB). The focus of the IHRB portion was to evaluate single-measure, low-cost, traffic-calming measures that are appropriate to major roads through small rural communities. Seven different low-cost traffic treatments were implemented and evaluated in five rural Iowa communities. The research evaluated the use of two gateway treatments in Union and Roland; five single-measure treatments (speed table, on-pavement "SLOW" markings, a driver speed feedback sign, tubular markers, and on-pavement entrance treatments) were evaluated in Gilbert, Slater, and Dexter.

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Center for Transportation Research and Education

Single-Measure Traffic Calming in Dexter, Iowa

tech transfer summary

Entrance treatments were installed and evaluated for their effectiveness in calming traffic in Dexter, Iowa.

November 2007

RESEARCH PROJECT TITLE
Evaluation of Gateway and Low-Cost Traffic-Calming Treatments for Major Routes in Small Rural Communities

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Iowa Highway Research Board (TR-523)
Federal Highway Administration

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IOWA STATE UNIVERSITY

Objective

The purpose of the project was to evaluate traffic-calming treatments on major roads through small Iowa communities using either single-measure, low-cost or gateway treatments. For this portion of the project, entrance treatments were evaluated in Dexter, Iowa.

Problem Statement

The main street through many small rural Iowa communities is a state or county highway with high speeds outside the city limits and a reduced speed section through the rural community. Consequently, drivers passing through the community often enter at high speeds and then maintain those speeds throughout. When speeds in rural communities are problematic, traffic calming provides a potential solution. However, traffic-calming measures are generally used in larger urban areas; their effectiveness in small communities is unknown. The Center for Transportation Research and Education (CTRE) at Iowa State University teamed up with the Iowa DOT to evaluate traffic-calming treatments in Dexter, Iowa.

Community Description

Dexter is located approximately 30 miles west of Des Moines and has a population of 689. The main road thru Dexter is county road F-65, which is an asphalt-paved two-lane roadway. Some sensitive areas near F-65 include an elementary school, a park, and a metal fabrication plant just outside the western city entrance. Trucks entering the fabrication plant are required to back into the plant from the highway. The city saw this as a safety concern because vehicles were traveling at high speeds when they entered the western city limits.

Layout of Dexter, Iowa

Research Description

Initial speed studies indicated high vehicle speeds were prevalent entering the communities from both the east and the west. Therefore, Dexter was selected for a single-measure entrance treatment.

The entrance treatment for Dexter was modeled after typical European entrance treatments, using red pavement markings with white text that displayed the speed limit. The surface treatments were selected after confirming that the measures did not violate guidelines set forth by the Manual on Uniform Traffic Control Devices (MUTCD). In addition to red markings with "35 mph," an eight-inch edgeline was painted along the sets of treatments.

To evaluate the effectiveness of the entrance treatments, data were collected using pneumatic road tubes placed at locations surrounding the entrance treatments. Speed and volume data were collected before the treatments was installed and at one months, three months, nine months, and twelve months after the treatments were installed.

East entrance before treatments were installed

East entrance after treatments were installed

Key Findings

The treatments were effective in reducing speeds at all three of the locations where they were tested. The effectiveness varied over time. Data could not be collected at six months after installation due to a period of unusually cold temperatures and blizzard-like conditions.

Nine months after installation, the effectiveness of the treatments appeared to decrease, most likely due to the fact that the markings had faded over time. The treatments were re-painted and the effectiveness increased again at the twelve-month data collection period.

Implementation Benefits

Lower vehicle speeds produce several safety benefits. For drivers, the area of focus is significantly increased at lower speeds, giving them a greater awareness of their surroundings and more time to react to potential problems.

Lower speeds also reduce the likelihood and severity of vehicle crashes. The Oregon DOT, in a handbook created for rural communities, reported speed statistics indicating that there is an 85% likelihood of death for a pedestrian struck at 40 mph. One struck at 30 mph has a 45% chance of being killed and the risk drops to 15% if the pedestrian is struck at 20 mph.

Implementation Readiness

Many rural communities do not have the resources to implement high-cost, elaborate traffic-calming measures. The on-pavement entrance treatments used in Dexter were low cost and easy to implement. The biggest expense associated with these treatments would be re-painting the markings as they fade over time.

West entrance treatment, illustrating fading of pavement markings at nine-month data collection period

Center for Transportation Research and Education

Single-Measure Traffic Calming in Gilbert, Iowa

tech transfer summary

A speed table was installed and evaluated as a single-measure traffic-calming treatment in Gilbert, Iowa.

November 2007

RESEARCH PROJECT TITLE
Evaluation of Gateway and Low-Cost Traffic-Calming Treatments for Major Routes in Small Rural Communities

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IOWA STATE UNIVERSITY

Objective

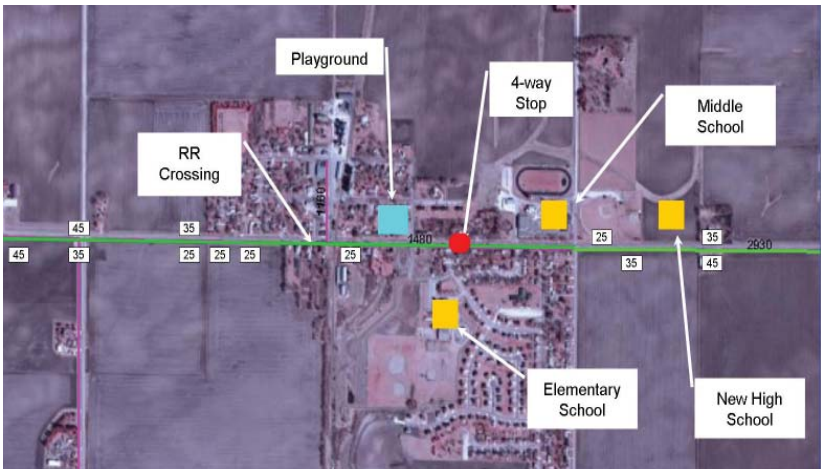
The purpose of the project was to evaluate traffic-calming treatments on major roads through small Iowa communities using either single-measure, low-cost treatments or gateway treatments. For this portion of the project, a speed table was installed and evaluated as a single-measure traffic-calming treatment in Gilbert, Iowa.

Problem Statement

The main street through many small rural Iowa communities is a state or county highway with high speeds outside the city limits and a reduced speed section through the rural community. Consequently, drivers passing through the community often enter at high speeds and then maintain those speeds throughout. When speeds in rural communities are problematic, traffic calming provides a potential solution. However, traffic-calming measures are generally used in larger urban areas; their effectiveness in small communities is unknown. The Center for Transportation Research and Education (CTRE) at Iowa State University teamed up with the Iowa DOT to evaluate a traffic-calming treatment in Gilbert, Iowa.

Community Description

Gilbert is located approximately 40 miles north of Des Moines and has a population of 987. The main road through Gilbert is County Highway E-23, which is a two-lane roadway oriented east/west through the middle of the community. The posted speed limit is 55 mph outside of town and 25 mph at the center of town, with transition zones on each end of town. There is also a four-way, stop-controlled intersection at the center of town.



Layout of Gilbert, Iowa

The town was in the process of building a new high school near Highway E-23 as the study commenced, and two other schools were already near the route. Furthermore, there were two parks nearby that generated additional pedestrian traffic. A total of nine crashes occurred along E-23 in the vicinity of Gilbert from 2001 to 2005.

Research Description

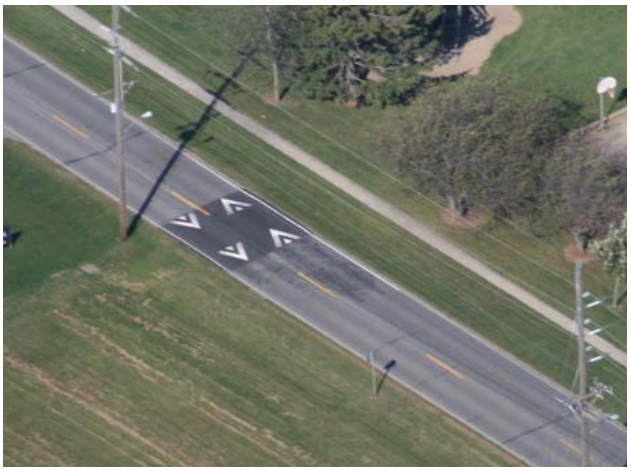
Gilbert was selected as a single-measure traffic calming community. To alleviate speeding problems at the center of town, a Seminole profile speed table was installed and evaluated.

Speed tables are asphalt or rubber mounds that cover the full width of the roadway. Speed tables are essentially speed humps that have been modified with a flat top, thus reducing the disruption to vehicle operation. The ramps of the speed table are sloped more gently than speed humps; therefore, design speeds for speed tables are higher than for speed humps. The Gilbert speed table was designed to accommodate vehicles traveling at 30 mph.

To evaluate the effectiveness of the speed hump, data were collected using pneumatic road tubes placed at locations both upstream and downstream of the speed table. Speed and volume data were collected before the speed table was installed and at one month and three months after installation. Data will also be collected at six, nine, and twelve months after installation.

Key Findings

The speed table was successful in decreasing speeds both immediately upstream and downstream of the speed table. The table slowed speeds in both directions. Several residents have complained because they do not like the speed table. The effectiveness of the speed table remained relatively constant over time. This was expected, since the device physically forces vehicles to slow down.



Aerial view of speed table in Gilbert, Iowa

Implementation Benefits

Lower vehicle speeds produce several safety benefits. For drivers, the area of focus is significantly increased at lower speeds, giving them a greater awareness of their surroundings and more time to react to potential problems.

Lower speeds also reduce the likelihood and severity of vehicle crashes. The Oregon DOT, in a handbook created for rural communities, reported speed statistics indicating that there is an 85% likelihood of death for a pedestrian struck at 40 mph. One struck at 30 mph has a 45% chance of being killed and the risk drops to 15% if the pedestrian is struck at 20 mph.

Implementation Readiness

Speed tables are a moderately expensive traffic-calming measure, but they are highly effective at reducing speeds. When installing speed tables in rural communities, consideration should be given to the accomodation of farm vehicles and heavy trucks that may travel through the community.

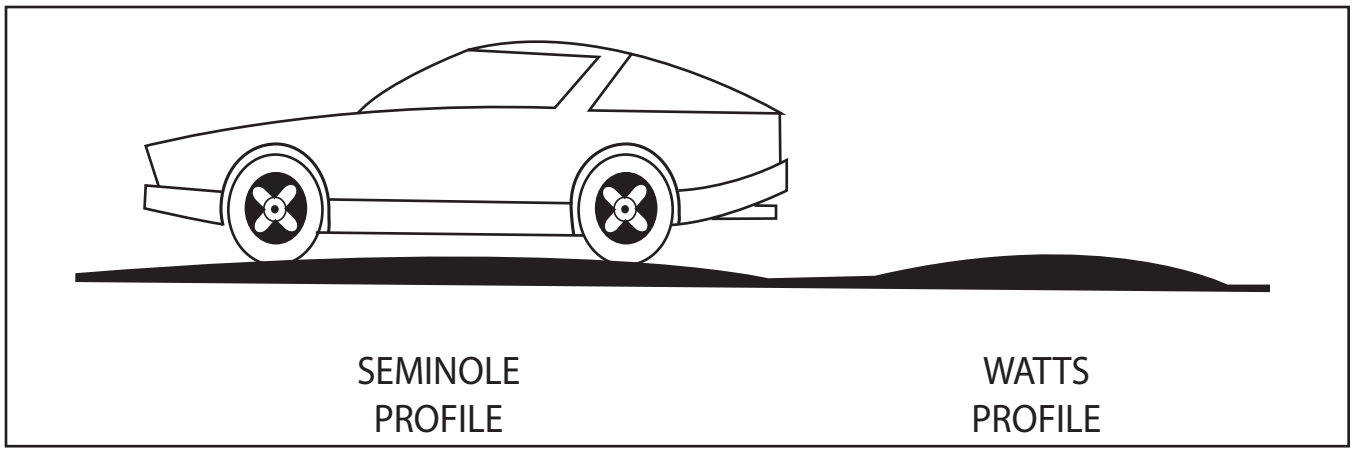


Diagram illustrating the difference between a Seminole profile speed table and a traditional Watts profile speed hump

Center for Transportation Research and Education

Gateway Traffic Calming in Roland, Iowa

tech transfer summary

Gateway traffic-calming treatments were installed and evaluated in Roland, Iowa.

November 2007

RESEARCH PROJECT TITLE
Evaluation of Gateway and Low-Cost Traffic-Calming Treatments for Major Routes in Small Rural Communities

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Federal Highway Administration

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IOWA STATE UNIVERSITY

Objective

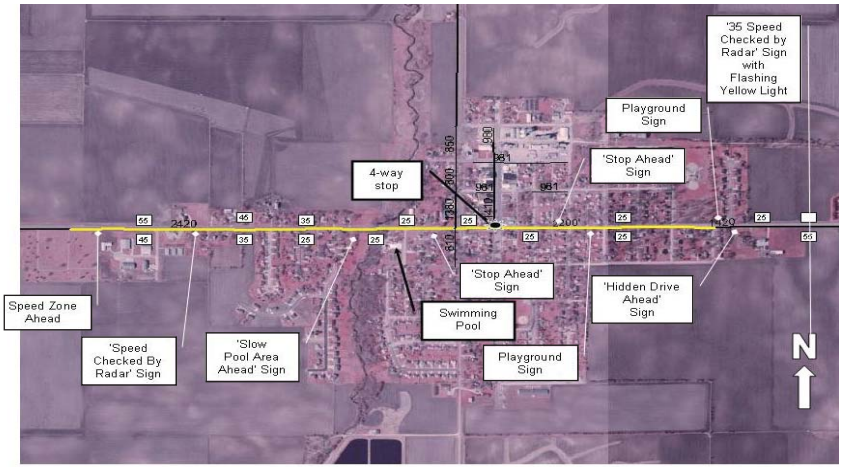
The purpose of the project was to evaluate traffic-calming treatments on major roads through small Iowa communities using either single-measure, low-cost or gateway treatments. For this portion of the project, gateway traffic-calming treatments were evaluated in Roland, Iowa.

Problem Statement

The main street through many small rural Iowa communities is a state or county highway with high speeds outside the city limits and a reduced speed section through the rural community. Consequently, drivers passing through the community often enter at high speeds and then maintain those speeds throughout. When speeds in rural communities are problematic, traffic calming provides a potential solution. However, traffic-calming measures are generally used in larger urban areas; their effectiveness in small communities is unknown. The Center for Transportation Research and Education (CTRE) at Iowa State University teamed up with the Iowa DOT to evaluate traffic-calming treatments in Roland, Iowa.

Community Description

Roland is located approximately 45 miles north of Des Moines and has a population of 1,324. City officials requested to be a pilot-study community, indicating that they encountered frequent problems with speeding on County Highway E-18, which is the main route through town. The posted speed limit is 55 mph outside of town and 25 mph at the center of town, with long transition zones on the west end of town and short transition zones on the east end of town. The intersection of E-18 and Main Street is four-way-stop controlled. Some sensitive areas along this road include a middle school, a park, and a swimming pool.



Layout of Roland, Iowa

Research Description

Roland was selected as gateway treatment location. Gateway treatments include a range of measures designed to slow vehicles entering a community and reinforce speeds throughout the community. The gateway treatment for Roland consisted of converging chevrons, on-pavement speed markings, and lane narrowing.

Converging chevrons were used to slow incoming traffic at the east and west community entrances. They were placed with decreasing space between each chevron as drivers enter the transition zone, giving drivers the perception of going too fast, or speeding up, and encouraging them to reduce their speeds.

On-pavement speed limit markings, reading "25 mph," were placed at regularly spaced intervals throughout both the eastern and western sections of the gateway treatment area to remind drivers of the speed limit. In addition, lanes were narrowed by painting wider shoulders. This technique has two benefits. First, narrowed lanes provide a feeling of constraint and cause drivers to reduce their speed. Second, wider shoulders provide more space for bicycle lanes and sidewalks.

To evaluate the effectiveness of the traffic-calming treatment, data were collected using pneumatic road tubes placed at a number of locations around traffic calming treatments and other locations. Data were collected before the treatments were installed and at one month, three months, six months, nine months, and twelve months after the treatments were installed.

Key Findings

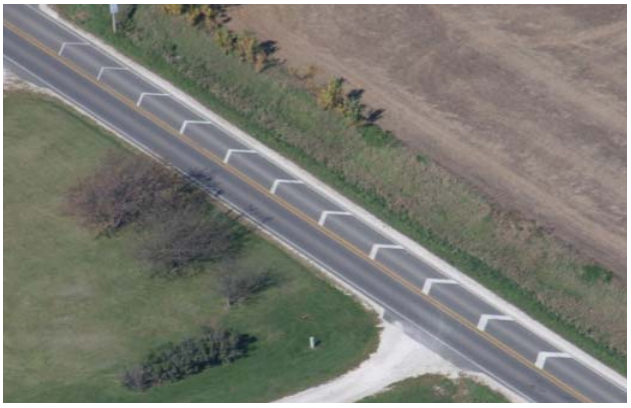
The gateway entrance treatments, which consisted of converging chevrons and a "25 mph" on-street pavement marking, were reasonably effective. Speeds decreased at all of the data-collection locations and decreases remained constant over the year-long data collection period.

Implementation Benefits

Lower vehicle speeds produce several safety benefits. For drivers, the area of focus is significantly increased at lower speeds, giving them a greater awareness of their surroundings and more time to react to potential problems.

Lower speeds also reduce the likelihood and severity of vehicle crashes. The Oregon DOT, in a handbook created for rural communities, reported speed statistics indicating that there is an 85% likelihood of death for a pedestrian struck at 40 mph. One struck at 30 mph has a 45% chance of being killed and the risk drops to 15% if the pedestrian is struck at 20 mph.

E-18 before implementation of traffic-calming treatments



Converging chevrons at east entrance

On-pavement "25 mph" speed markings and lane narrowing using painted shoulders

Implementation Readiness

Many rural communities do not have the resources to implement high-cost, elaborate traffic-calming measures. The measures used in Roland were low cost and simply involved painting the roadway and maintaining the painted markings. These measures were also designed to accommodate large farm vehicles, which are prevalent in rural communities. In short, the traffic-calming treatments in Roland, Iowa could easily be implemented in other rural communities.

Center for Transportation Research and Education

Low-Cost Traffic Calming in Slater, Iowa

tech transfer summary

Several low-cost traffic-calming treatments were implemented and evaluated in Slater, Iowa.

November 2007

RESEARCH PROJECT TITLE
Evaluation of Gateway and Low-Cost Traffic-Calming Treatments for Major Routes in Small Rural Communities

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Iowa Highway Research Board (TR-523)
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IOWA STATE UNIVERSITY

Objective

The purpose of the project was to evaluate traffic-calming treatments on major roads through small Iowa communities using either single-measure, low-cost treatments or gateway treatments. For this portion of the project, low-cost traffic-calming treatments were evaluated in Slater, Iowa.

Problem Statement

The main street through many small rural Iowa communities is a state or county highway with high speeds outside the city limits and a reduced speed section through the rural community. Consequently, drivers passing through the community often enter at high speeds and then maintain those speeds throughout. When speeds in rural communities are problematic, traffic calming provides a potential solution. However, traffic-calming measures are generally used in larger urban areas; their effectiveness in small communities is unknown. The Center for Transportation Research and Education (CTRE) at Iowa State University teamed up with the Iowa DOT to evaluate traffic-calming treatments in Slater, Iowa.

Community Description

Slater is located approximately 20 miles north of Des Moines and has a population of 1,306. Two major routes pass through Slater: State Highway 210, a two-lane road oriented east/west, and County Highway R-38, a two-lane road oriented north/south. Both serve as major commuter routes. A four-way stop exists at the intersection of the two roadways. Sensitive areas near the highways include an elementary school and a park.

Layout of traffic-calming treatments for Slater, Iowa

Four crashes occurred along the northern section of R-38 from 2001-2005. Seven crashes occurred along the western section of SH 210, and one crash was noted along the southern section of R-38. In addition, eight crashes were reported in the five-year period at the intersection of R-38 and SH 210, which is a four-way-stop intersection.

Research Description

Three different low-cost traffic-calming measures were evaluated in Slater. First, two center islands were created along R-38 using 36-inch longitudinal channelizers. A 25 mph speed limit sign was placed on a on a mountable sign support at the beginning of the center islands. The islands were located at the southern entrance to Slater, just after the first 25 mph speed limit sign, to slow down northbound traffic entering town from the south.

In an effort to slow speeds along the western section of SH 210, on-pavement "SLOW" markings were painted in two locations along this section of road. Finally, a driver speed feedback sign was installed along the northern section of R-38, across from the elementary school. This sign differed from other types of speed feedback signs in that it could be programmed to display two lines of text containing any five alphanumeric characters.

To evaluate the effectiveness of the treatments, data were collected using pneumatic road tubes placed at locations surrounding the treatment. Speed data were collected before the treatments were installed and at one, three, six, nine, and twelve months after the treatments were installed.

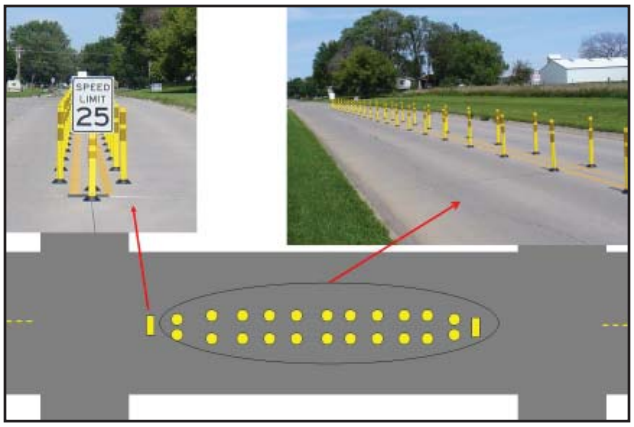
Key Findings

Results indicate that the longitudinal channelizers used to form a center island for the southern section of R-38 reduced speeds significantly. The driver speed feedback sign was also found to be effective in reducing speeds. Use of the on-pavement "SLOW" markings did not appear to be effective.

Implementation Benefits

Lower vehicle speeds produce several safety benefits. For drivers, the area of focus is significantly increased at lower speeds, giving them a greater awareness of their surroundings and more time to react to potential problems.

Lower speeds also reduce the likelihood and severity of vehicle crashes. The Oregon DOT, in a handbook created for rural communities, reported speed statistics indicating that there is an 85% likelihood of death for a pedestrian struck at 40 mph. One struck at 30 mph has a 45% chance of being killed and the risk drops to 15% if the pedestrian is struck at 20 mph.



Center island widening using longitudinal channelizers in Slater, Iowa

On-pavement "SLOW" marking in Slater, Iowa

Speed feedback sign in Slater, Iowa

Implementation Readiness

Many rural communities do not have the resources to implement high-cost, elaborate traffic-calming measures. The measures used in Slater were low cost and easy to install. These measures were also designed to accommodate large farm vehicles, which are prevalent in rural communities. In short, the traffic-calming treatments used in Slater, Iowa could easily be implemented in other rural communities.

Center for Transportation Research and Education

Gateway Traffic Calming in Union, Iowa

tech transfer summary

Gateway traffic-calming treatments were installed and evaluated in Union, Iowa.

November 2007

RESEARCH PROJECT TITLE
Evaluation of Gateway and Low-Cost Traffic-Calming Treatments for Major Routes in Small Rural Communities

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IOWA STATE UNIVERSITY

Objective

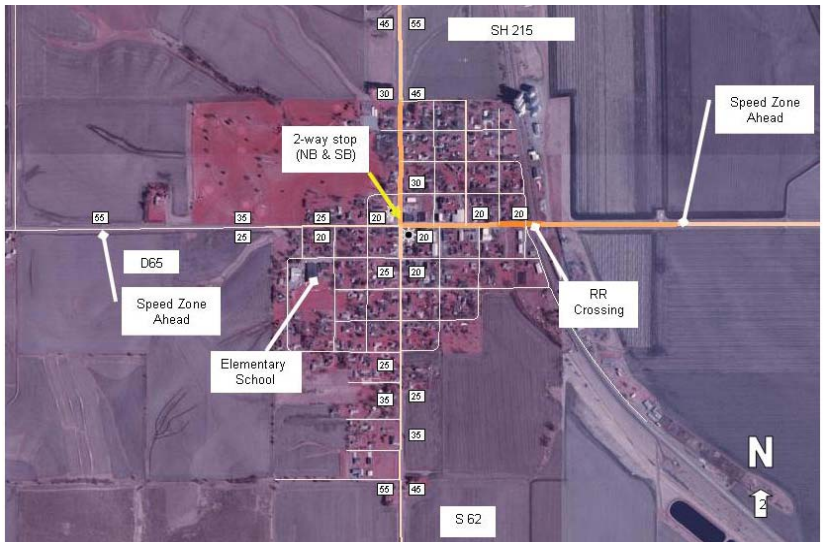
The purpose of the project was to evaluate traffic-calming treatments on major roads through small Iowa communities using either single-measure low-cost or gateway treatments. For this portion of the project, gateway traffic-calming treatments were evaluated in Union, Iowa.

Problem Statement

The main street through many small rural Iowa communities is a state or county highway with high speeds outside the city limits and a reduced speed section through the rural community. Consequently, drivers passing through the community often enter at high speeds and then maintain those speeds throughout. When speeds in rural communities are problematic, traffic calming provides a potential solution. However, traffic-calming measures are generally used in larger urban areas; their effectiveness in small communities is unknown. The Center for Transportation Research and Education (CTRE) at Iowa State University teamed up with the Iowa DOT to evaluate traffic-calming treatments in Union, Iowa.

Community Description

Union is located approximately 60 miles northeast of Des Moines and has a population of 427. Union is intersected by two major roads: D-65, which runs east to west, and S-62/ SH 215, which runs north to south. Residents complained of high speeds on the north, south, and west edges of town. On the east edge of town, railroad tracks that cross D-65 help to significantly slow drivers that are entering town from the east. Some sensitive areas near the highways include a middle school, a swimming pool, and a golf course.



Layout of Union, Iowa

Research Description

Union was selected as gateway treatment location. Gateway treatments include a range of measures designed to slow vehicles entering a community and reinforce speeds throughout the community. The gateway treatment for Union consisted of peripheral transverse pavement markings, lane narrowing through median and shoulder widening, and driver feedback signs.

Peripheral transverse markings consist of a series of parallel bars which decrease in spacing as drivers approach the community, giving them the perception that they are speeding up and encouraging them to slow down.

Lanes were narrowed using painted shoulders and a painted center island. Lane narrowing gives drivers a feeling of constraing, causing them to reduce their speed. In addition, wider shoulders provide more space for bicycle lanes and sidewalks.

Two driver feedback signs were placed at areas where pedestrians were most likely to be present and where speeds were higher. Due to backorder and problems with the sign manufacturer, the speed signs were not installed until just before the six-month data collection period.

Key Findings

The transverse markings appeared to be moderately effective in decreasing vehicle speeds directly downstream of the markings for all three locations, although none of the differences were large. The lane narrowing did not appear to be effective. Once the speed feedback signs were installed, significant speed decreases resulted.

Union appeared to have experienced a general upward trend in speeds independent of the gateway treatments. Speeds measured at control locations where the effect of the treatments would not have been felt indicated that speeds overall increased over the study period. This may suggest that the full effect of the treatments is not reflected in the data presented.

Implementation Benefits

Lower vehicle speeds produce several safety benefits. For drivers, the area of focus is significantly increased at lower speeds, giving them a greater awareness of their surroundings and more time to react to potential problems.

Lower speeds also reduce the likelihood and severity of vehicle crashes. The Oregon DOT, in a handbook created for rural communities, reported speed statistics indicating that there is an 85% likelihood of death for a pedestrian struck at 40 mph. One struck at 30 mph has a 45% chance of being killed and the risk drops to 15% if the pedestrian is struck at 20 mph.

Peripheral transverse pavement markings

Lane narrowing using center island and shoulder widening

Driver feedback sign showing driver speed

Implementation Readiness

Many rural communities do not have the resources to implement high-cost, elaborate traffic-calming measures. With the exception of the speed signs, which are moderately expensive, the other treatments used in Union were low cost and simply involved painting the roadway and maintaining the painted markings. These treatments were alsodesigned to accommodate large farm vehicles, which are prevalent in rural communities. The on-pavement markings used in Union could easily be implemented in other rural communities.