Colored Entrance Treatments for Rural Traffic Calming

Authors

Shauna L. Hallmark
Interim Director, Institute for Transportation, Professor, Civil, Construction, and Environmental Engineering, Iowa State University
515-294-5249, shallmar@iastate.edu

Skylar Knickerbocker
Researcher, Institute for Transportation, Iowa State University

Neal Hawkins
Director, Center for Transportation Research and Education, Iowa State University

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MTC MIDWEST TRANSPORTATION CONSORTIUM

Center for Transportation Research and Education
Iowa State University
2711 S. Loop Drive, Suite 4700
Ames, IA 50010-8664
515-294-8103

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IOWA STATE UNIVERSITY
Institute for Transportation

Background

Small rural communities often lack the expertise and resources necessary to address speeding and the persistent challenge of slowing high-speed through traffic. The entrances to communities are especially problematic given that drivers must transition from a high-speed, often-rural roadway setting to a low-speed community setting.

The rural roadway provides high-speed mobility outside the community, yet the same road within town provides local access and accommodates pedestrians of all ages, on-street parking, bicycles, and other features unique to the character of a small community. Drivers who have been traveling for some distance on the high-speed road, and are traveling through the community, may not receive the appropriate clues that the character of the roadway is changing and may not adjust their speeds appropriately.

Addressing speeding issues is an even greater challenge given that smaller communities typically lack engineering staff and resources, which can lead to decisions that may not conform to accepted design guidance. For instance, many rural communities set speed transition zones too low a significant distance outside the community, before there is any practical need for drivers to slow down.

Communities may also have unrealistic expectations about what speed reductions are practical and, in some cases, may even implement strategies to reduce speeds that are not appropriate for the situation. For instance, some small communities with speeding issues simply use stop signs to slow traffic, which can diminish both enforcement and compliance.

A number of traffic-calming devices were evaluated to determine their effectiveness in reducing speeds along the main road through a small rural community. Five different treatments were selected and installed in six rural Iowa communities. This tech brief highlights use of colored entrance treatments.

Description

Colored surface dressing or textured surfaces are common traffic-calming treatments in the United Kingdom (UK) and are used often in conjunction with gateways or other traffic-calming measures to emphasize the presence

Colored entrance treatment for Jesup east community entrance

of traffic-calming features. Surface treatments are typically done in different colors or textures. They draw attention to the fact that something about the roadway is changing and provide visual clues to drivers that they have entered a different area.

A study in Shropshire, UK reported on the use of colored surface treatments in conjunction with speed limit signs (DETR 2005). The study used red patches 26.25 feet (8 meters) long across the full width of the roadway along with speed limit signs placed for each direction. This configuration was repeated at 10 locations throughout the city and was used along with other traffic-calming measures. The study indicated that reductions in both mean and 85th percentile speeds occurred although actual values were not provided.

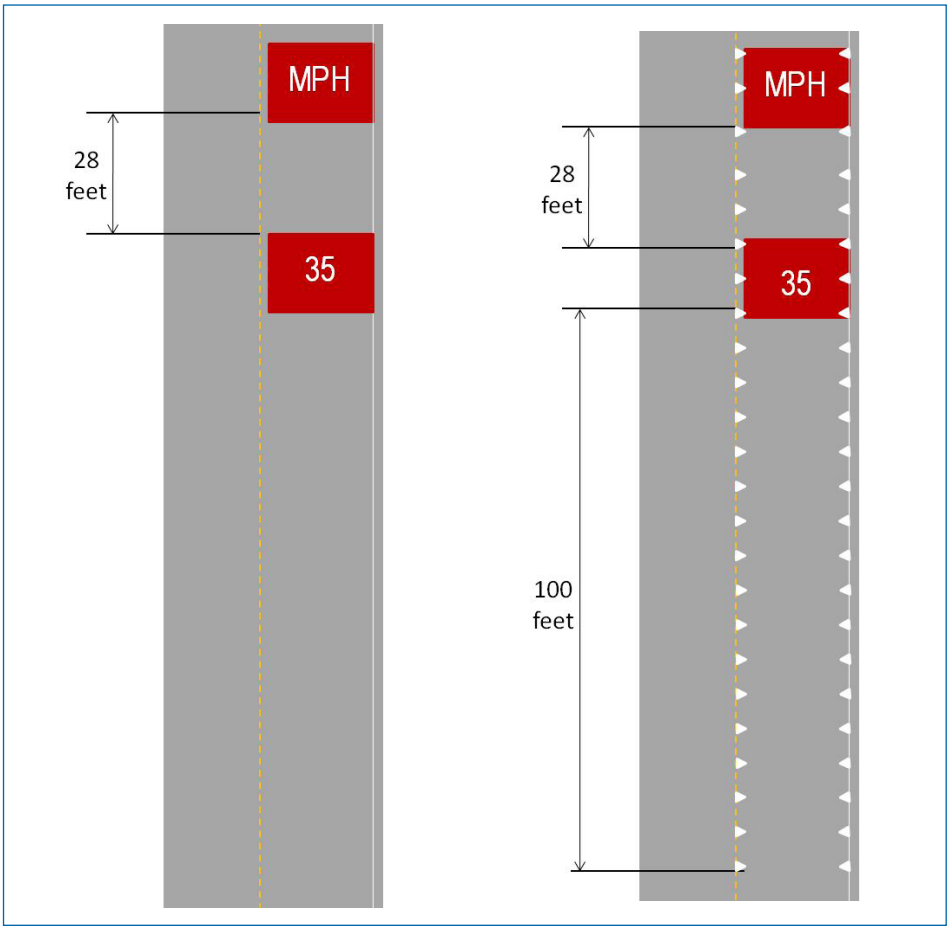
In a previous Iowa study, a modification of the European treatment was evaluated at the entrances to Dexter, Iowa along 350th Street (State Highway 925). The treatment resulted in a reduction in mean speed of 5.4 mph and a reduction in 85th percentile speed of 8 mph. The percentage of vehicles traveling 5 or more mph over the posted speed limit was reduced by up to 32 percent and the percentage of vehicles traveling 10 or more mph over the posted speed limit was reduced by 14.5 percent (Hallmark et al. 2007).

The colored entrance treatment used in this study was based on the Dexter treatment, modified to reflect the treatments used in Europe more closely.

Treatment Design

The treatment consists of "dragon's teeth" for approximately 100 feet, followed by two colored boxes, which reinforce the speed limit. The treatment was set to terminate at the beginning of the speed limit at the community entrance given this is where it is desirable to slow drivers as they enter the community.

The colored box portion of the treatment reminds drivers that the roadway is changing and reinforces the change in posted speed limit. The box provides significant visual contrast. The box is approximately 12 feet tall with 8 foot lettering using a standard font and spacing. The boxes are spaced 28 feet apart so that drivers are able to read the message sequentially.



Schematics of treatments with initial treatment (left) and final treatment (right)

The dragon's teeth are used to lengthen the area of the treatment so it is more visible to drivers. The red treatment was very effective in the previous study in Dexter; however, the treatment is not that large and is somewhat unusual. The white dragon's teeth provide some transition, which may be effective in getting driver attention in advance of the red treatments. The white portion also provides some visual narrowing of the lanes.

The dragon's teeth pattern was used instead of the speed-reduction markings covered in Section 3B.22 of the Manual on Uniform Traffic Control Devices (MUTCD) given a previous study segment in Union, Iowa using the peripheral transverse bars showed them as being only moderately effective (Hallmark et al. 2007). The dragon's teeth are larger and more unusual, so it was felt that the pattern was more likely to get driver attention.

The original design for this project was to use the red markings and dragon's teeth together. The MUTCD experimentation team requested that the red markings be tested first and then the white dragon's teeth be added one year later, so that the effect of only the red treatment compared to the combined design could be assessed. As a result, the treatment was applied in two phases.

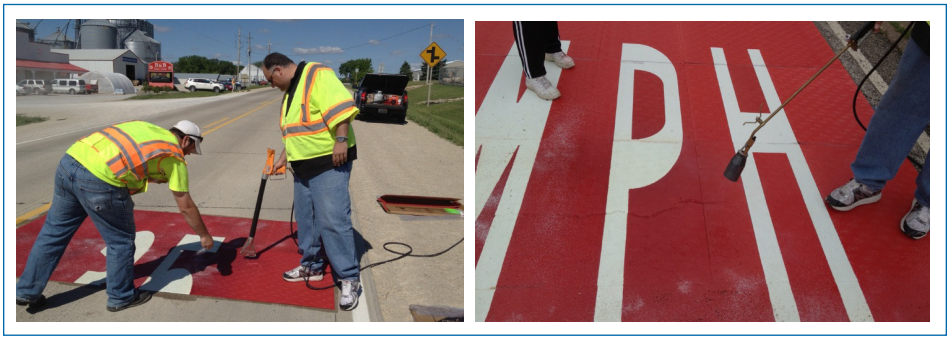
Given the initial study period was not long enough for the required after analysis, this tech brief has been updated to include the final results. The dragon's teeth were installed June 5, 2013 and the results are included here and in the updated final report.

The use of on-pavement speed limit markings (35 mph) are allowed as described in Section 3B.20 of the MUTCD (2009 version). Use of the colored box is not covered in the MUTCD, although Section 3A.05 states that pavement markings shall be yellow, white, red, or blue.

The dragon's teeth are similar to speed-reduction markings (Section 3B.22) but are not covered specifically in the MUTCD. Orientation and size of the triangle used in the design was selected so it would not be confused with yield lines (Section 3B.16), advance speed hump markings (3B.26), or any other type of marking covered in the MUTCD. The markings are white for both sides in compliance with Section 3B.15 in the MUTCD, which states that transverse markings should be white.

The colored box portion of the treatment was constructed from a thermoplastic, high-friction material so that the area is skid resistant. The treatment is placed on the roadway by heating. Glass beads are added while the treatment is placed to increase visibility and skid resistance. The dragon's teeth were added June 5, 2013 using the same process.

This traffic-calming treatment was installed in Jesup, Iowa along 220th Street (State Highway 939) at the east and west community entrances. The treatments were placed so they ended at the first 35 mph posted speed limit sign. The treatment was also installed at the north entrance to Ossian, Iowa along County Road W-42. The treatment was placed to end at the first 25 mph speed limit sign at the community entrance.



Installation of colored entrance treatment

Colored entrance treatment with addition of dragon's teeth for north community entrance to Ossian

Results

Pneumatic road tubes were used to collect speed and volume data before and after installation of the rural traffic-calming treatments. Pneumatic road tubes are fairly accurate (99 percent accuracy for individual vehicle speeds), can collect individual vehicle data (speed, volume, headway, and classification), and are fairly low-cost. Data were collected using JAMAR FLEX HS counters. Road tubes were typically laid just downstream of the treatment or at the treatment.

Data were typically collected for 48 hours on a Monday through Friday under mostly dry weather conditions. In a few cases, due to issues with the traffic counters, data were available for only a 24 hour period. Use of full 24 hour periods avoids biasing the speed sample to speed choices based on time of day. The collection periods occurred Monday through Friday while avoiding holidays to avoid any unusual traffic patterns.

Typical speed statistics, such as change in average speed, were calculated for each location where data were collected.

In the initial phase, without the dragon's teeth, decreases were noted at all three sites with decreases in mean speed between 1 and 2.3 mph and a decrease of up to 2 mph in the 85th percentile speed. Decreases up to 49 percent resulted in the fraction of vehicles traveling 5 or more mph over the posted speed limit, 60 percent in the fraction traveling 10 or more mph over, and up to 100 percent in the fraction traveling 15 or more mph over.

After the initial colored entrance treatment had been in place for 12 months, dragon's teeth were placed on the pavement. Data were collected again after the dragon's teeth had been in place for 1 month.

Results indicate that the speed reductions with the dragon's teeth were similar to what was found for the initial phase without the dragon's teeth. Consequently, addition of the dragon's teeth did not appear to improve the effectiveness of the treatment, or at least not significantly, at the three evaluation sites.

References

DETR. 2005. *Traffic Calming on Major Roads*. Department of the Environment, Transport and the Regions. England.

Hallmark, Shauna L., Eric Peterson, Eric Fitzsimmons, Neal Hawkins, Jon Resler, and Tom Welch. 2007. *Evaluation of Gateway and Low-Cost Traffic-Calming Treatments for Major Routes in Small Rural Communities*. November 2007. www.intrans.iastate.edu/research/detail.cfm?projectID=-226410767

Results for colored entrance treatment with and without teeth after installation

	Jesup East			Jesup West			Ossian North		
	Without Teeth		With	Without Teeth		With	Without Teeth		With
	1 Month	12 Month	1 Month	1 Month	12 Month	1 Month	1 Month	12 Month	1 Month
Mean Speed	-1.3	-1.4	-1.0	-1.5	-0.8	-0.8	-2.3	-1.2	-0.6
85th Percentile Speed	-2	-1	-2	-2	-1	-1	-2	-1	0
Fraction of Vehicles Traveling Over Posted Speed Limit									
≥ 5 mph	-43.5%	-34.8%	-38.4%	-29.7%	-48.6%	-13.8%	-29.6%	-14.8%	-11.8%
≥ 10 mph	-40.0%	-60.0%	-55.7%	-40.0%	-50.0%	-41.3%	-36.4%	-18.2%	-3.3%
≥ 15 mph	-100.0%	-100.0%	-61.4%	-50.0%	-50.0%	-37.4%	-57.1%	-14.3%	5.7%

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