Transverse Speed Bars for Rural Traffic Calming

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Iowa Highway Research Board
Iowa Department of Transportation
Midwest Transportation Consortium
Federal Highway Administration
(IHRB Project TR-630, InTrans Project 11-393)

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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

Transverse bar treatment at Hazleton east 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 conjunctions 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.

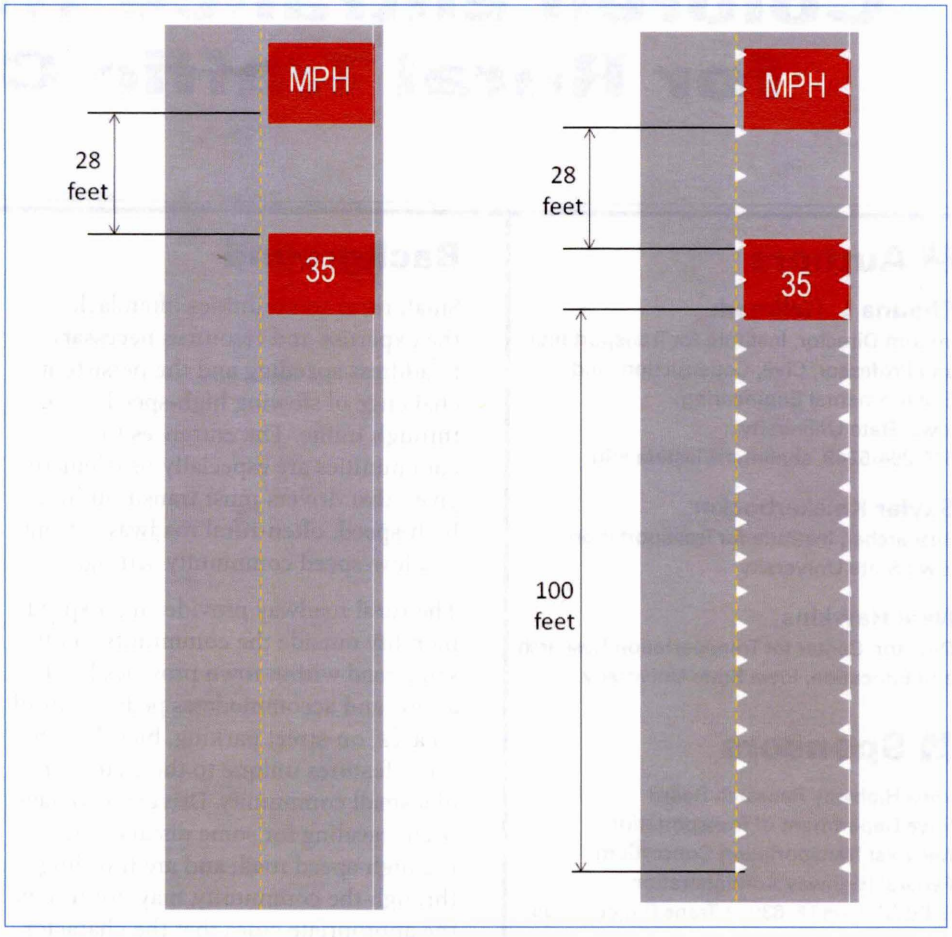
In a previous Iowa study, a modification of the European treatment was evaluated at the entrances to Dexter, Iowa along 350th Street (State Highway 925). The treatment resulted in a reduction in mean speeds of 5.4 mph and reductions in 85th percentile speeds of 8 mph. The percentage of vehicles traveling 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, Iowa 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 (Phase I) left and final treatment (Phase II) 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 a previous study conducted in Dexter, Iowa. However, the red treatment is not that large and is somewhat unusual. The white "dragon's teeth" provides 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 the previous study in Union, Iowa using the speed-reduction markings showed them as being only moderately effective. 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 was to use both the red marking 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 just the red treatment compared to the entire design could be assessed. As a result, the treatment was applied in two phases.

Given the study period was not long enough for the required 24 month after analysis period, this tech brief provides results for the first year. The dragon's teeth will be installed in the summer of 2013 and the project results will be updated when the results are available.

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. As noted above, the "dragon's teeth" will be added in 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 for north community entrance in 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 as described below.

Speeds decreased at all three sites with decreases up to 2.3 mph in mean speeds. All sites had decreases in 85th percentile speeds of 2 mph. The fraction of vehicles traveling 5 or more mph over the posted speed limit decreased by 30 to 44 percent and the fraction of vehicles traveling 10 or more mph over the posted speed limit decreased by about 40 percent for all sites. A large decrease resulted in the fraction of vehicles traveling 15 or more mph over the posted speed limit (up to 100 percent). No change was noted in the fraction of vehicles traveling 20 or more mph over the speed limit.

Results for colored entrance treatment at 1 month after installation

	Jesup East	Jesup West	Ossian North
Mean Speed	-1.3	-1.5	-2.3
85th Percentile Speed	-2	-2	-2
Fraction of Vehicles Traveling Over Posted Speed Limit			
≥ 5 mph	-43.5%	-29.7%	-29.6%
≥ 10 mph	-40.0%	-40.0%	-36.4%
≥ 15 mph	-100.0%	-50.0%	-57.1%
≥ 20 mph	0.0%	0.0%	0.0%

References

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

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