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Chevrons and Oversized Chevrons

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Abstract
Chevrons provide additional emphasis and guidance for drivers. If spaced properly, chevrons can delineate the curve so drivers can interpret the sharpness of the curve. Table 2C-2 of the *Manual on Uniform Traffic Control Devices* (FHWA 2009a) recommends the size of chevron alignment (W1-8) signs by roadway type. Several agencies, including the Iowa Department of Transportation (Iowa DOT), have applied a larger chevron size to a roadway than suggested by this table. The idea is that larger chevrons will be more prominent and visible to drivers. These larger chevrons may be particularly useful if sight distance issues exist.

Keywords
Countermeasures, Highway Safety, Ran off road crashes, Rural highways, Signs, Symbol signs, Traffic control devices, Traffic safety

Disciplines
Civil Engineering

Comments
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Description

Chevrons provide additional emphasis and guidance for drivers. If spaced properly, chevrons can delineate the curve so drivers can interpret the sharpness of the curve.

Table 2C-2 of the *Manual on Uniform Traffic Control Devices* (FHWA 2009a) recommends the size of chevron alignment (W1-8) signs by roadway type. Several agencies, including the Iowa Department of Transportation (Iowa DOT), have applied a larger chevron size to a roadway than suggested by this table (see Figure 1). The idea is that larger chevrons will be more prominent and visible to drivers. These larger chevrons may be particularly useful if sight distance issues exist.

Placement

Chapter 2 of the MUTCD (FHWA 2009a) covers standard application of chevrons. No standards exist for use of oversized chevrons. In general, standard chevrons signs are replaced with the next largest size specified in the MUTCD.

In contrast to chevron size, alternatives to the frequency and spacing around a curve have also been evaluated. A field study by the Texas Transportation Institute (TTI) (Rose and Carlson 2005) evaluated the impact of varying the number of chevrons in view around a curve and developed an alternate spacing chart to assist maintenance personnel.

Pratt et al. (2009) composed a table of speed based guidelines for selecting curve traffic control devices. As shown in Table 1, chevrons, large arrows, or both are required for differences between speed limit and advisory speed exceeding 15 mph. However, their use is recommended only for 10 to 14 mph differences in speed.

Effectiveness of Oversized Chevrons

The effectiveness of oversized chevrons is unknown.

Effectiveness of Chevrons

No studies have been completed in Iowa to evaluate the effectiveness of

Figure 1. Oversized chevrons on US 6 in Johnson County, Iowa (Tom Welch, Iowa DOT)

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Table 1. Guidelines for the Implementation of Curve Traffic Control Devices Based on Speed Differentials

	Difference Between Speed Limit and Advisory Speed (mph)				
Sign Type	5 to 9	10 to 14	15 to 19	20 to 24	≥ 25
Turn, Curve, Reverse Turn, Reverse Curve, or Winding Road	Recommended	Required	Required	Required	Required
Advisory	Recommended	Required	Required	Required	Required
Chevrons, Large Arrow, or Both	Optional	Recommended	Required	Required	Required
Horizontal Alignment/Advisory Speed at Beginning of Curve	—	—	Optional	Optional	Recommended

chevrons. A current study is being conducted involving crash modification factors for chevrons. This brief will be updated when the study is completed. Known national studies on the effectiveness of chevrons in reducing speed or crashes are summarized below.

Zador et al. (1987) evaluated the effectiveness of chevrons and other treatments at 46 sites in Georgia and five sites in New Mexico. Additionally, at several other control sites, the researchers collected lateral placement data at each curve. The authors found that, at night, drivers moved away from the centerline, and vehicle speed and placement variability were reduced slightly with the use of chevrons and raised pavement markings.

Jennings and Demetsky (1983) evaluated chevrons along several rural Virginia curves. The roadway segments had average daily traffic (ADT) between 1,000 and 3,000 vehicles per day (vpd). The researchers found that overall speed and speed variance decreased with the use of chevrons. The researchers also recommended chevron installation for curves greater than seven degrees.

Re et al. (2010) evaluated the application of chevrons and chevrons with a full-post retro reflective treatment at two curves on rural two-lane roadways in Texas. Both sites had paved shoulders and a posted speed limit of 70 mph during the day and 65 mph at night. One site had an advisory speed of 45 mph and the other had an advisory speed of 50 mph.

Each treatment was applied to each site and the researchers collected speed and lateral position before and 10 days after installation of the treatment. Average speeds with chevrons were 1.6 mph lower (see Table 2), and 85th percentile speeds decreased on average by 1.3 mph.

A pooled fund study evaluated the impact of improved curve delineation (FHWA 2009b) in the state of Washington. This study installed chevrons at sites where chevrons were not posted previously, as well as increased the number of chevrons at locations where they were already present. The authors noted a reduction in several crash types (see Table 3).

Advantages

Low cost

Disadvantages

Use of traffic control devices when not warranted can result in additional costs for maintenance and replacement

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Table 2. Speed Results for Chevrons (Re et al. 2010)

		Mean speed (mph)			85th pecentile speed (mph)		
Site	Advisory speed (mph)	Before	After	Change	Before	After	Change
1	45	58.3	56.8	-1.5	65.7	64.2	-1.5
2	50	54.8	53.2	-1.6	64.2	63.1	-1.1
Average		**56.6**	**55.0**	**-1.6**	**65.0**	**63.7**	**-1.3**

Table 3. CMFs for Chevrons

Sign Type	Crash Type	CMF
Chevron and curve warning signs (Montella 2009)	All crashes on principal arterial/freeways/expressways	0.59
	ROR rashes on principal arterial/freeways/expressways	0.56
	Fatal/serious injury/minor injury	1.46
	Nighttime	0.66
Chevron signs (Montella 2009; Srinivasan et al. 2009)	All crashes on principal arterial/freeways/expressways	0.63 to 1.27
	ROR crashes on principal arterial/freeways/expressways	0.90
	Property damage only on principal arterial/freeways/expressways	0.83
	Fatal and injury crashes on principal arterial/freeways/expressways	1.46
	Nighttime on principal arterial/freeways/expressways	1.92
	Wet road crashes on principal arterial/freeways/expressways	0.41
	All crashes on rural two-lane	0.96
	Head-on/sideswipe on rural two-lane	0.94
	Fatal and injury crashes on rural two-lane	0.84
	Nighttime on rural two-lane	0.75
	Nighttime head-on/sideswipe on rural two-lane	0.78

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