

to turns and

Alerting motorists

curves ahead

This issue of *StreetWise* discusses how to choose and place warning signs and delineators to help guide motorists through turns and curves.

Here are four conditions in which a turn or curve could benefit from additional warning signs and post-mounted delineators:

- Accident lists show there have been “run off the road,” “hit fixed object” or other turn- and curve-related crashes at the location.
- Physical evidence, such as shoulder damage, scars on adjacent trees or other marks on the shoulder or berm, indicates errant vehicles left the road.
- Day and night test runs suggest that additional warning signs and delineators are needed to indicate the travel path to drivers.
- The turn or curve is “hidden” from drivers, or the roadway offers few or confusing cues to the alignment ahead. For example, signs and delineators may be needed where a turn or curve immediately follows a crest in the road, or where an overhead utility line diverges from the highway.

Proper use of warning devices

The primary devices for alerting drivers about turn and curve severity, delineating the travel path and providing guidance through the curvature are the Large Single Arrow sign, Chevron Alignment sign and post-mounted delineators, which are reflective buttons, squares or strips attached to metal or flexible posts.

The Large Single Arrow sign typically is used at short turns and curves—300 to 350 feet

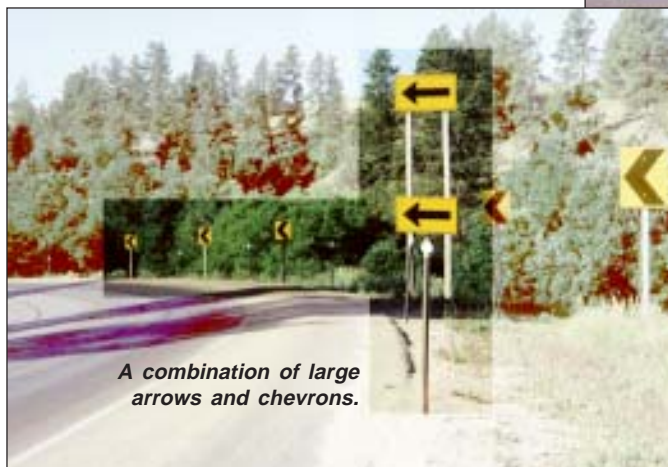
long—to mark a severe change in alignment. The standard size of the sign is 48 inches by 24 inches.

Chevron Alignment signs usually are used in a series at longer turns and curves—greater than 7 degrees. The standard size of the sign is 18 inches by 24 inches.

Chevrons also should be considered where post-mounted delineators have proven inadequate.

Chevrons should *not* be used

- 1) on a winding road where they could confuse drivers who may be confronted with the last in a series of the signs at the point where the road begins to turn in the reverse direction, or
- 2) where a turn or curve within the segment has inadequate length for proper spacing of the signs.



A combination of large arrows and chevrons.



A typical delineator

Alerting motorists to tu



Chevrons must be used in a series of at least three.

Placed in a series on the side of the road, post-mounted delineators provide a succession of reflective points that is particularly helpful to drivers at night. A single delineator has a minimum reflective area of 7 square inches.

Types of delineators

A delineator usually is a center-mount button or a square. Buttons are 3 inches to 3.25 inches in diameter. Squares normally are 4 inches by 4 inches and often are made in the shop from old sign blanks or scrap sheet aluminum covered with Type III or IV reflective sheeting. More than one button or square can be mounted on a post to provide a longer reflective area.

Delineators may be attached to rigid or flexible posts. Rigid posts often are made from channel bar. They usually require replacement if hit by an errant vehicle.

Flexible posts are designed to withstand high-speed impacts and return to an upright position. Because they typically are made of a white or light-colored plastic material, they are noticeable enough to provide some guidance when vehicle headlights may not be in use.

The color of the reflector on each post must be the same as the color of the nearest white or yellow pavement stripe. For example, post-mounted delineators adjacent to the lane of travel on a two-way road must be white. On an one-way road or divided highway, they must be white on the right side and yellow on the left side in the one-way direction.

When marking the location of a potential hazard, such as a culvert end, the post-mounted delineator should be yellow. Red delineators may be installed on posts where they will be viewed by motorists traveling in the wrong direction on a ramp, divided highway or one-way road.

Placement of signs

The Large Single Arrow sign must be placed on the outside of a turn or curve at a right angle to approaching traffic.

Chevron Alignment signs also are placed on the outside of a turn or curve at right angles to approaching traffic. Most often they are mounted back to back on one post. One sign serves motorists traveling in one direction, and the other sign serves motorists traveling in the opposite direction. Of course, the point of the Chevron must indicate the direction of the curvature.



A series of Chevrons should be installed from the beginning to end of a turn or curve such that two Chevrons are always in a driver's view until the alignment of the road eliminates the need for additional signs. To be most effective, Chevrons should be visible for at least 500 feet.

Remember that these warning signs should not be used where the alignment and severity of curvature are readily apparent to drivers. Excessive use tends to breed disrespect for signs in general. In fact, use of warning signs must be based on engineering judgment.

Placement of delineators

Post-mounted delineators must be placed so that the top of the reflective area is 4 feet above the near edge of the roadway. The posts must be



Turns and curves ahead

installed 2 to 6 feet outside the edge of the shoulder or in line with a guide rail.

They should not be greater than 12 feet or less than 2 feet from the outside edge of the roadway. Their distance from the outside edge of the roadway should be kept constant, except where an obstruction intrudes into their alignment. In that case, the line of posts should make a smooth transition to the inside of the obstructions and then return to its normal alignment once the obstruction is passed.

On straight sections of roadway, delineators normally should be from 200 to 528 feet apart.

Along a turn or curve, spacing between post-mounted delineators depends on the radius of the turn or curve; several delineators should remain visible at a glance to the driver. Spacing varies in areas of transition into and out of turns and curves.

The following table provides approximate spacing between delineators along turns and curves of various radii and in the transition areas leading into and out of the curvature.

Radius (R) of turn or curve (feet)	Delineator spacing (S) within turn or curve (feet)	Delineator spacing in advance of and beyond curvature		
		1 st delineator	2 nd delineator	3 rd delineator
50	20	40	65	125
150	30	60	90	180
200	35	70	110	215
250	40	85	125	250
300	50	95	145	290
400	55	110	170	300
500	65	125	190	300
600	70	140	210	300
700	75	150	230	300
800	80	165	245	300
900	85	175	260	300
1000	90	185	275	300

Spacing on turns and curves that have radii not shown may be interpolated from the table or computed from the formula:

$$S = (R-50)$$

Further information

Guidelines for the placement of Large Single Arrow signs, Chevron Alignment signs and post-mounted delineators may be found in the *Sign and Pavement Marking Handbook for Local Municipalities*. Sign standards are provided in the *Handbook of Approved Signs*. Both publications are available from the Nevada T² Center library. To borrow either of them, call Aunt Jenny at 775/784-1433.

The shortest spacing on turns and curves should be 20 feet, and the greatest should not exceed 300 feet. The first delineator in advance of the point of curvature and the first delineator after the curvature ends should be placed at approximately 2S from the beginning and end of the curvature, the second at 3S, and the third at 6S, but not at a spacing that exceeds 300 feet.



For additional information, contact the Nevada T² Center at the address shown below.

StreetWise is published periodically by the Nevada Transportation Technology Transfer Center at the University of Nevada, Reno. The publication contains rewritten material compiled from reliable sources, but it assumes no responsibility for their correctness.

The Nevada T² Center is part of the nationwide Local Technical Assistance Program. It is financed jointly by the Nevada Department of Transportation and the Federal Highway Administration.

StreetWise

Nevada T² Center/257
University of Nevada, Reno
Reno, NV 89557

Phone: 775/784-1433 • FAX: 775/784-1429

The University of Nevada, Reno is an Equal Opportunity/Affirmative Action employer and does not discriminate on the basis of race, color, religion, sex, age, creed, national origin, veteran status, physical or mental disability, and in accordance with university policy, sexual orientation, in any program or activity it operates. The University of Nevada, Reno employs only United States citizens and aliens lawfully authorized to work in the United States. 1/94. 1,000.



University of Nevada, Reno

Nevada T² Center/257
Reno, NV 89557-0179

NONPROFIT
ORGANIZATION
U.S. Postage
PAID
Reno, NV
Permit No. 26