

RECOMMENDED PRACTICES	PART	HIGHWAY SIGNS
	SECTION	WARNING SIGNS
	SUB-SECTION	

General

Unexpected changes in roadway alignment (such as abrupt turns, curves, or the termination of road sections) may involve hazardous driving situations unless drivers are advised in advance of these conditions.

Statistics indicate that the potential for *run-off-the-road* and *hit fixed object* collisions is greater at curves and turns than along tangent roadway sections.

For example, in Alberta, *run-off-road* collisions account for 24% of the total number of collisions on the provincial two-digit highways. Approximately two-thirds of these collisions involve horizontal curves.

This potential for collisions can be greatly reduced by applying appropriate warning roadway alignment signs in advance of the curves.

Several types of roadway alignment signs are available for use. Selecting the most appropriate sign for each situation is usually based on an engineering study and good judgement.

Factors usually considered in selecting the most appropriate sign type include safe travelling speed along a curve, radius of a curve, number of curves in the vicinity, and separation distance between curves.

Standard

There are three basic roadway alignment signs: Turn (WA-1), Sharp Curve (WA-2) or Curve (WA-3).



WA-1-R WA-1-L	600 mm x 600 mm R-right, L-left	
Colour	Symbol and Border Background	Black Yellow
Sheeting	ASTM Type III or IV	

Of the set of basic roadway alignment signs, the Turn sign (WA-1-L left version) and (WA-1-R right version) indicate the most severe change in road alignment.



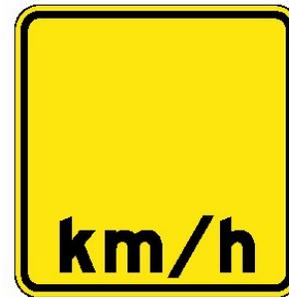
WA-2-R WA-2-L	600 mm x 600 mm R-right, L-left	
Colour	Symbol and Border Background	Black Yellow
Sheeting	ASTM Type III or IV	

The Sharp Curve signs (WA-2-L left version) and (WA-2-R right version) indicate a less severe change in roadway alignment than the Turn sign and a more extreme change than the Curve sign.



WA-3-R WA-3-L	600 mm x 600 mm R-right, L-left	
Colour	Symbol and Border Background	Black Yellow
Sheeting	ASTM Type III or IV	

Of the set of basic roadway alignment signs, the Curve sign (WA-3-L left version) and (WA-3-R right version) indicate the least extreme change in road alignment.



WA-7	600 mm x 600 mm	
Colour	Symbol and Border Background	Black Yellow
Sheeting	ASTM Type III or IV	

The Advisory Speed tab sign (WA-7) indicates the safe speed for driving along a curve.

The degree of curve symbol, progressing from Curve to Sharp Curve to Turn, is selected based on a combination of the posted speed on the curve approach and the advisory speed on the curve itself.

Specific criteria for selecting a symbol shape for a roadway alignment sign are included in the following sections.

Sizes of Roadway Alignment Signs

The standard size of a basic roadway alignment sign (Turn, Sharp Curve or Curve) is **600 mm x 600 mm**. It is the minimum size permitted on provincial highways.

Oversize signs are permitted in special situations where an investigation has shown that a larger sign is needed for greater visibility or emphasis.

Such situations include complex visual environments where many traffic control devices compete for driver attention, or high speed and high traffic volume locations where drivers must concentrate more on the driving task.

In determining whether an oversize sign is warranted, one should consider aspects such as posted speed, background distractions, and degree of hazard, as revealed by a collision history or field inspection. There are no simple warrants for the use of oversize signs: each case must be decided on its own merit.

Guidelines for Use

Curve signing warrants assist in selecting a roadway alignment sign (Turn, Sharp Curve, or Curve) for a specific situation. The warrants are summarized in Table 1 on the following page.

Definitions

Curve approach speed – speed along a tangent section prior to a curve or a posted speed on a highway.

Curve advisory speed – safe travelling speed on a curve where the curvature is the greatest as determined by a ball bank indicator.

The criteria included in Table 1 has been developed based on the general principle that the greater the difference between the initial curve approach speed and the final

speed on the curve the more extreme the indication of curvature on the sign symbol.

In the table, values in the first column represent the curve approach speeds. Values in the top row represent advisory speeds on a curve where the curvature is greatest.

A symbol for a roadway alignment sign (Turn, Sharp Curve, or Curve) is selected based on a combination of the curve approach speed (i.e., posted speed) and the curve advisory speed.

Curve signing warrants are summarized as follows:

- An appropriate roadway alignment warning sign (Turn, Sharp Curve, or Curve) is always used where **the advisory speed on a curve is less than the curve approach speed (posted speed)**.
- Where **the advisory speed on a curve is equal to the curve approach speed**, a Curve sign should be used when both of the following conditions are met:
 - the radius of the curve is 2,000 metres or less
 - the curve approach speed is 80 km/h or more.
- When the curve advisory speed is less than 80 km/h, a Curve sign to mark the curves with a radius of 2,000 m or less is recommended but not required.
- A Sharp Curve sign is used when the curve advisory speed is less than two-thirds of the curve approach speed but greater than 20 km/h.

- The Turn sign is used where the curve advisory speed is 20 km/h or less.

TABLE 1 Criteria for Selecting Turn/Sharp Curve/Curve Warning Signs

Curve Approach Speed (Posted Speed) Km/h	Curve Advisory Speed (safe traveling speed) Km/h								
	105	95	85	75	65	55	45	35	25
110	WA-3 ¹	WA-3*	WA-3*	WA-3*	WA-3*	WA-2*			
100		WA-3 ¹	WA-3*	WA-3*	WA-3*	WA-2*			
90			WA-3 ¹	WA-3*	WA-3*	WA-2*	WA-2*		
80				WA-3 ¹	WA-3*	WA-2*	WA-2*	WA-2*	
70					WA-3 ²	WA-2*	WA-2*	WA-2*	WA-1*
60						WA-3 ²	WA-2*	WA-2*	WA-1*
50							WA-3 ²	WA-2*	WA-1*

WA-1 – Turn sign

WA-2 - Sharp Curve sign

WA-3 – Curve sign

* - A star indicates that an Advisory Speed tab is mandatory

¹ - Curve sign required if the radius on a curve is 2,000 m or less.

² - Curve sign recommended on curves with a radius of 2,000 m or less but not required.

Where the curve advisory speed is 15 km/h less than the curve approach speed, a Curve, Sharp Curve, or Turn sign must be supplemented with an Advisory Speed sign tab (WA-7).

(e.g. 75 km/h, 85 km/h).

The Advisory Speed indicated on the tab must be determined through ball-bank indicator testing.

The Advisory Speed tab sign indicates a maximum safe speed at which a particular curve may be negotiated under favorable conditions. The speed shown on the legend must be in multiples of 10 km/h ending at 5

A detailed overview of the methods for establishing advisory speed along curves is provided in the Traffic Operations guideline entitled *Methods for Establishing Safe Speeds on Curves*.

Since curve warning signs are primarily for the benefit of drivers unfamiliar with the road, they must be placed at locations which ensure their greatest conspicuity.

Curve warning signs should provide adequate time for the driver to perceive, identify, decide, and perform any necessary maneuver to safely negotiate the curve.

The total time to perceive and react to a sign is the sum of the perception, and identification/understanding times and times needed for decision-making, and execution of decision.

For situations where the curve approach speed is equal to the curve advisory speed, placement of roadway alignment signs should be as follows:

- for curve approach speed (posted speed) of 70 km/h or more, signs should be placed at a distance of 150 to 200 m in advance of a curve.
- for curve approach speed (posted speed) of less than 70 km/h, signs should be placed at a distance of 50 m to 150 m in advance of a curve.

For situations which require that a driver reduce speed, the distances should be adjusted to reflect a 2.5 second brake reaction time and time needed to decelerate to the safe speed on the curve.

Table 2 below summarizes the desirable distances for the placement of signs in such situations.

The values in the table provide general guidelines only. The exact location of signs should be established in field based on site geometric conditions, available sight distances, presence of obstructions, and other operational conditions.

TABLE 2
Desirable Distances for Advance Placement of Roadway Alignment Signs

Curve Approach Speed	Advisory Speed (km/h)		
	95 - 85	75 - 65	55 - 45
(Posted Speed) km/h	Desirable Advance Distance (m)		
110	250 - 350	300-400	
100	200 - 300	250-350	
90		200-300	250-350
80		150-250	200-300
70			200-250
60¹			150- 200

¹ for curve approach speeds lower than 60 km/h apply 50 to 150 metres placement distance.

Roadway Alignment signs (Turn, Sharp Curve, Curve) must be installed on the right-hand side of the roadway facing traffic.

On divided highways and one-way multilane roadways, an additional sign should be installed on the left side of the roadway.

Supplementary Traffic Control Devices

Safety along sharp horizontal curves may also be enhanced through the use of supplementary traffic control devices.

Several types of traffic control devices are available for use. They include delineators, chevron alignment signs, checkerboard signs, and in some very special cases flashing beacons.

Guidelines in the Highway Pavement Marking Guide have been developed for the use of delineators along curves. Delineators should always be considered on curves with a radius of 1,500 metres or less. The guidelines also define the number of posts and their spacing along curves with various radii.

Chevron alignment signs may be used to provide additional guidance to drivers along sharp curves. Several factors need to be considered before signs can be installed along a curve. Factors to consider include curve radius, collision history along a curve (e.g., number of *run-off-road* or *fixed object* collisions), and the operational and geometric characteristics of the location (e.g., traffic volumes, distribution, shoulder width, surface type).

The Checkerboard sign may be used to indicate an abrupt change in alignment at a turn. The sign should normally be considered at locations where the potential for collisions is high due to the drivers proceeding straight ahead.

References to Standards

<i>Recommended Practices</i> Section: Traffic Operations	Methods for Establishing Safe Speeds on Curves
<i>Highway Pavement Marking Guide</i> Section C7	Delineators