User Guide for R1-6 Gateway Treatment for Pedestrian Crossings

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DEFINITION

A gateway installation of the R1-6 signs can be installed at a crosswalk by placing them on the edge of the road[1] and on all lane lines. This requires all drivers to drive between two signs. The perceived narrowing of the road is one factor influencing the treatments efficacy. However, the message also has been shown to influence efficacy even more. Double-sided signs are recommended because they increase the likelihood that drivers will see a sign in heavy traffic conditions.

Figure 1.[2]

[1] **Edge line sign placement requires permission to experiment from the FHWA before use. Please note: discussion of the use of the R1-6 signs on edge lines or configurations showing edge line sign placement producing the noted yielding compliance rates are accurate but do require permission to experiment for all applications statewide.**

[2] **Curb placement of R1-6 signs as shown in Figure 1 currently requires FHWA permission to experiment also. Curb placement does not require permission to experiment if the curb is on a median island, pedestrian refuge island, or curb extension.**

Gateway Elements

A gateway treatment can be constructed from three types of elements[3]: A R1-6 sign mounted in the roadway[4] on a curb types base, and a flexible delineator post mounted on the white lane line, and a R1-6 sign flush mounted on a curb on a median island, or curb extension. The Photograph on the left side of Figure 2 shows a R1-6 sign mounted on a white curb type base. A yellow base should be used when the R1-6 sign is mounted on a yellow line. The middle picture in Figure 2 shows a flexible delineator mounted on a white lane line. The delineator should be the same color as the R1-6 sign and should have reflective markings. The right picture in Figure 2 shows a flush mounted R1-6 sign mounted on a curb extension. It is permissible to place these signs on the edge of a refuge island or curb extension.

Figures 2a-c. Figure 2a (above left) shows an R1-6 sign installed on a removable curb base. Figure 2b (middle) shows a flexible delineator installation. Figure 2c (above right) shows an R1-6 sign mounted on a flush mounted base.

[3] The R1-6 signs used in study that had the best survivability (shown on lane line in Figure 2a) measures 8 inches wide by 28 inches high. The R1-6 sign in Figure 2c, shown mounted on top of the curb, measures 12 inches wide by 36 inches high.

[4] **Edge line sign placement requires permission to experiment from the FHWA before use. Please note: discussion of the use of the R1-6 signs on edge lines or configurations showing edge line sign placement producing the noted yielding compliance rates are accurate but do require permission to experiment for all applications statewide.**

Effectiveness of the R1-6 Gateway Installation:

- Increase driver yielding compliance at crosswalks (see individual configuration sheets for reduction ranges).
- Traffic calming effect – decreases vehicle speeds with or without pedestrians present.

The Following Factors Contribute to the Effectiveness of the R1-6 Gateway:

- Gap Size - The narrower the gap between the signs the more effective the gateway treatment.
- Speed Limit - The gateway is very effective on roads with a speed limit of 30 mph or less regardless of AADT. However, it appears to be very effective on roads with operating speeds of 35 mph, only when AADT is below 12,000.
- The gateway treatment has not been studied on roadways with speed limits over 35mph.
- Not as effective at roundabouts; however, the treatment is more effective at entrance points than at exit points of roundabouts.
- The yielding rates are much higher for gateways than just placement on centerline or just placement on curbs.
- A gateway treatment with the wording on the signs performs significantly better than a gateway with similarly sized delineators.

Factors Contributing to the Survival of the Gateway Installation:

- The in-street gateway signs need to be removed each year before the winter plowing season and reinstalled in the spring.
- Edge signs placed in the gutter pan, on top of the edge of a refuge island, or in the gutter pan tend to survive better than signs placed on the roadway edge line[5].
- With on-street parking, curb extensions are recommended to protect the sign, increase the visibility of the signs and reduce screening of pedestrians entering the crosswalk.
- On multilane roads, consider replacing the sign on the white lane lines with flexible yellow-green delineator posts that deforms in shape when hit and recovers to its original shape immediately after the strike. This type of device will survive a larger number of strikes than delineators that have a pivoting axis at the base. Note: The R1-6 background color and the delineators should be the same color.
- Preliminary data seem to show that the R1-6 signs installed with a removable curb type base (see Figure 1a) placed in the roadway seem to survive better than those bolted to a flush base.
- In many cases placing signs further back (30 to 50 ft. in advance of the crosswalk) will increase survival because they are out of the turning radius of vehicles and will increase the distance drivers yield from the crosswalk reducing the chance of a multiple threat crash.

General Guidance on Gateway Installations:

- Signs and delineators should be installed between 1.5 feet and 50 feet advance of the crosswalk so as not to be a tripping hazard for pedestrians and to make it easy to repaint or re-install thermoplastic markings.
- If only local law requires that drivers to yield to pedestrians in a crosswalk than LOCAL LAW should appear at the top of the sign. If no local law exists this message should be omitted.
- At locations with a median or pedestrian refuge island, you may place in-street signs on top of the median or refuge island curb (does not require permission to experiment).
- If two crosswalks exist at an intersection the gateway need only be placed on the approach legs of the roadway.
- No portion of the sign or sign base shall be in the crosswalk or on the crosswalk lines.
- A refuge island and advance yield lines are recommended where AADT is 12,000 or greater.

[5] **Edge line sign placement requires permission to experiment from the FHWA before use. Please note: discussion of the use of the R1-6 signs on edge lines or configurations showing edge line sign placement producing the noted yielding compliance rates are accurate but do require permission to experiment for all applications statewide.**

Gateway Treatment, Four-Lane Configuration With Refuge Island	
Travel Lanes	4
R1-6 Signs	4
Flexible Delineators	2
Yielding Compliance	Between 70% and 90% compliance rate on roads with posted speeds of 30 mph or lower with ADT up to 25,000; Compliance rate on roads with a posted speed of 35 mph is 35% to 60% with ADT above 12,000.
Approximate Cost	$1,260 for materials 40-minute installation 10 minutes to remove for winter 10 minutes to reinstall in spring

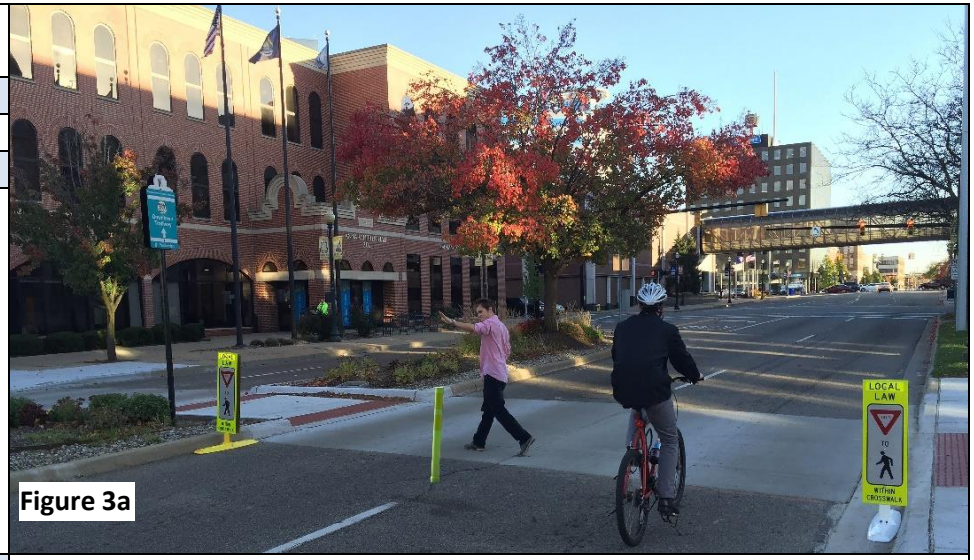

Figure 3a

General Description:

Edge signs on the left can be installed on the median island as close to the curb as possible. Signs on the right are installed in the gutter pan[6]. The element installed on the lane line is most likely to be struck and is therefore the most vulnerable element in this configuration. That is why a flexible delineator post is recommended in this location. A refuge island and advance stop or yield line markings are recommended at crosswalks on multilane roads if AADT is above 12,000. A recent draft NCHRP report has found a crash modification factor associated with both of these treatments. The gateway treatment is associated with a 6-7 mile per hour reduction in vehicle speeds traveling through the gateway on multilane roads. Installing a gateway treatment 30 feet in advance of the crosswalk also can improve yielding rates.

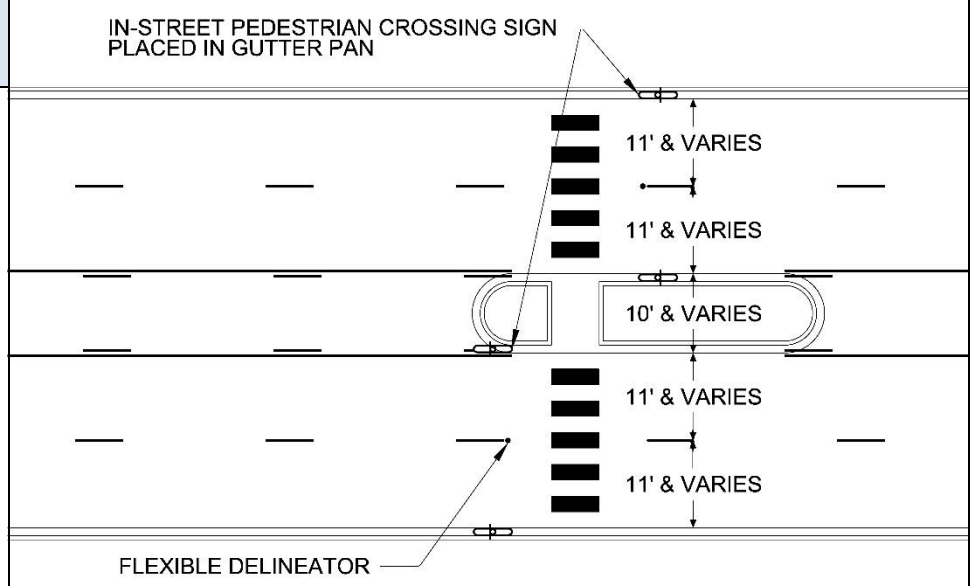

Figure 3b

[6] **Edge line sign placement requires permission to experiment from the FHWA before use.**

Gateway Treatment, Four-Lane Configuration at an Intersection, No Refuge Island	
Travel Lanes **Parking Lanes**	4 2
R1-6 Signs	3
Flexible Delineators	2
Yielding Compliance	Between 55% and 80% compliance rate on roads with posted speeds of 30 mph or lower with ADT up to 25,000; Compliance rate on roads with a posted speed of 35 mph is 35% to 40% with ADT above 12,000.
Approximate Cost	$1,160 for materials 35-minute installation 8 minutes to remove for winter 8 minutes to reinstall in spring

Figure 4a

General Description:

Note: Because of on-street parking, the edge[7] signs would be vulnerable to turning vehicles if they were placed out into the roadway in line with the parking lane. In this case, the installation of a curb extension, also known as a "bulb-out" is recommended. The curb extension improves the view of pedestrians before they step off the curb and would allow the sign to be placed on the edge of the curb extension providing it protection.

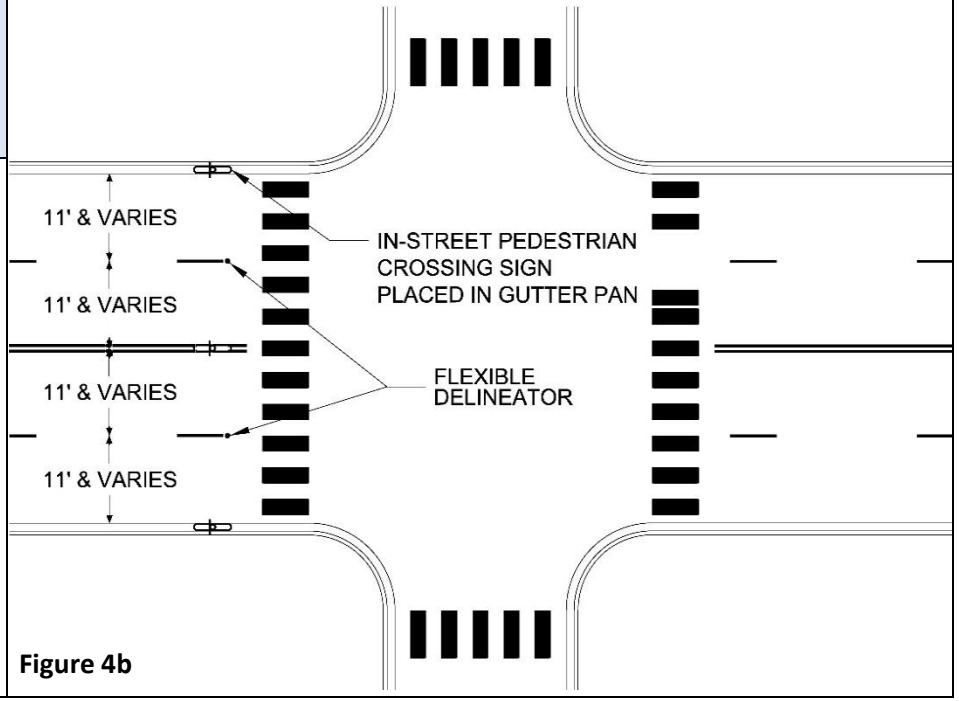

Figure 4b

[7] **Edge line sign placement requires permission to experiment from the FHWA before use.**

Gateway Treatment, Three-Lane Configuration With Refuge Island	
Travel Lanes **Passing/Turn Lanes**	2 1
R1-6 Signs	4
Flexible Delineators	0
Yielding Compliance	Between 60% and 80% compliance rate on roads with posted speeds of 30 miles per hour or lower with ADT up to 25,000; Compliance rate on roads with posted speed of 35 miles per hour unknown
Cost	$1,200 for materials 20-minute installation 8 minutes to remove for winter 8 minutes to reinstall in spring

Figure 5a

General Description:

Note: Signs at this location are less likely to be damaged if the signs on the left side of the lane are installed on top of curb on the refuge island, and those on the right side of the road are installed in the gutter pan[8] or on top of curb[9] as shown in Figure 5a. Signs placed on the refuge island should be placed on the curb rather than on the center of the island because the width of the gateway influences its effectiveness.

The gateway treatment is associated with a 3 mile per hour reduction in vehicle speeds going through the gateway on three-lane roadways when pedestrians are not present in the crosswalk.

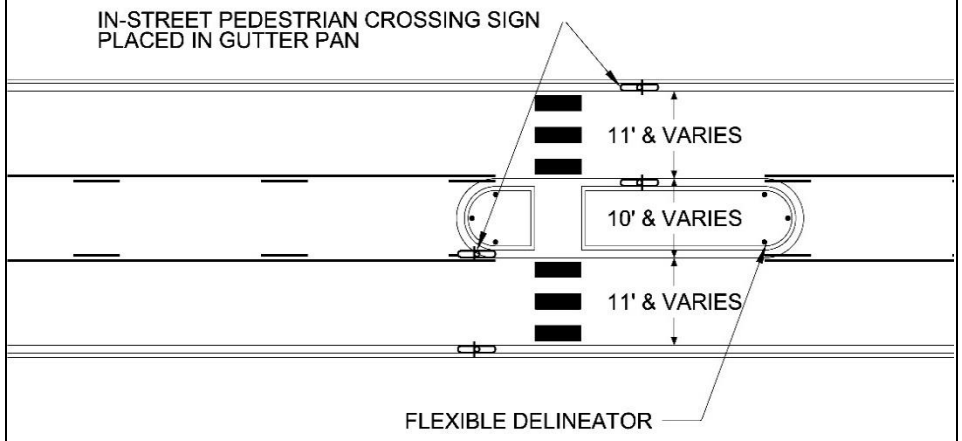

Figure 5b

[8] **Edge line sign placement requires permission to experiment from the FHWA before use.**

[9] **Curb placement of R1-6 signs currently requires FHWA permission to experiment.**

Gateway Treatment, Three–Lane Configuration Without Refuge Island	
Travel Lanes **Passing/Turn Lanes**	2 1
R1-6 Signs	4
Flexible Delineators	0
Yielding Compliance	Between 60% and 90% compliance rate if speed limit is 30mph or less for ADT up to 25,000. If the speed limit is 35 mph expect similar results if ADT is 12,000 or less. UNKNOWN above 12,000 ADT.
Approximate Cost	$1,200 for materials 20-minute installation 8 minutes to remove for winter 8 minutes to reinstall in spring

Figure 6a

General Description:

Note: By installing the gateway on the near side of the intersection, both crosswalks are covered with only four signs. Data show that a gateway at the near side crosswalk continues to be effective for the far side of the intersection, as the motorist on the far side has already passed through a gateway on the near side.

The signs on the curb side in the gutter pan would have a better chance of survival if they are moved placed between 3 and 50 feet in Advance of the crosswalk markings. This would reduce the chance of the sign being struck by a turning vehicle. Figure 6b shows a typical installation[10].

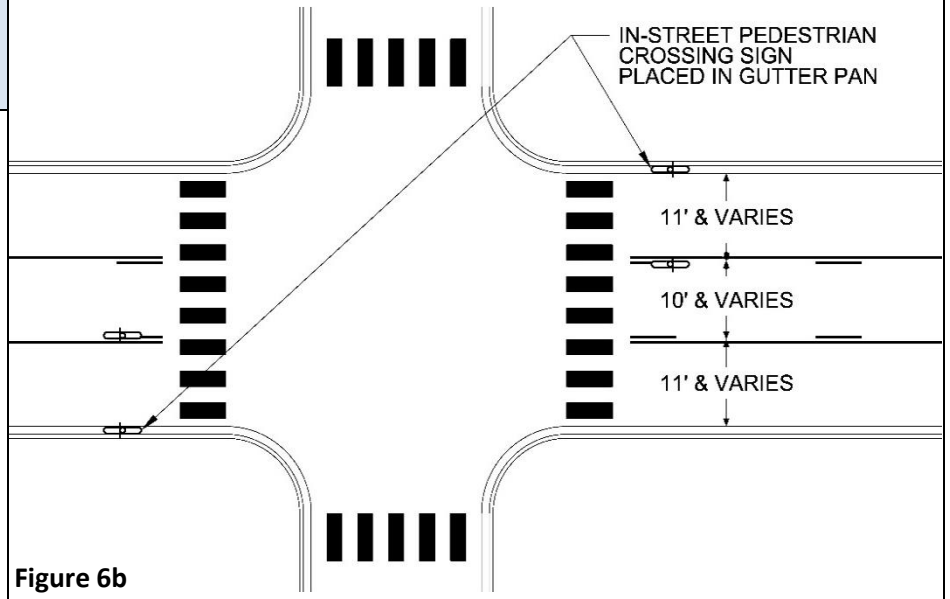

Figure 6b

[10] **Edge line sign placement requires permission to experiment from the FHWA before use.**

Gateway Treatment, Two-Lane Configuration With Median Island and Bike Lanes	
Travel Lanes **Bike Lanes**	2 2
R1-6 Signs	4
Flexible Delineators	0
Yielding Compliance	If posted speed limit is 30mph for AADT up to 25,000 expect 70% to 80% yielding. If the speed limit is 35 mph and AADT is above 12,000 expect yielding of 40% to 60%.
Approximate Cost	$1,200 for materials 20-minute installation 8 minutes to remove for winter 8 minutes to reinstall in spring
General Description: Note: Signs are less likely to be damaged if the signs on the left side of the road are installed in the gutter pan or on top of the curb on the median island. Figures 7a and 7b show that signs on the right side of the road are installed on the lane line because of the presence of a bike lane[11]. An installation on the edge of the roadway might reduce the effectiveness of the treatment because it would increase the gap because of the width of the bike lane.	

Figure 7a

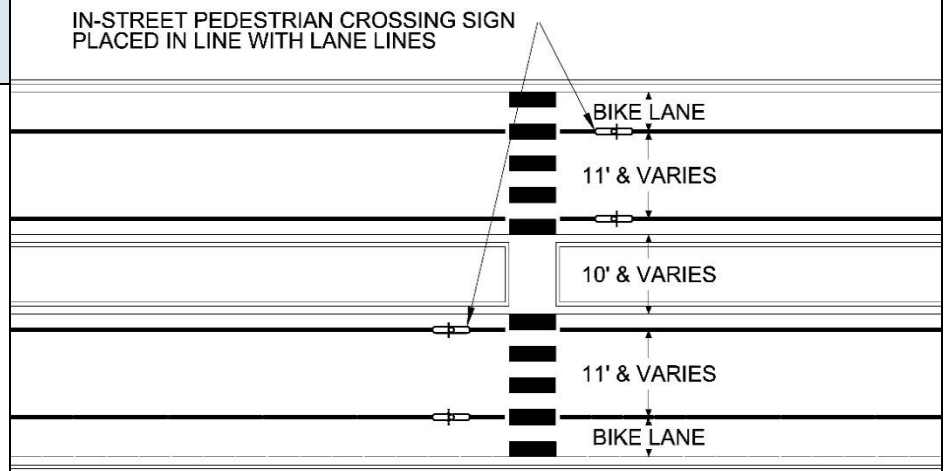

Figure 7b

[11] **Edge line sign placement requires permission to experiment from the FHWA before use.**

Gateway Treatment, Two-Lane Configuration with Curb Extensions	
Travel Lanes	2
R1-6 Signs	3
Flexible Delineators	0
Yielding Compliance	Between 80% and 90% if posted speed limit is 30mph. If the speed limit is 35 mph and AADT is above 12,000 Unknown.
Approximate Cost	$900 for materials 15-minute installation 6 minutes to remove for winter 6 minutes to reinstall in spring

General Description:

Note: The signs on the curb extensions can be epoxied to a flush mounted base on top of the curb extension. Mounting the sign on the curb extension, as shown in Figures 8a and 8b, is permitted because it is treated the same way as a refuge island.

Mounting then on the curb extension increases sign survival. It is important that the signs on the curb extensions are mounted are as close as possible to the curb (Ideally, they should be placed on top of the curb).

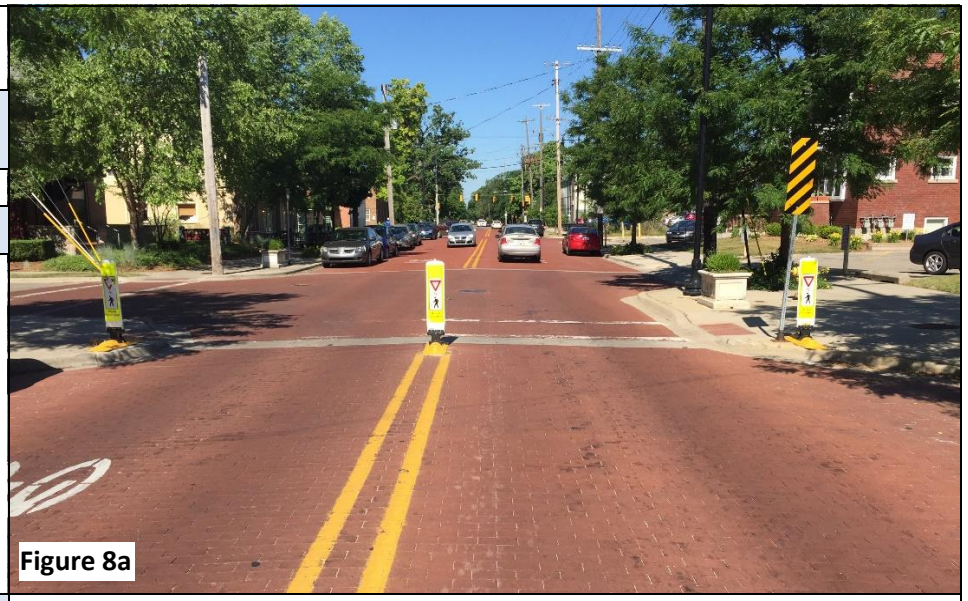

Figure 8a

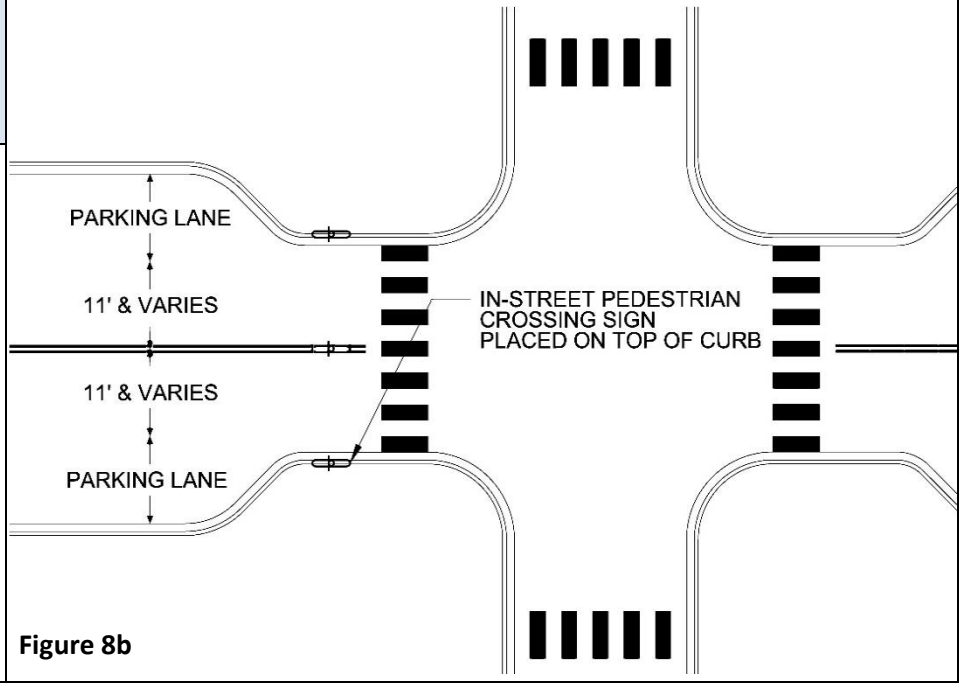

Figure 8b

Gateway Treatment, Two-Lane Configuration at an Intersection, One-Way Street with a Bike Lane and On-Street Parking	
Travel Lanes **Parking Lanes** **Bike Lanes**	2 1 1
Number of R1-6 Signs	2
Number of Flexible Delineators	1
Yielding Compliance	Between 85% and 95% if posted speed limit is 30mph. If the speed limit is 35 mph and AADT is above 12,000 expect 50%.
Approximate Cost	$730 for materials 20-minute installation 8 minutes to remove for winter 3 minutes to reinstall in spring
General Description: Note[12]: The city post can be used on the lane line to increase the survival of this treatment. If speeds are low and there are few trucks the use of three R1-6 signs may be considered. An installation drawing is shown in Figure 9b. Speed reductions when pedestrians were not present were 8 mph at this site. Drivers began slowing at the dilemma zone in advance of the crosswalk.	

Figure 9a

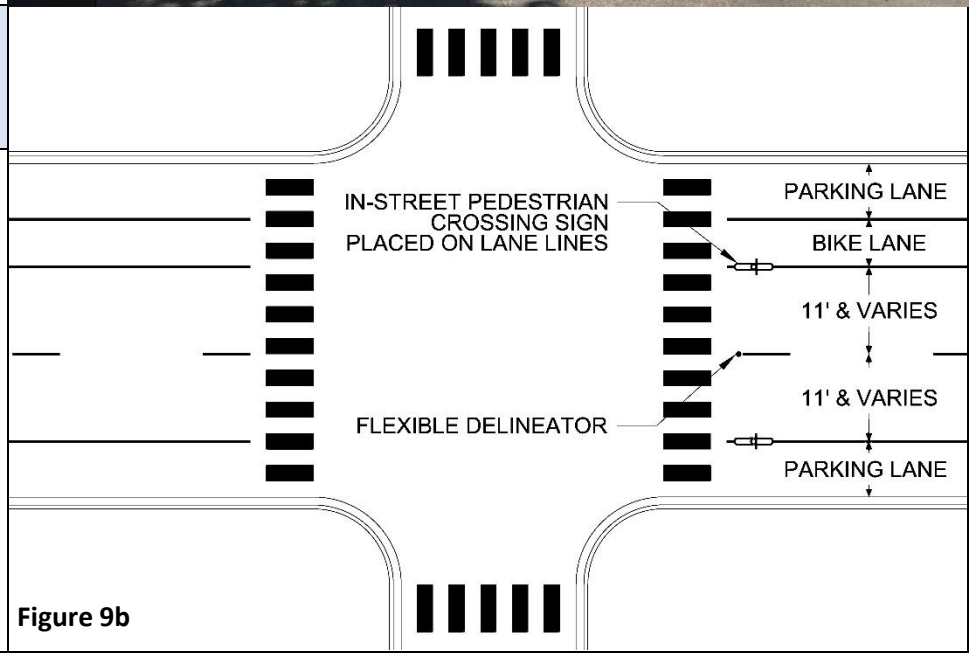

Figure 9b

[12] **Edge line sign placement requires permission to experiment from the FHWA before use.**

Gateway Treatment, Three-Lane Configuration, T-Intersection with Offset Installation	
Travel Lanes **Turn Lanes**	2 1
R1-6 Signs	4
Flexible Delineators	0
Yielding Compliance	Between 70% and 80% if posted speed limit is 30mph. If the speed limit is 35 mph and AADT is above 12,000 expect 60%.
Approximate Cost	$1200 for materials 20-minute installation 8-minute to remove for winter 8-minutes to reinstall in spring
General Description: Note[13]: This installation uses four signs with curb type bases. The signs are installed a short distance (20 to 50 feet) in advance of the intersection to protect them from impacts with turning vehicles. They also encourage motorists to stop in advance of the crosswalk.	

Figure 10a

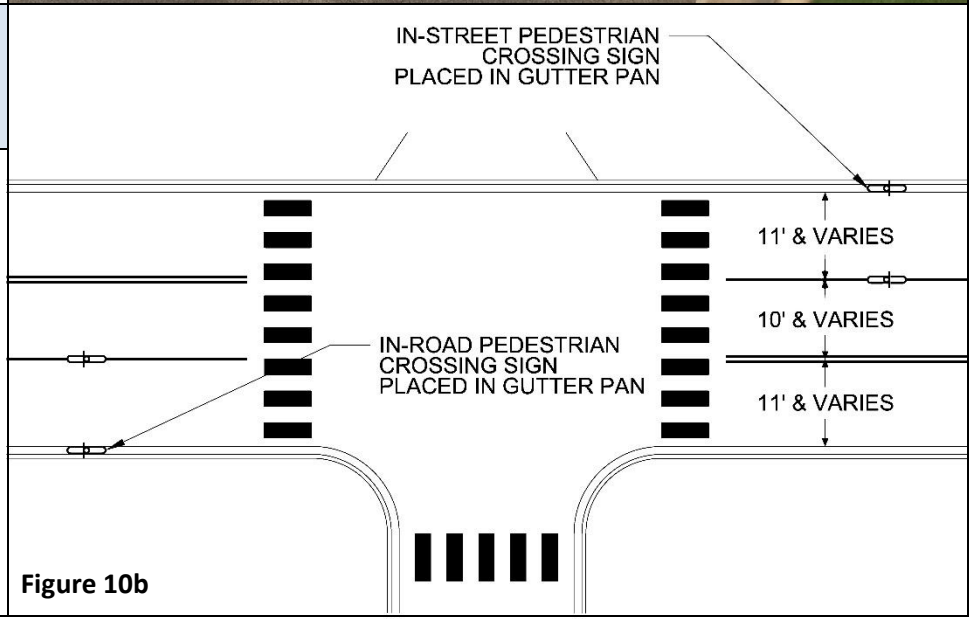

Figure 10b

[13] **Edge line sign placement requires permission to experiment from the FHWA before use.**

MATERIAL COST OF VARIOUS GATEWAY ELEMENTS	
R1-6 sign mounted on a curb type base[14]	$300
R1-6 sign mounted a base cemented on top of the curb beside the road[15]	$200
Cost of a flexible delineator post, base, cap and epoxy	$130
INSTALLATION TIME (MOBILIZATION AND TRAVEL NOT INCLUDED)	
R1-6 Sign on a curb base mounted in the roadway[14]	5 min.
R1-6 sign on a base cemented to the top of the curb[15]	5 min.
Flexible Delineator mounted in the roadway	10 min.
Note: Cost for all configurations would be lower with edge signs placed on top of curb. This configuration requires FHWA request for experimentation	
APPROXIMATE INDIVIDUAL INSTALLATION COST ITEMS	
R1-6 Sign mounted on a curb base[14]	$190
R1-6 sign mounted on top of curb beside roadway[15]	$190
Flexible delineator post installed on white lane line[14]	$110

INSTALLATION TIME ESTIMATES	
Removal of curb type base and sign	2 min.
Reinstallation of curb type base and sign[14]	2 min.
Removal of sign mounted on top of curb	1 min.
Reinstallation of sign mounted on top of curb[15]	1 min.
Removal of flexible delineator, install cap for winter	40 sec.
Reinstallation of flexible delineator, remove cap in spring	90 sec.

FOLLOW MANUFACTURER'S GUIDELINES FOR INSTALLATION

[14] **Edge line sign placement requires permission to experiment from the FHWA before use.**

[15] **Curb placement of R1-6 signs currently requires FHWA permission to experiment.**

References

Bennett, M.K. & Van Houten, R. (2016). Examination of Some Variables Influencing the Efficacy of the Gateway In-Street Sign Configuration on Motorist Yielding Right-of-Way to Pedestrians. Transportation Research Record, 2585, 100-105. DOI 10.3141/2586-11.

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