

An Overview of Shared Use Lane Pavement Markings for Cyclists

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Abstract

The provision of cyclist markings on roadways is increasingly important as a means of encouraging cycling, which can help achieve greenhouse gas emission reduction goals, improve personal health, and alleviate traffic congestion. While reserved bicycle lanes are a common measure, there are situations where roadway geometry and/or operations do not readily lend themselves to bicycle lane implementation. As an alternative marking option, the shared-use pavement marking symbol, or “sharrow” may be used, and was recently adopted by TAC for use in Canada.

The sharrow marking consists of two chevron markings placed in front of a bicycle stencil. The general purpose of the sharrow symbol is to indicate to cyclists the correct positioning on the roadway, and to indicate to drivers the position where cyclists may be expected. There are three general applications of this marking: 1) side-by-side cyclist-motorist operation, 2) single file cyclist-motorist operation, and 3) conflict zones. An overview of the marking design will be given, as well as an overview of the three applications in terms of marking placement, spacing, signage considerations and the range of applicability. Finally, a review of several case studies of actual device implementation will be presented, highlighting emergent issues with the use of this device.

Introduction

TAC has recently adopted the shared-use pavement marking, or “sharrow”, for use in Canada. This cyclist marking can be a useful measure for facilitating and encouraging cyclist use on roadways where it may not be possible to install bike lanes. The provision of cyclist markings on roadways, including sharrow markings, is increasingly important as a means of encouraging cycling, which can help achieve greenhouse gas emission reduction goals, improve personal health, and alleviate traffic congestion.

This paper provides an overview of the purpose, design, and applications for the shared use lane marking, of which there are three main applications: 1) side-by-side, 2) single file, and 3) conflict zones. Signage that is recommended to accompany the shared use markings will also be discussed. Following this, some case studies of actual device implementation will be discussed, with issues that have been raised, along with potential future questions and design considerations for the shared use lane marking.

Sharrow Origins & Background

An original version of marking for a shared use lane was outlined in the 1998 *TAC Bikeway Traffic Control Guidelines for Canada*. This original version was intended for use in a wide shared-use lane situation, to indicate a wide shared use lane where drivers and cyclists would travel in a side-by-side manner. The design consisted simply of the bicycle stencil, with optional text of “SHARED USE” or “SHARED LANE” placed behind the stencil. The stencil placement was adjacent to the curb, at 200 m intervals (1).

This original formulation had drawbacks in design, application guidance, and range of applicability. In terms of layout, no guidance was provided regarding the placement of the stencil with respect to the curb or edge of pavement, nor in regards to lane width considerations. Also, concerns were raised regarding the recommended stencil spacing of 200 m as potentially being too great a distance. The optional text introduced language comprehension issues and should both English and French versions of the optional text be used there would be text markings clutter on the roadway.

The marking usage was also not necessarily in full agreement with emerging practice in some American and European jurisdictions, where shared use lane markings of various designs were being used to indicate where on the roadway a cyclist should ride and alert drivers of where cyclists may be expected. The bicycle stencil on its own does not clearly convey this message, nor does the added optional text.

A review of the marking design was conducted as part of the *TAC Bikeway Pavement Marking Guidelines*, in order to establish the intended purpose for the marking, the marking design style, and applications. The recommendations of this document provide some of the key recommendations regarding design and applications for sharrow markings. As part of this document, however, some key design considerations were identified that required additional development, which were developed as part of the *Bicycle Signage Testing Study* and the *Bicycle Pavement Markings in Conflict Zones* study. The results from all three of these documents are

presented here, and are to be incorporated into the upcoming update to the *TAC Bikeway Traffic Control Guidelines for Canada* document.

Sharrow Markings Overview

Purpose

The intended purpose of the marking is to indicate to both cyclists and drivers of the intended area of bicycle travel on a roadway. The symbols raise awareness to both cyclists and motorists of the correct positioning in the lane. This intent holds for all applications.

Stencil Design

The TAC-recommended design consists of two white chevron markings, with a stroke width of 100 mm spaced at 100 mm, placed ahead of the bicycle symbol stencil (see Figure 1) (1). Note that, at present, no consideration exists for potentially adjusting the stencil elongation based on roadway speed. Also note that some jurisdictions have used stencils with a thicker stroke width.



Figure 1: Sharrow Stencil Design

Applications

There are three main applications for the sharrow design: 1) shared-use lanes side-by-side, 2) shared use lane single file, and 3) conflict zones. The type of application dictates the placement of the stencil on the roadway. Except where noted, the application details are listed in accordance with the upcoming *Update to the Bikeway Traffic Control Guidelines for Canada* (1).

Shared Use Side-by-Side Application

The shared use side-by-side application is intended for use on lanes which are wide enough for side-by-side cyclist/driver operation, but not wide enough for bike lanes. These markings should be used on roadways with posted vehicle speeds of 60 km/h or less. The volume and type of traffic should also be taken into account. For instance, if the roadway carries transit vehicles or trucks then at least 4.3 m width is required for side-by-side operation in accordance with already established TAC guidelines. A width of 4.0-4.2 m is permissible if no transit vehicles or trucks are present up to 6,000 annual average daily traffic (AADT) in the shared lane (as per the TAC *Geometric Design Guide for Canadian Roads*) (2).

The placement on the roadway is dependent upon whether on-street parking is permitted or prohibited. On roadways without on-street parking, the marking should be placed so that the centre of the marking is 1.0 m (with a minimum of 0.75 m) from the edge of the bikeway or edge of curb. On roadways with full-time on-street parking, place so that the centre of the marking is a minimum of 3.4 m from the edge of bikeway or curb face so that the cyclist position is outside the door zone. The door zone is considered to extend 2.9 m from the edge of bikeway or curb face. This dimension is based on a field study done on San Francisco. Figure 2 shows the recommended sharrow placement when no on-street parking is permitted, and Figure 3 shows the recommended sharrow placement when full-time on-street parking is used.

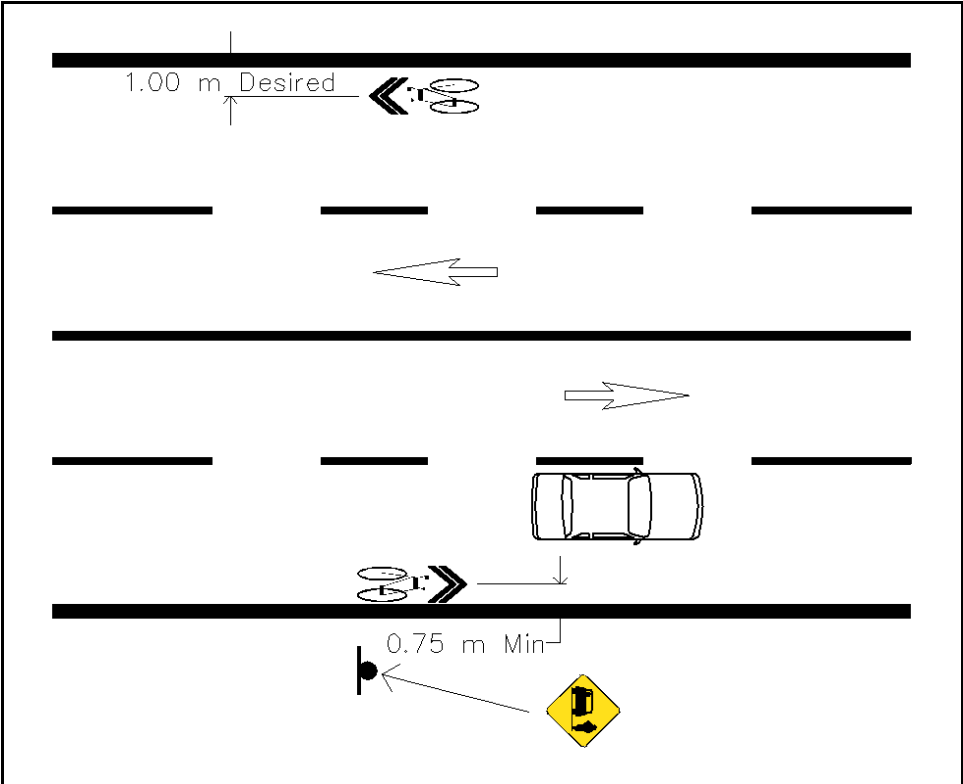


Figure 2: Sharrow Placement – Side-by-Side Operation, No On-Street Parking

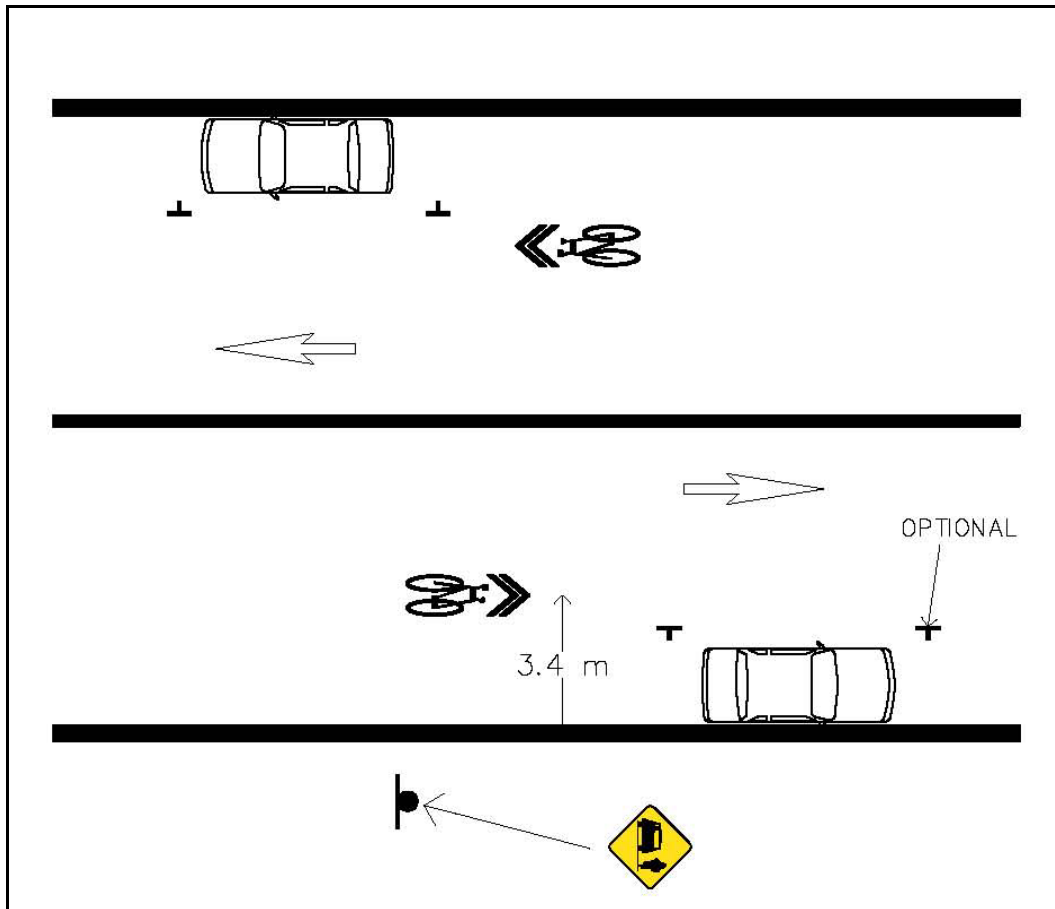


Figure 3: Sharrow Placement – Side-by-Side Operation, Full-Time On-Street Parking

The recommended spacing is to place immediately after an intersection and 10 m before the end of a block. Space longitudinally at intervals of 75 m (this spacing may be decreased as needed to have evenly spaced markings within a block). In rural applications where intersections are spaced over 400 m apart, wider spacing of up to 200 m is acceptable.

The recommended signage to accompany sharrow markings in side-by-side applications is the Share the Road Sign (WC-47) and mandatory supplementary tab (WC-47S). The sign warns drivers that there is adequate driving space for cyclists on the road and advises extra caution to both drivers and cyclists for the upcoming section of road. The signs are shown in Figure 4.



Figure 4: Share the Road Sign (WC-47) and Tab (WC-47S)

Shared Use Lane Single File Application

The shared use single file application is intended for use on lanes which are too narrow for cyclists and drivers to operate in a side-by-side manner. For single file applications, the marking is placed in the centre of the lane if the lane is less than 4.0 m wide. Posted vehicle speed limits should be 50 km/h or less. Vehicle volumes are also a consideration for the designer in assessing the appropriateness of using sharrows in a single file application, however no specific guidelines or thresholds are identified in TAC manuals at this time. This marking may also be applied at least 30 m in advance of a roundabout, and as a temporary measure at other short roadway sections (less than 500 m in length) where lanes are narrowed or bicycle lanes are intermittently terminated. An example single file application is shown in Figure 5.

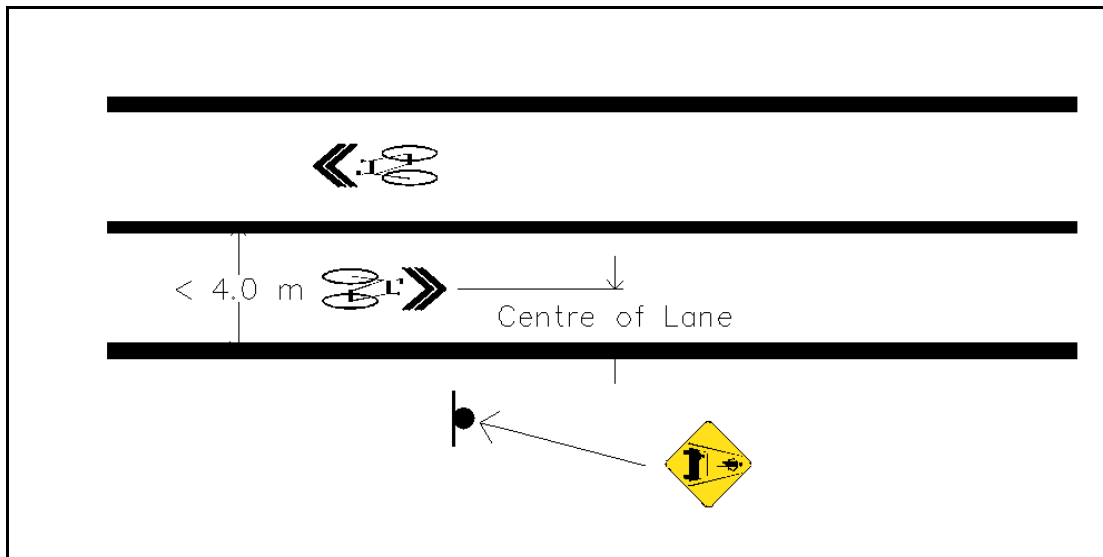


Figure 5: Sharrow Placement – Single File Operation

The recommended spacing is to place immediately after an intersection and 10 m before the end of a block. Space longitudinally at intervals of 75 m (this spacing may be decreased as needed to have evenly spaced markings within a block). In rural applications where intersections are spaced over 400 m apart, wider spacing of up to 200 m is acceptable.

The Shared Use Lane Single File sign is used to warn motorists and cyclists that cyclists are allowed full use of the lane ahead and to warn motorists that the lane is too narrow for side-by-side operation. Shared use lane markings should be used to mark the location where cyclists should position themselves within the lane. The Single File supplementary tab sign must be used to convey the meaning of the Shared Use Lane Single File sign. The signs are shown in Figure 6.



Figure 6: Shared Use Lane Single File Sign and Tab

Conflict Zones

The final application where sharrow markings may be considered for use are conflict zones. Conflict zones are defined as areas where cyclists have the right of way but where this may not be understood by motorists or even cyclists. An example would be at the merge or diverge point associated with a right turn channelization island, where conflicts could occur between through-moving cyclists and turning drivers. Other examples could be to guide cyclists through complex intersections or left hand turns. There are three conflict zone marking options which are endorsed by TAC: white dashed bicycle lane markings, white dashed bicycle lane markings plus bicycle stencils, and sharrow markings carried through the conflict zone.

In areas where the practitioner deems that a bicycle route carried through a conflict zone warrants increased visibility and/or demarcation, a succession of sharrow markings may optionally be used if there is no requirement for lane markings. The requirement for lane markings may vary by jurisdiction. The minimum spacing between stencils is 1.5 m, and they may be spaced wider apart if so desired. Sharrows should be placed throughout the length of the conflict zone. Figure 7 shows an example application of white dashed markings carried through a conflict zone, Figure 8 shows white dashed markings plus bicycle stencils carried through a conflict zone, and Figure 9 shows sharrows in a conflict zone.

The use of sharrow markings (or other conflict zone marking types) must only be used on lower speed roadway (those with a posted speed limit of 70 km/h or less). This is because the high

speed differential between cyclists and motorists on roadways with faster operating speeds introduces a significant conflict potential and motorists do not typically expect to yield to cyclists in these locations.

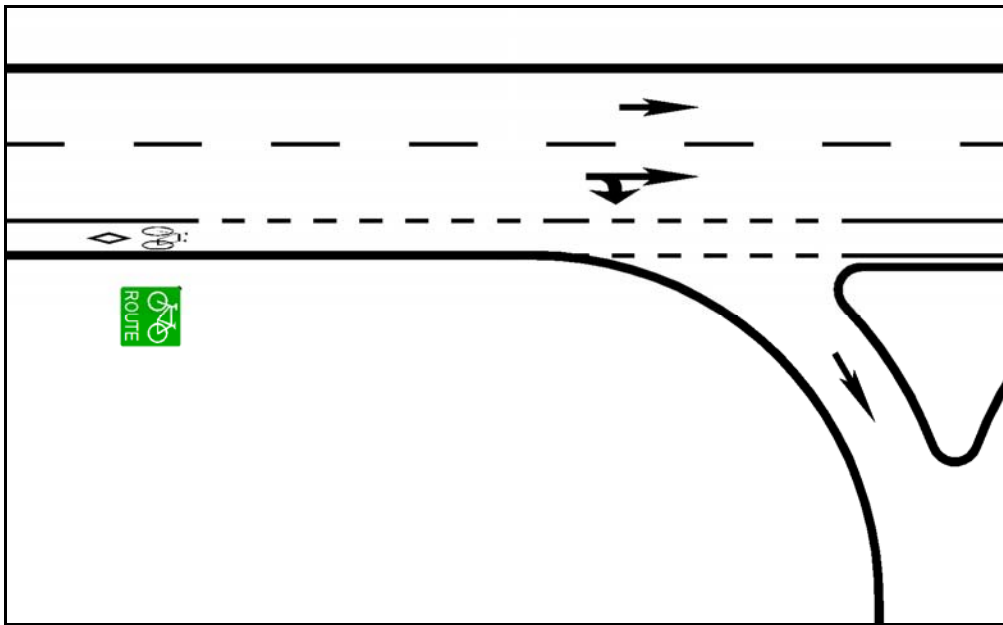


Figure 7: White Dashed Markings Carried Through a Conflict Zone

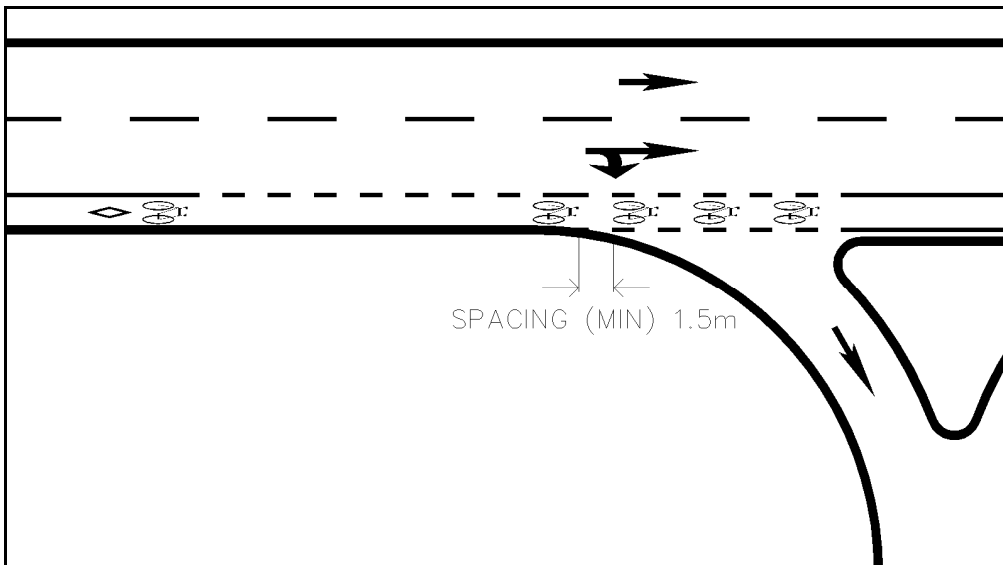


Figure 8: Dashed Markings Plus Bicycle Stencils Carried Through a Conflict Zone

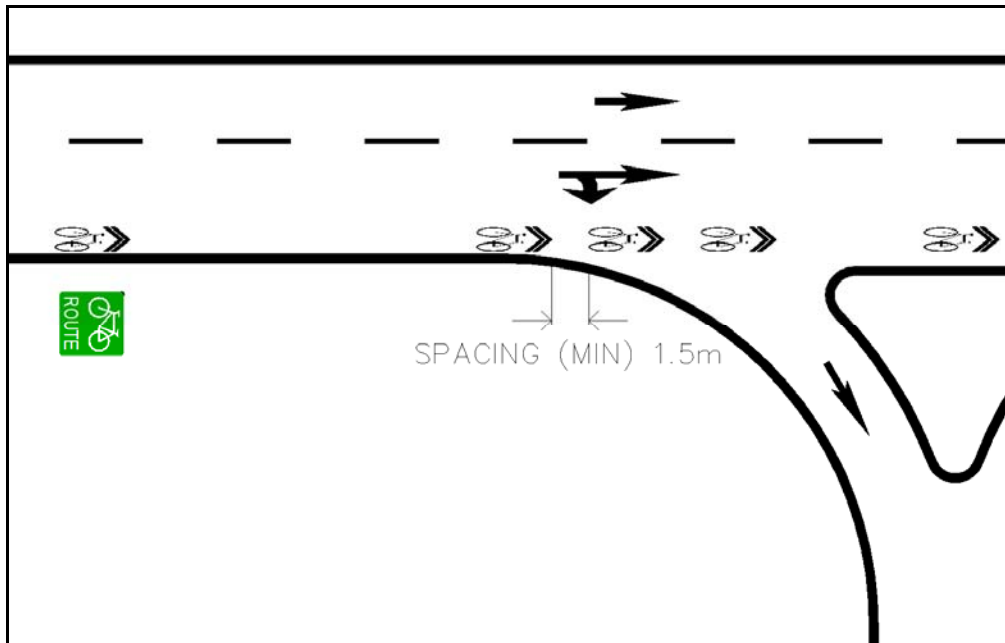


Figure 9: Example of Sharrow Markings Through a Conflict Zone

The Yield to Bicycles Sign (shown in Figure 10) may be used where motorists are required to cross a facility used by cyclists and are required to yield to the cyclists. As this is reflective of many conflict zone scenarios, this sign is of possible consideration in some instances (such as the example shown in Figure 9). Note that this sign design is currently under review as part of the update to the TAC *Bikeway Traffic Control Guidelines for Canada*, and may be replaced with a more symbol based sign.

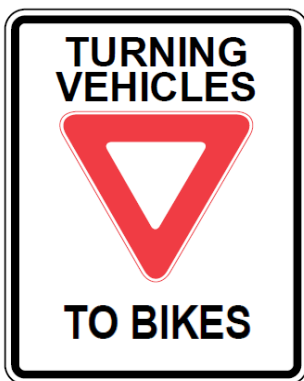


Figure 10: Yield to Bicycles Sign, as Could Optionally be Used in Some Conflict Zone Applications

Case Study Examples

Side-by-Side Application

West 4th St – Vancouver

Sharrow markings are currently employed in a side-by-side manner on some sections of West 4th St in Vancouver. In the example (shown in Figure 11), sharrows are placed such that cyclists are positioned to the left of on-street parking. The figure also shows the lane dimensions and sharrow position.

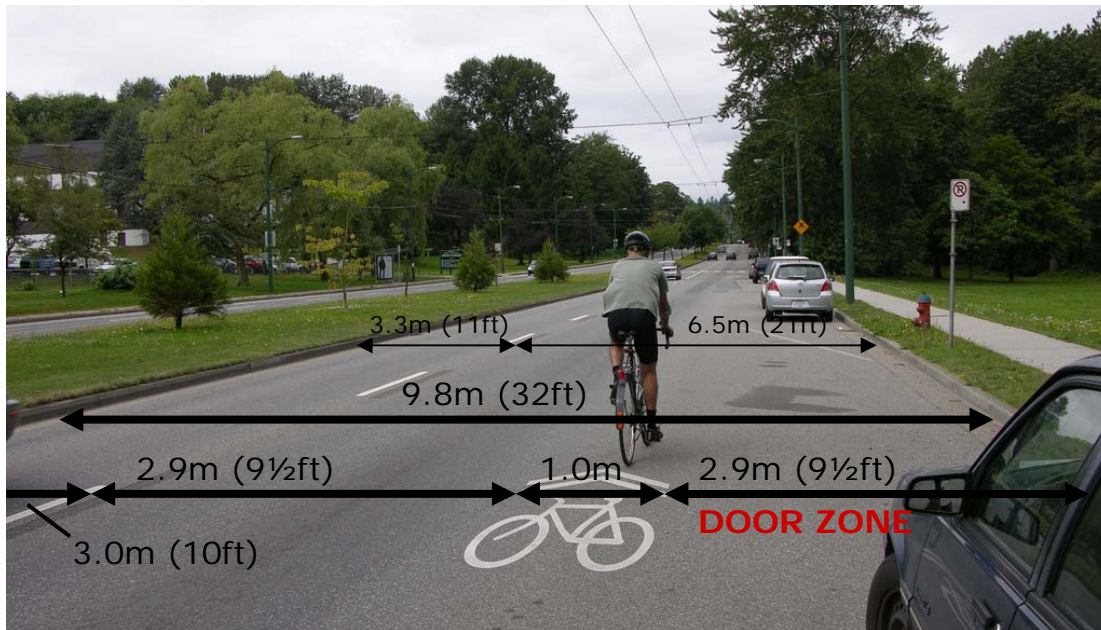


Figure 11: Side-by-Side Sharrow Application on West 4th St, Vancouver BC

(Photo Source: Jack Becker)

An issue which has been identified is that the recommended minimum spacing of 3.4m from the curb to the centre of the sharrow (in on-street parking applications) may be a greater distance than is potentially necessary, which can influence the ability to provide a sufficient distance between through motor vehicles and cyclists. An example along West 4th St is shown in Figure 12, where a pickup truck can be seen encroaching upon the stencil despite being otherwise appropriately positioned in the drive lane, which is undesirable for a side-by-side application. (It would be difficult for the truck to be travelling much further to the left, without unduly encroaching upon the leftmost drive lane.)



Figure 12: Truck Encroaching upon Sharrow in a Side-by-Side Application on West 4th St, Vancouver BC

(Photo Source: Jack Becker)

Single File Application

Yukon St – Vancouver

An example of sharrow markings being used in a single file manner can be found along some of Yukon St in Vancouver. In this instance, they are used in the downhill direction on along a sloped segment. There is a bicycle lane in the uphill direction. The downhill grade allows for higher cyclist speeds and better integration with the motor vehicle traffic stream. In the example shown in Figure 13, the road is 12.5m wide, with 2.5m parking lanes, a 1.5m uphill bicycle lane, and 3.0m vehicle or shared lanes.



Figure 13: Single File Sharrow Application on Yukon St, Vancouver BC

Side-by-Side Application, Part Time On-Street Parking

Pender St – Vancouver

On Pender St in downtown Vancouver, there is an example of using sharrows to accommodate part-time on-street parking. Sharrows were placed twice on the street; one set near the curb (for non-parking hours) and one set to the left side of the curb lane (for parking periods). Figure 14 shows the configuration. (Note that this photo was taken before TAC adopted the current chevron arrow portion of the “sharrow” stencil.)



Figure 14: Side-by-Side Application with Part Time Parking, on Pender St, Vancouver BC

The benefit of this configuration is that it accommodates cyclists with sharrows in all time periods and parking conditions. There is, however, the issue of multiple sharrows being visible when no parked cars are covering the curb-side stencils. This can potentially be confusing to cyclists and motorists alike.

The difficulty, however, is that no readily apparent alternative marking scheme is at present accepted. For example, time text stencils could be used to match the given sharrow set with the corresponding parking / no-parking hours, but they might be difficult to interpret and would involve maintenance considerations.

Conclusions

Sharrow bicycle markings, which have been recently adopted by TAC, are an emerging tool for facilitating and encouraging cyclists on roadways where it may not be possible to install bike lanes. The provision of cyclist markings on roadways, including sharrow markings, is increasingly common in many jurisdictions across Canada. The markings, which consist of a

standard bicycle stencil and two chevron arrows, indicate to both cyclists and drivers of the correct positioning of cyclists in a lane. There are three main applications for the sharrow: (1) side-by-side cyclist-motorist operation, (2) single file cyclist-motorist operation, and (3) conflict zones. An overview of three sharrow applications in Vancouver BC was provided (for a side-by-side with full-time on street parking, single file operation, and for side-by-side with part-time on-street parking), from which some operational observations were made.

Additional Considerations / Further Research

The following are some issues and concerns that have been raised, and may be of consideration for future research:

- Bicycle stencil elongation, as a function of roadway speed.
- Bicycle stencil width (narrow vs. thicker).
- Minimum sharrow placement from the curb for the full-time parking situation (currently 3.4 m is the recommended minimum, however shorter distance placement may be feasible). The 3.4 m dimensions is based on only one field study (San Francisco).
- Further consideration of establishing recommended sharrow application and/or marking dimensioning parameters based on traffic volume, vehicle speed, and vehicle classification.
- Sharrow (or other) marking schemes for part-time parking routes (i.e. along routes where parking is not permitted during rush hours).

References

(1) Transportation Association of Canada. *Update to the Bikeway Traffic Control Guidelines for Canada (75% Draft)*. Ottawa: Transportation Association of Canada, 2009

(2) Transportation Association of Canada. *Geometric Design Guide for Canadian Roads*. Ottawa: Transportation Association of Canada, 1999, pp3.4.6.2 – 3.4.6.2