



Cycle Notes

No. 8 February 2001

Providing for Cyclists at Signalised Intersections

Welcome to CYCLE NOTES No. 8. The purpose of CYCLE NOTES is to provide information on the design of bicycle facilities for engineers and planners.

CYCLE NOTES should be read in conjunction with:

- Austroads Guide to Traffic Engineering Practice, Part 14 - Bicycles, and
- Australian Standard 1742.9, Manual of Uniform Traffic Control Devices, Part 9 Bicycle Facilities.

This edition of Cycle Notes provides a framework for designing on-road bicycle lanes at signalised intersections. It explains the six intersection elements for cyclists, provides options for each of these elements, and discusses the practical application of the framework.

Six Intersection Elements

Bicycle lanes at intersections enhance cyclist safety by separating bicycles from motor vehicles. These lanes should provide clear messages about how each road user is expected to behave and who has priority. They should be designed to minimise conflicts between cyclists and other road users.

To simplify the design of bicycle lanes at intersections, six intersection elements have been identified. Figure 1 shows these elements as *midblock*, *transition*, *approach*, *waiting*, *through* and *departure*. Also illustrated in Figure 1 are the various positions a cyclist may need to take as the rider travels through an intersection.

The six intersection elements are based on an understanding that a cyclist rides along *midblock* in a bicycle lane, and then undertakes a manoeuvre to *transition* to the *approach* of the intersection. The person then rides along the *approach* and if required, stops, *waiting* until they are able to proceed. They will then proceed *through* the intersection, *departing*, and ending up in the next *midblock* bicycle lane.

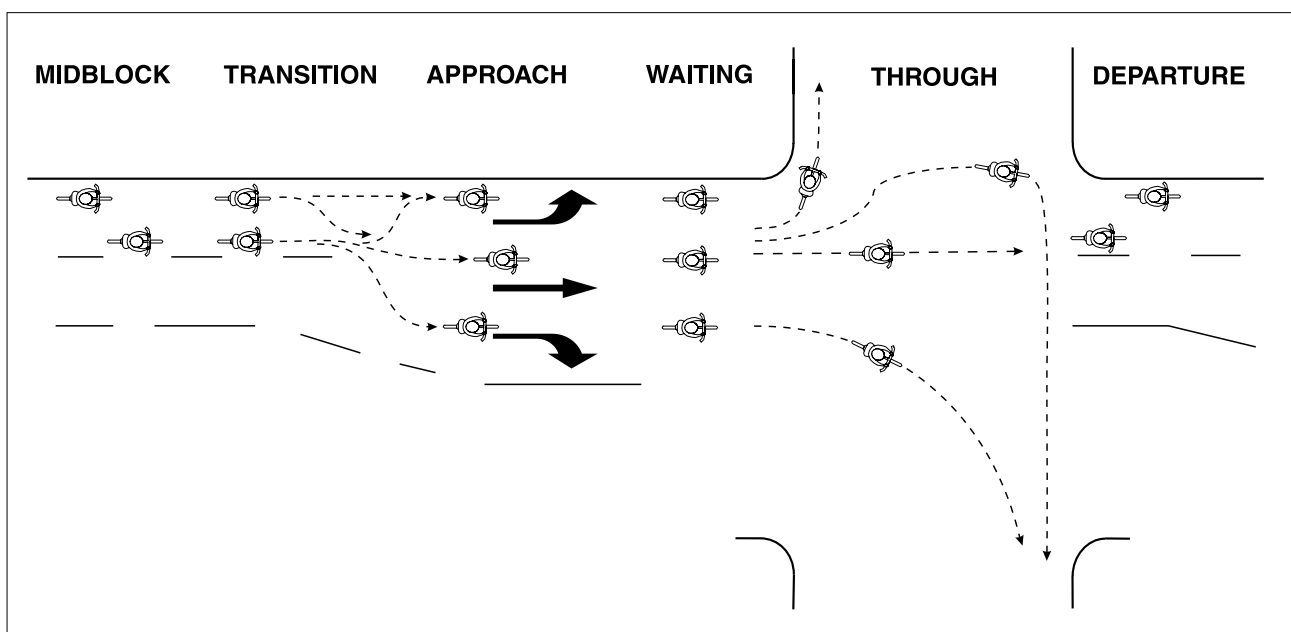


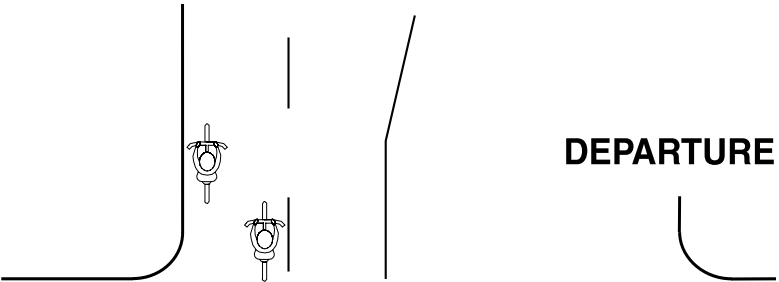
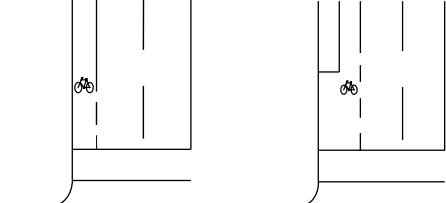
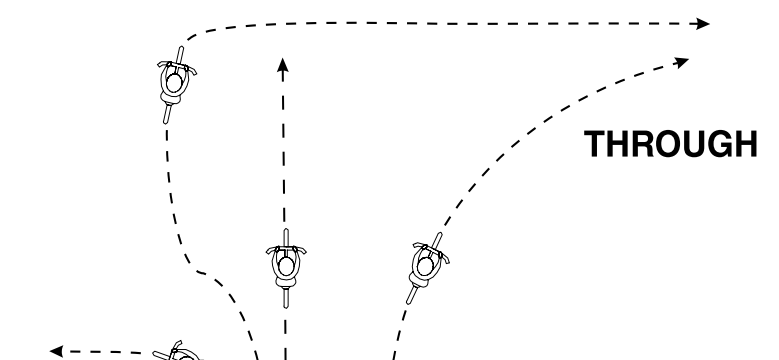
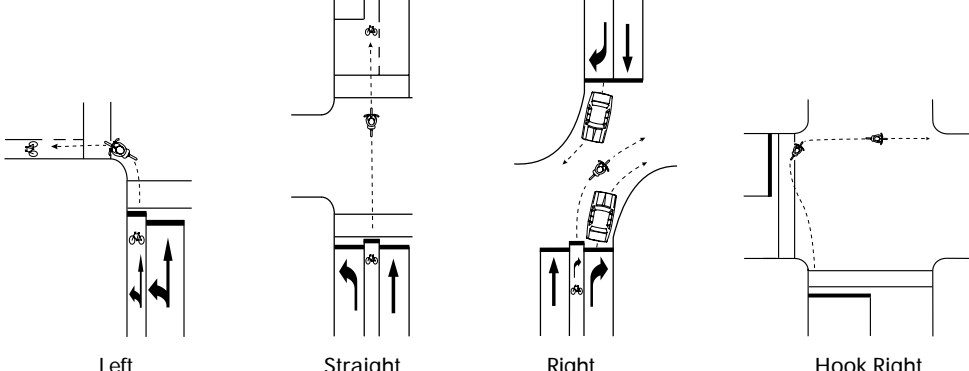
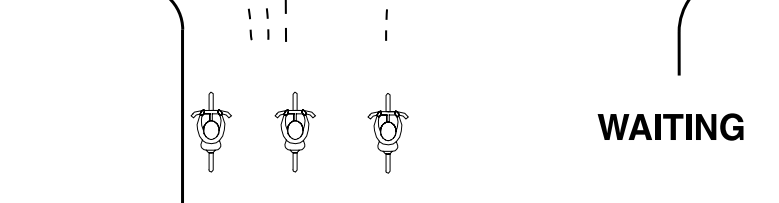
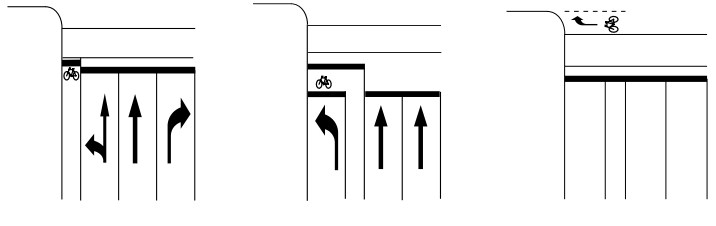
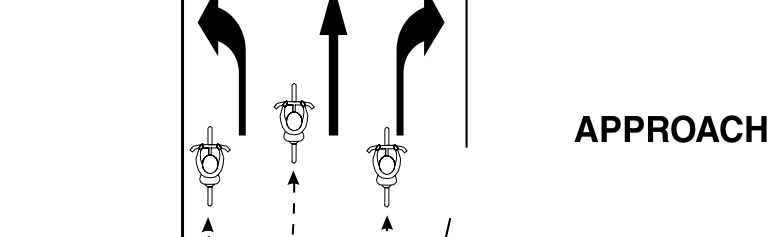
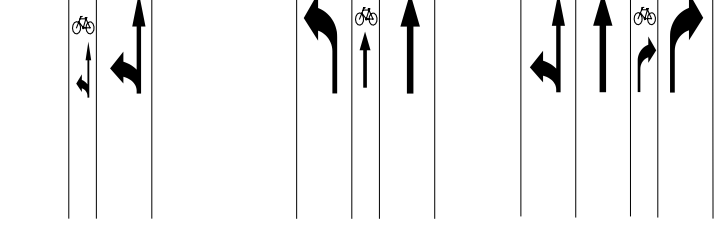
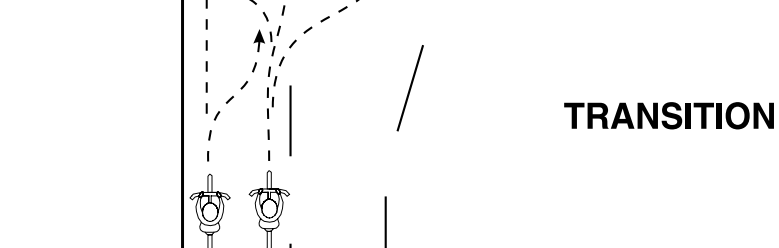
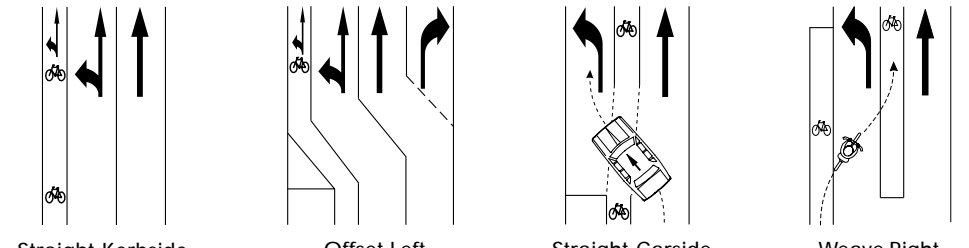

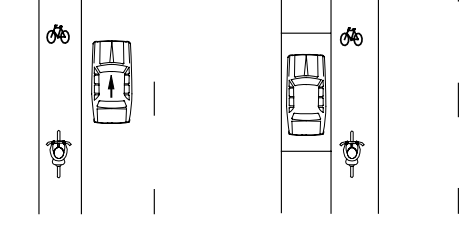
Figure 1: Six elements for cyclists at an intersection

Designing for Six Intersection Elements

The six intersection elements provide designers of bicycle facilities with an understanding of how to provide bicycle lanes at intersections. The concept provides a framework for reducing complex design problems into six smaller design issues. Designers can now actively try to include each of the elements in their designs.

The table below illustrates the options for each of the six intersection elements. These are the most common options currently used in bicycle planning. When planning bicycle lanes at intersections, the appropriate option within each element can be selected after taking account of the layout of the intersection.

To assist in the understanding of each of the common options, a brief description is provided below along with the key characteristics of the option.

CYCLISTS AT AN INTERSECTION	DESIGN OPTIONS	DESCRIPTION OF OPTIONS
 <p>DEPARTURE</p>	 <p>Kerbside Carside</p>	<p>DEPARTURE bicycle lanes provide for cyclists as they leave the intersection. The lanes can be provided by:</p> <ul style="list-style-type: none"> ● Kerbside departure bicycle lanes adjacent to the kerb, ● Carside departure bicycle lanes adjacent to car parking. <p>A bicycle pavement logo and a bicycle lane sign should be located on the departure side of the intersection to advise motorists of the bicycle lane.</p>
 <p>THROUGH</p>	 <p>Left Straight Right Hook Right</p>	<p>THROUGH element occurs when cyclists pass through the intersection in any direction. The movements are:</p> <ul style="list-style-type: none"> ● Left movements, when cyclists undertake a left turn, ● Straight movements, when cyclists proceed straight ahead from one side of the intersection to the other, ● Right movements, when cyclists turn right from the centre of the road, ● Hook right movements, when cyclists undertake a right turn from the left in two staged movements <p>In more complex intersections or where delineation of motor vehicle lanes occur through the intersection, consideration should be given to also delineating bicycle lanes through the intersection.</p>
 <p>WAITING</p>	 <p>Advanced Expanded Hook Turn</p>	<p>WAITING areas are required when cyclists are stopped at intersections. Waiting space can be provided by:</p> <ul style="list-style-type: none"> ● Advanced waiting space, where the stop line of the approach bicycle lane is in advance of the motor vehicle stop line, ● Expanded waiting space, is provided by moving the motor vehicle stop line back to create a larger waiting area, ● Hook turn waiting space, provides an area adjacent the pedestrian crossing designating where cyclists wait for the change of traffic signals before undertaking a hook turn. <p>When cyclists wait at the front of the traffic queue, they are safer as motorists can more easily see them.</p>
 <p>APPROACH</p>	 <p>Kerbside Carside Rightside</p>	<p>APPROACH bicycle lanes are installed leading up to the intersection and are located between the motor vehicle lanes. Approach bicycle lanes may be:</p> <ul style="list-style-type: none"> ● Kerbside, where the approach bicycle lane is adjacent the kerb, ● Carside, where the approach bicycle lane is to the right of a motor vehicle left turn lane, ● Rightside, where the approach bicycle lane is to the left of a motor vehicle right turn lane. <p>Approach lanes should be provided for at least the through movement. If there is high cyclist demand for left or right turns, bicycle lanes for these movements should also be considered.</p>
 <p>TRANSITION</p>	 <p>Straight Kerbside Offset Left Straight Carside Weave Right</p>	<p>TRANSITION is the movement cyclists undertake to travel from a midblock bicycle lane to the intersection approach bicycle lane. Transitions occur by:</p> <ul style="list-style-type: none"> ● Straight kerbside, where the bicycle lane continues adjacent to the kerb, ● Offset left, where the bicycle lane moves from midblock carside position to an approach kerbside position, ● Straight carside, where the bicycle lane moves from a midblock carside position and continues straight to an approach carside position, or ● Weave right, where bicycle lanes overlap to allow cyclists to move across a motor vehicle lane to be in the appropriate approach lane position.
 <p>MIDBLOCK</p>	 <p>Kerbside Carside</p>	<p>MIDBLOCK provision for cyclists is usually a bicycle lane that will be either a:</p> <ul style="list-style-type: none"> ● Kerbside bicycle lane where cyclists travel adjacent the kerb; or ● Carside bicycle lane where cyclists travel adjacent to parked cars. <p>Midblock bicycle lanes should continue through unsignalised minor intersections using continuity lines.</p>

THE PRACTICAL APPLICATION

New Intersections

The practical application of the model bicycle intersection is to provide a simplified approach to designing bicycle facilities at intersections. It allows a complex problem to be considered as six smaller and simpler problems. By considering the options for providing for cyclists within each element, designers are able to select the most appropriate bicycle facility. The six element approach also provides designers with a checklist to ensure that they have considered bicycles in each part of the intersection.

Retrofitting Existing Intersections

When retrofitting bicycle facilities to existing intersections, space needs to be found for each of the intersection elements. This can sometimes be difficult. Providing cyclists with a partial solution comprising of bicycle lanes in only some of the six elements can still provide significant benefits. A partial solution is preferable to providing no bicycle lanes at all.

It is easier to find space for some intersection elements than others. *Waiting* space can easily be found by moving the motor vehicle stop line back. Space for the *through* and *departure* elements of bicycle lanes at intersections can often be found. Left and right turn motor vehicle lanes are only on the approach to the intersection and hence there is often corresponding space on the departure side of the intersection for through and departure bicycle lanes.

Finding space for *transition* and *approach* bicycle lanes is usually more difficult. Options such as narrowing motor vehicle lanes, indenting right turn lanes into medians, and indenting left turn lanes into footpath/nature strip areas may need to be considered. At some intersections, removing a motor vehicle lane may be the only option. If none of these are acceptable, then transition and approach bicycle lanes may not be possible given the current space balance between the various road users. However, this may be an acceptable outcome if space for bicycles has been found at the midblock, waiting, through, and departure elements.

The example in Figure 2 shows an intersection with midblock, waiting, through, and departure bicycle facilities. These facilities were retrofitted during the remodelling of the intersection. Transition and approach bicycle lanes were unable to be provided due to the need to maintain the number of motor vehicles lanes. Whilst cyclists were provided with four rather than all six intersection elements, they will still receive significant safety and amenity benefits.



Figure 2: Cyclists receive significant benefits from four of the six intersection elements, being midblock, waiting, straight through, and departure