

8.1 OVERVIEW

Signal operations can have a significant impact on the comfort and safety of pedestrians and cyclists. The Region presently utilizes a number of best practices in signal phasing for pedestrians and cyclists.

For information on signal operations related to pedestrians, please refer to the Region's current practices & guidelines.

Since the application of separated bikeways is growing across the Region, **the following sections focus on phasing, timing and detection considerations for separated cycling facilities.**

8.2 SIGNAL PHASING FOR SEPARATED CYCLING FACILITIES

The following section summarizes some best practices for signal phasing for separated cycling facilities. In some cases, signal phasing modifications will be considered to enhance separated cycling facilities. Considerations for the applications of protected and leading bicycle phases are summarized below.

Protected Bicycle Phase – A fully protected cycling phase allows cyclists dedicated time in a cycle while vehicular movements are held.

A fully protected phase may be considered in the following cases:

- **At locations with two-way or contraflow bicycle movements**
– In instances with bi-directional separated cycling facilities, intersection movements are complex. Drivers turning left on two-way streets may be less likely to look for cyclists approaching from behind while they are focused on selecting a gap in traffic. In these cases, protected phases help to eliminate potential conflicts.
- **Locations with high volumes of cyclists, or with unique movements** – In some instances, the geometry of cycling facilities means that unusual or atypical movements are required through intersections. In these cases, or in cases with heavy cycling volumes, a protected phase can help to reduce cognitive demands of cyclists and drivers, as well as reducing frustration for drivers in trying to select a gap between cyclists

- **Locations with high volumes of conflicting vehicular turning movements** – In some cases, heavy turning volumes may make it nearly impossible for a cyclist to clear an intersection. A protected phase (even a minimum length phase) can provide the opportunity a cyclists needs to clear an intersection. The threshold for high turning volumes may vary, depending on street context. A sample warrant from MassDot’s Separated Bike Lane Planning & Design Guide is shown in Exhibit 8-1. While these thresholds may require refinement over time to better suit the Regional context, they provide basic guidance for practitioners.

Exhibit 8-1. Sample thresholds for consideration of protected bicycle signal phasing

Separated Bike Lane Operation	Motor vehicles per hour turning across separated bike lane		
	Right Turn	Left Turn across One Lane	Left Turn across Two Lanes
One-way	150	100	50
Two-way	100	50	0

Source: Adapted from MassDOT’s Separated Bike Lane Planning & Design Guide

The biggest downside to a protected bicycle phase is the potential for increased delays for motorists. The competing demands at an intersection may also result in a short interval for cyclists. It is important to note that protected bicycle phase can often be implemented in concert with an exclusive pedestrian phase, extending the benefits to other intersection users.

Leading Bicycle Phase – A leading interval which provides waiting cyclists a head start through the intersection before allowing conflicting vehicular movements may be considered where the facility and volumes are not supportive of protected phases, or where protected phases are not feasible, but there is a desire to provide a higher quality cycling crossing. Where implemented, a leading bicycle phase would likely be coordinated with a leading pedestrian phase, to ensure benefits for all vulnerable users.

As with any signal phasing, both leading and protected bicycle phases must be considered in the context of other competing demands. For example, the City of Toronto’s practice is to consider bicycle phases only in circumstances where they would provide increased safety, throughput or convenience to cyclists with minimal or no impact to other movements (refer to the City of Toronto’s Traffic Signals Operations Policies & Strategies). In York Region, additional studies and/or business cases may be needed to assess the full impacts of adding a protected or leading cycling phase to the existing intersection traffic operations. In addition, the Region’s Traffic Signal Operations group needs to be consulted for any potential sites where a protected bicycle phase is planned to confirm the controller

has the capability to add extra bicycle phases. As noted in OTM Book 12A, “since bicycle phasing is not commonplace, it is incumbent on the practitioner to use engineering judgement as to the appropriateness of installing bicycle phasing and the best way to implement it”.

The OTC’s Bicycle Traffic Signal Guide provides a ‘long-list’ of potential considerations in pursuing separated signal phasing, which is summarized in Exhibit 8-2 for reference. Note these criteria are provided for reference only, and may require refinement to better reflect the York Region context.

Exhibit 8-2. – Summary of Potential Criteria for Considering Separated Bicycle Phases

Collision/Conflict Criteria <ul style="list-style-type: none"> • a bicycle signal phase should only be considered for use when an engineering study finds that a significant number of bicycle/motor vehicle conflicts occur or may be expected to occur at the intersection and that other less restrictive measures would not be effective • collisions (when two or more bicycle/vehicle collisions of types susceptible to correction by a bicycle signal have occurred over a 12 month period and a responsible public-works official determines that a bicycle signal will reduce the number of collisions) • when there is a need to provide a leading interval for cyclists in order to increase their visibility and safety 	Geometric Criteria <ul style="list-style-type: none"> • geometric (a path connection or to allow movement not allowed by vehicles) • geometric factors: an intersection that impedes cyclist crossings that could be mitigated with the bicycle phase • an approach to a signalized intersection is intended for bicycles only and it is desirable to signalize that approach • examples of geometric configurations that might benefit from the use of a bicycle signal phase include: <ul style="list-style-type: none"> • a bike lane to the right of a high volume right turn; and, • a multi-use path that comes into the intersection in such a way that motorists may not see or yield to cyclists approaching the intersection 	Volume/Delay Criteria <ul style="list-style-type: none"> • volume, based on the number of bicycles per peak hour (at least 50) and the number of vehicles at the peak hour entering the intersection • to reduce overall delay to cyclists where delay is significant
Planning Criteria <ul style="list-style-type: none"> • where the addition of a special phase would complete the continuity of a bicycle system and where the movement protected or encouraged would otherwise be challenging 	Timing/Phasing Criteria <ul style="list-style-type: none"> • where paths cross roadways – to provide a shorter green time for cyclists when no pedestrians are present • if there is a bicycle movement that is not accommodated by typical traffic signals 	Demographic/Geographic Criteria <ul style="list-style-type: none"> • proximity to schools, parks, and popular bike routes should be considered

Source: Adapted from OTC’s Bicycle Traffic Signals Guide