

Transportation Design Guidelines:

All Ages and Abilities Cycling Routes



Version 1.1
March, 2017

Overview:

The City of Vancouver has a vision to make cycling safe, convenient, comfortable and fun for all ages and abilities (AAA), including families with children, seniors, and new riders. An inviting and connected network of low stress “AAA” routes will provide a wide spectrum of the population the option to cycle for most short trips.

This guideline provides 10 “**general rules**” to consider when designing or designating a route “AAA”. It is intended as a living document that will be updated and supplemented periodically as we learn from local projects, research, and other leading cities.

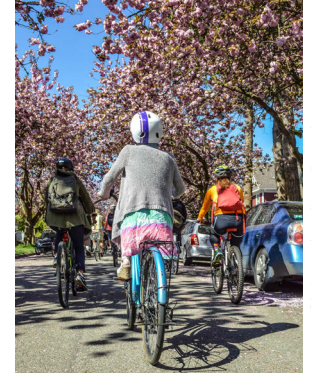


Image: Chris and Melissa Bruntlett

Rule #1:

Build the types of cycling facilities that feel comfortable for all



Many types of traditional bike facilities only appeal to people who are comfortable riding in traffic. However, bikeways on quiet streets, protected bike lanes, and off-street pathways appeal to people who are interested in cycling but concerned for their safety.²

The general approaches to creating AAA cycling routes on city streets are:

- Ensuring low motor vehicle speeds and volumes on local streets, or
- Providing physical separation on busy streets

Rule #2:

Local Street
Bikeway

**Target motor vehicle
volume below 500/day
(below 50/peak hour)**

Reducing the number of interactions between motor vehicles and people cycling can improve safety and comfort. At a volume below 500 vehicles per day, most people cycling will encounter less than one motor vehicle per block in the peak hour.

Considerations:

- On routes with more than 500 vehicles/day (more than 50/hr), consider additional traffic calming or diversion to bring volumes down to the target value.
- Routes with up to 1,000 vehicles/day (100/hr) may be considered AAA after carefully considering speed, parking turnover, and passing opportunities.
- On routes where low motor vehicle volumes are not possible to achieve, separation of bikes from vehicles is needed.



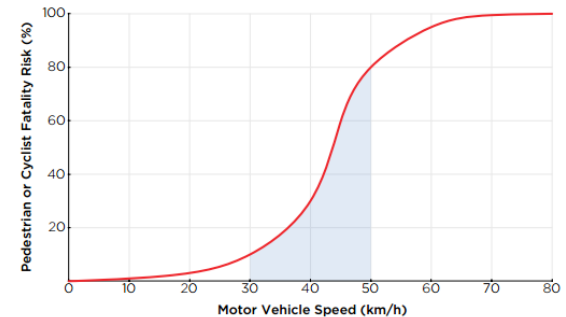
Rule #3:

Local Street
Bikeway

**Target motor vehicle speed below 30km/hr
median (below 40km/hr 95th percentile)**

Slower vehicle speeds reduce the likelihood of a collision by making it easier for drivers to see people cycling and by shortening the distance needed to stop. Slower speeds also reduce the severity and fatality risk in the event of a collision. Along local street bikeways, the posted speed limit is 30km/hr. In order for a shared roadway to be safe and comfortable for people cycling it is important that the speed limit is respected.

Lower Speeds Reduce Risk



Source: Based on data from VicRoads, Australia.
Found in Victorian Auditor-General's Office

Considerations:

- Traffic calming measures, landscaping, and other design features should be integrated into bikeways to encourage compliance with the posted speed.
- If vehicle speeds cannot be brought below the AAA threshold, separation of bicycles from motor vehicles is recommended.

Rule #4:

Local Street
Bikeway

Consider the interplay between parking and roadway width:

- **8m (26ft) allows parking on one side**
- **10m (33ft) allows parking on both sides**

The roadway widths above allow for a person cycling to pass an oncoming car without feeling squeezed or entering a door zone. It also allows two people cycling side by side to comfortably pass an oncoming cyclist. Providing this width is especially important in areas with high parking occupancy and along busy bike routes.

Considerations:

- Engineering judgement is needed when considering each context. Wider streets provide more comfortable passing and increased cycling capacity, but may also encourage higher vehicle speeds and other undesired effects.
- Where motor vehicle volumes and parking turnover are very low, a minimum roadway width of 9m (30ft) with parking on both sides, or 7m (23ft) with parking on one side, may be considered AAA.
- Where parking occupancy is typically less than 40%, an 8m (26ft) street with parking on both sides may be considered AAA.



**Too narrow for
comfortable passing**



**Allows for
comfortable passing**



Rule #5:

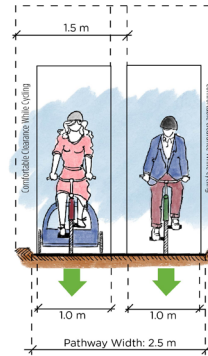
Protected Bike Lane

Off-Street Pathway

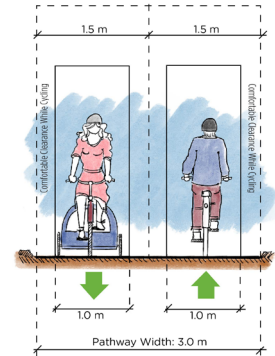
Design bike lane width for comfortable passing:

- **2.5m (8ft) unidirectional**
- **3.0m (10ft) bidirectional**

For optimal usability and comfort, protected bike lanes should be wide enough for comfortable passing, allow some degree of conversational cycling, and accommodate all types of wheeled active transportation (skateboards, cargo bikes, etc.). For unidirectional travel, a 2m (6.5ft) bike lane may allow for occasional passing as it can physically fit two standard bicycles. However, 2.5m (8ft) provides some lateral clearance for more comfortable passing and conversational cycling. For comfortable bidirectional travel, the bike lane should be at least 3m (10ft) to accommodate the full comfortable clearance envelope of two cyclists.



**Preferred minimum
2.5m unidirectional path**
Provides some clearance for
passing and conversational
cycling



**Preferred minimum
3.0m bidirectional path**
Provides comfortable
clearance for passing
oncoming cyclist

Considerations:

- Edge conditions must be taken into account when determining appropriate width, as they may add to or subtract from usable width.
- Additional clearance is needed from vertical obstructions such as lamp poles.
- Widths of 4.5m (15ft) bidirectional or 3.0m (10ft) unidirectional are recommended where 2-way bike volumes are expected to be greater than 7500 bikes/day.
- Over short distances or in constrained environments (eg. behind bus stops) narrower lanes may be acceptable taking into account the local context.

Rule #6:

Local Street Bikeway

Protected Bike Lane

Off-Street Pathway

Provide adequate lighting along the entire length of the route

Reliable and consistent lighting can enhance safety and comfort for people biking, especially in the winter months or during inclement weather. Sufficient lighting is of particular importance at intersections.



Image: Chris and Melissa Bruntlett

Considerations:

- Further research is needed to define an “adequate” level of lighting. In the meantime, a subjective review of lighting can be used to determine if a route is AAA.
- Recreational routes without lighting may be considered AAA during daylight hours.
- It is desirable to provide lighting on portions of recreational routes that are used for transportation cycling.



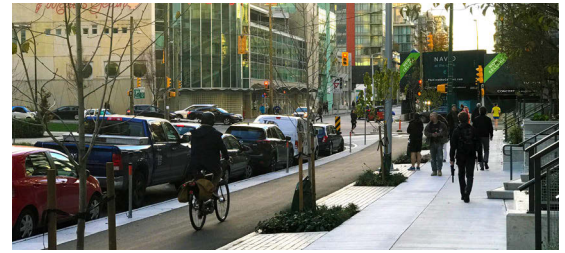
Rule #7:

Create separate spaces for walking and cycling

Protected Bike
Lane

Off-Street
Pathway

Shared-use pathways are perceived to be comfortable by many people on bikes and can help to encourage more cycling. However, they tend to have a higher collision risk than bike-only pathways.³ For people walking, shared pathways can be uncomfortable when there are high numbers of people biking at relatively fast speeds.



Separated space is more comfortable for all

Considerations:

- Existing shared-use pathways and public spaces may be considered AAA; however, consideration should be given to separating users in busy areas. New pathways should be designed with separated walking and cycling space.
- The type of separation can vary and could be a landscaped buffer, a beveled curb, or a painted line depending on context.

Rule #8:

Provide smooth and paved travel surfaces

Local Street
Bikeway

Protected Bike
Lane

Off-Street
Pathway

Smooth surfaces are especially important for older adults and people who are new to cycling because rough surfaces are more jarring, less comfortable, and may contribute to falls. Research out of the Netherlands shows a preference for asphalt, followed by concrete, over pavers and other textured surfaces.⁴



Rough surfaces are uncomfortable



Smooth surfaces are comfortable

Considerations:

- Separate pathways should be intuitive. In general, asphalt is the preferred material for cycling and concrete is the preferred material for walking.
- A variety of surface treatments such as saw-cut concrete, textured treatments, or finely crushed aggregate may be considered AAA through plazas, parks, and other context-sensitive areas.
- Where there are abrupt changes in grade, the bicycle facility should be designed to minimize jarring. For example, long ramps and vertical curves should be used where a bike lane transitions from road to sidewalk level.



Rule #9:

Keep grades below 3% as much as possible

Local Street
Bikeway

Protected Bike
Lane

Off-Street
Pathway

Steep hills can be very challenging, particularly for young riders, seniors, people who are new to cycling, and some people with disabilities. Most people can maintain a speed of 10 km/hr—a speed that helps to maintain balance—on a grade of 4% or less. Other research suggests a grade of 3% or less is desirable for longer distances. For grades between 4% and 8%, people are more likely to weave to maintain balance on a bike. At grades above 8%, speed drops to a point where many people have a hard time keeping their balance and have to dismount.⁵



Some people have to weave to get up steeper hills

Considerations:

- For new bridges and ramps, start with concepts using a 3% grade. If the concepts are not feasible, grades up to 5% may be acceptable.
- Since it is not always possible or practical to avoid a hill, routes with grades up to 5% may be considered AAA and above 5% for short distances:
 - i. Less than 500m, for grades between 5% and 7%.
 - ii. Less than 150m (about a block), for grades between 7% and 8%
 - iii. Less than 30m, for grades above 8%.
- For routes with grades of 5% or higher:
 - i. Consider mitigation measures for people riding uphill, such as flat landings at regular intervals (-every 100m) for resting and a wider bike path to accommodate weaving.
 - ii. Consider mitigation measures for people riding downhill, including higher design speeds, improved sightlines, and other safety measures.
 - iii. Sign a flatter alternate route if possible.
 - iv. Identify hills on cycling route maps.



Rule #10:

Design intersections thoughtfully to reduce conflicts, increase visibility and provide clear direction of movement

Local Street
Bikeway

Protected Bike
Lane

Off-Street
Pathway

Quality intersection design is essential for the safety and comfort of people regardless of how they travel. Intersection designs should minimize conflicts between people walking, cycling, and driving by heightening visibility, denoting a clear right of way, and facilitating eye contact and awareness of different modes. Intersections should be intuitive and provide directional messaging when needed. The level of intersection treatment required for AAA safety and comfort is context sensitive, depending on many factors. Some potential features are shown below.

Features:

1

Right turn lanes, or an area for motor vehicles to pull out of the traffic stream, when turning across bike lanes

2

Separate motor vehicle turn and through bike signal phases at complex intersections or where there are high turn volumes (>150/hr across unidirectional lanes)

3

Green coloured treatment* and elephants feet at street crossings

**Where bikes have or sometimes have right-of-way over cross traffic*

4

Advance stopping areas to increase visibility of people biking and help accommodate bike turns

Considerations:

- Crossings at major streets with three or more motor vehicle travel lanes (including turn lanes) require a signal. Typically a separate bike signal head is recommended.
- Crossings at major streets with two travel lanes require an enhanced treatment such as a median refuge or a signal.
- Crossings at local or equally classified streets should favour the right-of-way of the AAA cycling facility if possible.

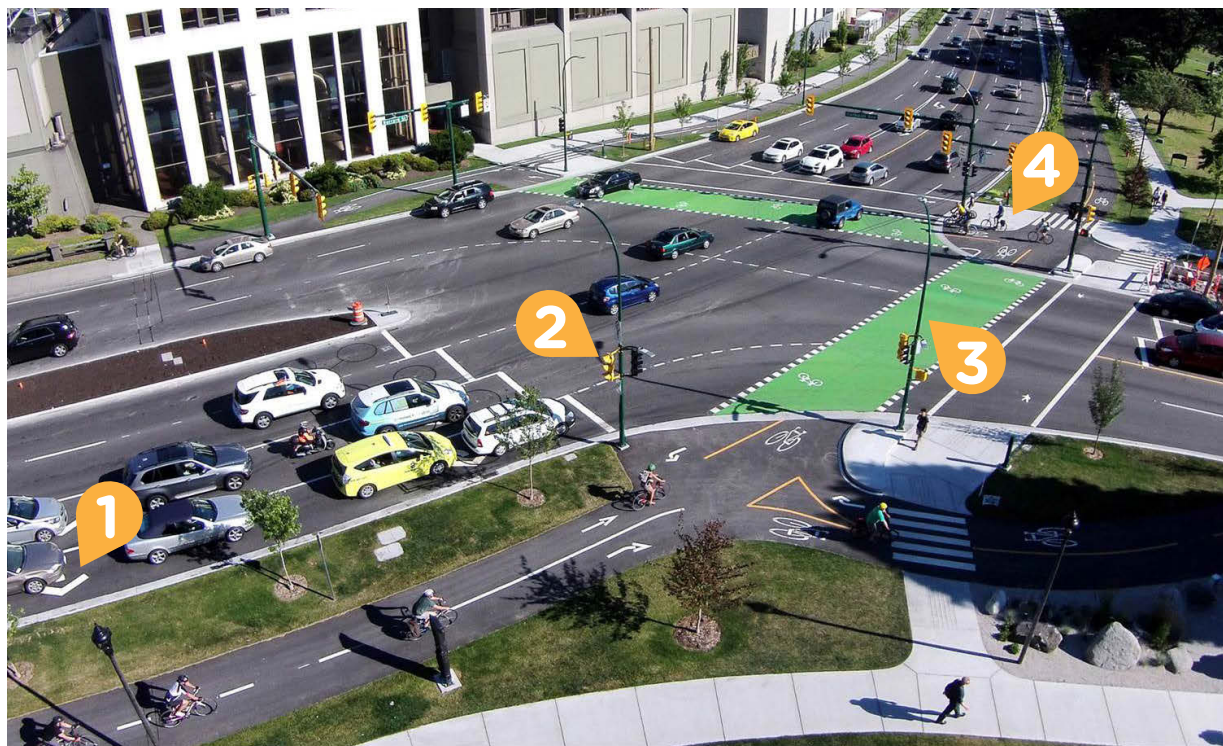
¹ General rules are intended to have broad application and may not be accurate for every situation. Understanding of the context and using judgement is important when applying these rules.

² Based on research from multiple sources including the University of British Columbia, Rutgers University, The City of Portland, and TransLink

³ Winters et al. "Safe Cycling: How Do Risk Perceptions Compare With Observed Risk (2012)", Canadian Journal of Public Health Nov. 2012, P.42-47.

⁴ Per CROW Design Manual for Bicycle Traffic (2006) P.293

⁵ Based on VeloQuebec Planning and Design Guide for Pedestrians and Cyclists (2010) and AustRoads Guide to Road Design (2009)



For more information:

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