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Cycling infrastructure provides choice in how people are able to move around the city. Cyclists are vulnerable road users and can be seriously injured in even minor collisions, so prioritizing the safety of cyclists by designing safe streets for cycling is critical. Streets that feel unsafe for cycling may also discourage people from choosing to ride. For many people, cycling close to fast moving motor vehicles is uncomfortable, but well-designed streets and cycling facilities can reduce conflicts for all road users and enhance real and perceived safety. It is critical to consider safe and comfortable cycling on all Toronto

streets as part of the street design process. This includes mitigating exposure to potential conflict between cyclists and motor vehicles. Toronto's On-Street Bikeway Design Guidelines and Multi-Use Trail Design Guidelines provide detailed design guidance and should be used in the design of cycling facilities. When trips are shifted from driving to cycling, motor vehicle volumes decrease, which in turn reduces traffic congestion, as well as air and noise pollution. Streets with cycling infrastructure also have the potential to move more people, at a lower cost, and with improved public health outcomes.

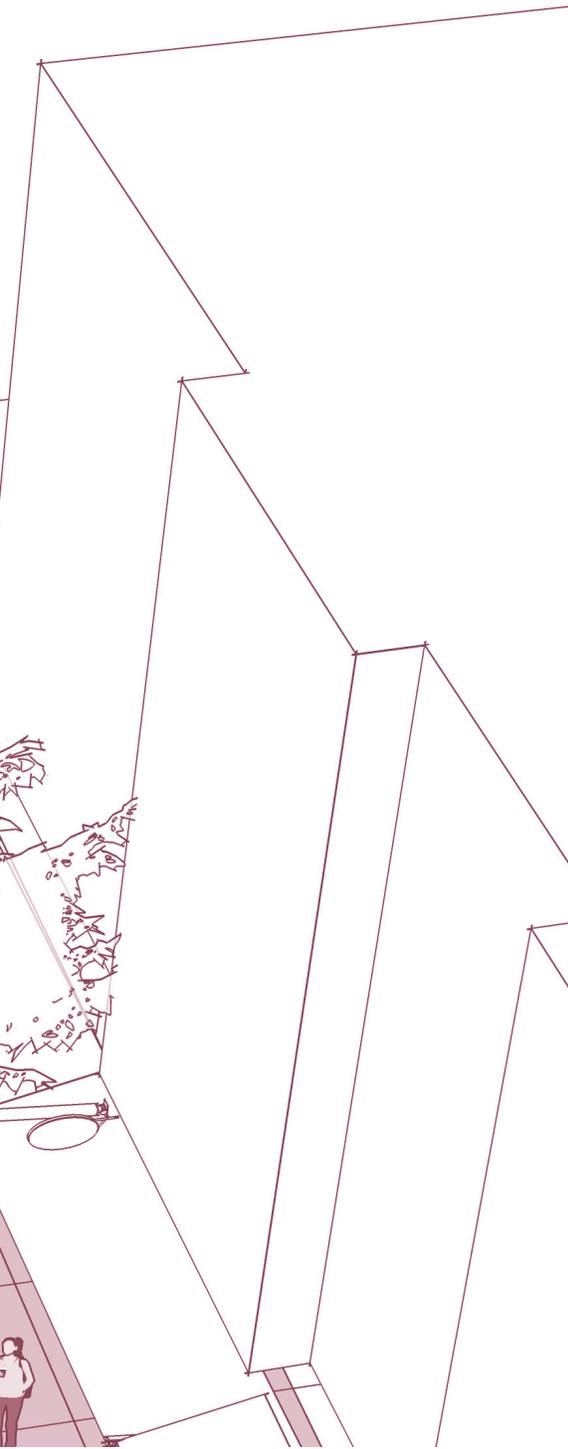
5.0 STREET DESIGN FOR CYCLING

5.1

CYCLING DESIGN PRINCIPLES



For illustrative purposes - may include a mix of permanent/temporary materials.



1. Apply context-appropriate designs. Faster, busier streets create more risk for cyclists and will need greater separation and protection for cyclists. Quiet streets with low traffic volumes and low speeds may provide a comfortable cycling experience without a dedicated cycling facility.

2. Design for both present and future users. Cycling ridership numbers will grow if a cycling facility is provided on a street that was previously uncomfortable for cycling. Where cyclist volumes are growing, consider widening the cycling facilities.

3. Prioritize the most vulnerable road users. Vulnerable users can be seriously injured or killed in even minor collisions. Think of how to design facilities for all types of cyclists, as well as the protection of pedestrians of all ages and abilities. Protect pedestrians from cyclists by providing cycling facilities that are separated from sidewalks using design treatments that respond to both pedestrian and cycling speeds and volumes. Treatments range from buffers and physical delineators to visual contrast and tactile indicators.

4. Visible, intuitive cycling facilities. Clear delineation of the cycling path of travel and wayfinding can improve safety for all road users. Use pavement markings, signs, grade change between users and physical design, like buffers, to mitigate hazards, such as car doors opening, or pedestrians walking into bicycle paths.

5. Intersection safety and mixing zones. Continue bicycle lane markings through intersections and pedestrian crossing markings over cycling routes and clearly mark conflict areas. Consider providing visible, designated space for cyclists to wait and make turns. Avoid pedestrian and cyclist mixing zones, especially at intersections with high pedestrian volumes.

6. Supply adequate bicycle parking and Bike Share access. Support and encourage cycling through Toronto's bike sharing system - Bike Share Toronto, and a convenient and adequate supply of bicycle parking, including multi-unit corrals especially in mixed use, institutional, and commercial areas.

7. Design and maintain bike-friendly curbside conditions. Ensure catch basin covers are bike-friendly, and that debris, water and ice do not accumulate where people will be cycling.

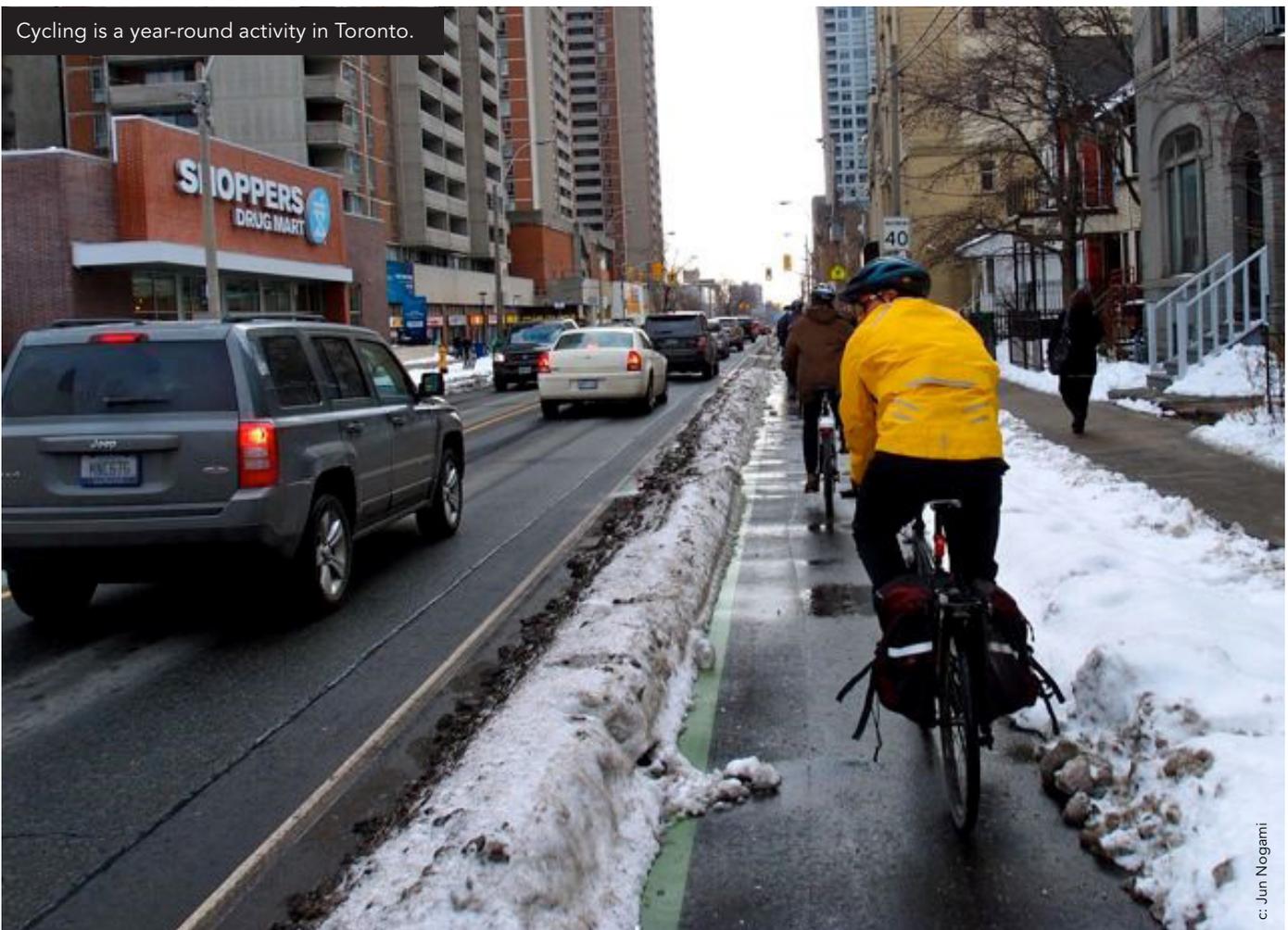
8. Surface conditions. Provide smooth riding surfaces as much as possible by re-paving before adding cycling facilities, and regular maintenance, such as sweeping and snow ploughing. Provide pavement markings that guide cyclists safely across streetcar tracks.

5.2

CONTEXT-SENSITIVE CYCLING FACILITIES

As part of the street design process, a key step is identifying whether the proposed project is part of the existing or planned Cycling Network or other area or corridor plans. The Cycling Network Plan aims to build and connect higher-order cycling routes across the city. A key benefit is to attract and accommodate a wide range of cyclists. While the Cycling Network Plan identifies key routes and their preferred cycling facility type, there is still opportunity to select and design context-sensitive cycling facilities for streets not yet in the plan.

Cycling is a year-round activity in Toronto.



c: Jun Nogami

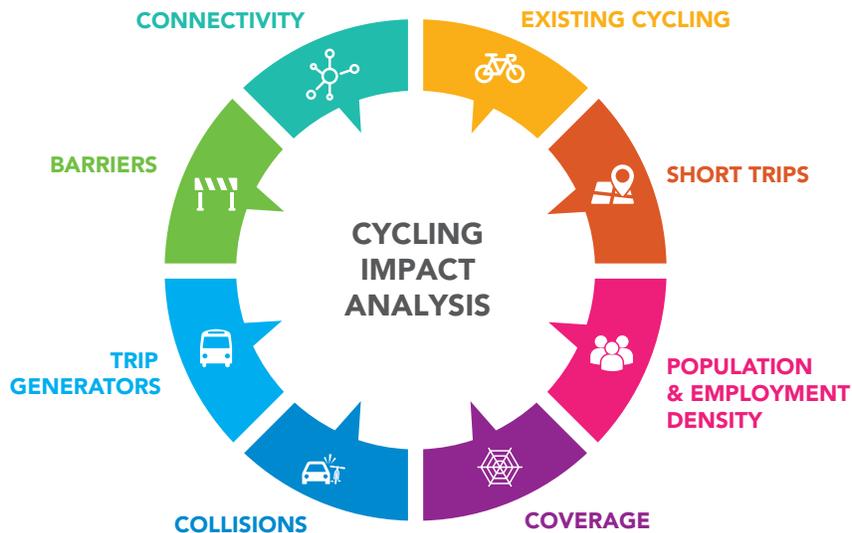


Figure 5-1: Considerations for Cycling Impact Analysis.
For more information on Toronto's cycling network, visit toronto.ca/cyclingnetwork

A good starting point for practitioners is to refer to the Ontario Traffic Manual (OTM) Book 18, which guides facility selection based on motor vehicle operating speed and average daily traffic volumes. In addition, it will be important to apply Toronto's On-Street Bikeway Design Guidelines to design for the context and local conditions. At the outset of a project, design teams should consider the:

- Presence of existing or planned Cycling Network Routes.
- Proximity and potential connections to the Cycling Network.
- Speed and volume of motor vehicles.
- Street's proximity to schools, seniors' homes, or similar institutions, as this may affect the types of users and the interaction with pedestrians of all ages and abilities.
- Existing and potential pedestrian volumes, as this may affect the suitability of sidewalk-level cycling facilities.
- Presence of transit and taxi stands.
- Presence of on-street parking (off-peak, lay-bys or lanes).

THE CYCLING NETWORK PLAN – A KEY NETWORK OVERLAY

Toronto's Ten Year Cycling Network Plan (2016) is the result of extensive feasibility analyses, together with public and stakeholder consultation. The following technical factors were combined to rate a route's cycling impact and feasibility:

- **Current and potential demand:** Number of existing and potential cycling trips. Number of short trips by motorists (less than 5km) with a high potential to shift to cycling. Areas where cycling volumes have high growth.
- **Population and employment density:** Greater density or new developments suggests more cycling trips.
- **Network coverage, connectivity, and barrier crossings:** The presence of gaps in the network or barriers (e.g. ravines, rail corridors) that a route could help overcome.
- **Trip generators and target demographics:** Assesses whether the cycling project would improve access to places many people would like to access, such as schools, universities, and transit stations. It also looks at how well the cycling project would meet the needs of target demographics such as women commuting, tourists, and children getting to school.
- **Safety:** Opportunities to improve cycling safety if the street in question is known to have a high number of collisions, or reported traffic safety issues.

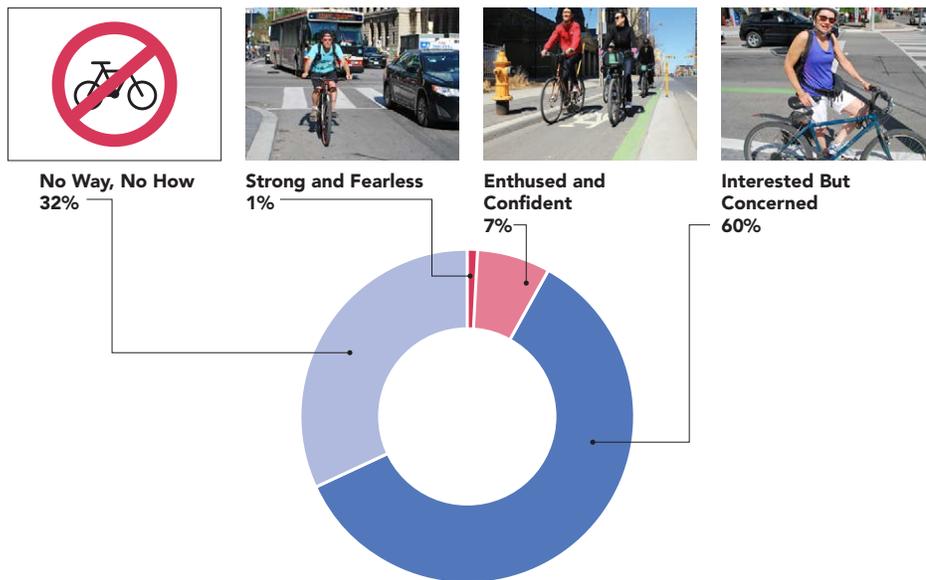


Figure 5-2: Designing for Cyclists of All Types.

source: Ontario Traffic Manual Book 18: Cycling Facilities (2013). Dill, Jennifer and McNeil, Nathan (2012). Four types of cyclists? Examining a typology to better understand bicycling behavior and potential. Geller, R. (2006) Four Types of Cyclists, Portland Bureau of Transportation.



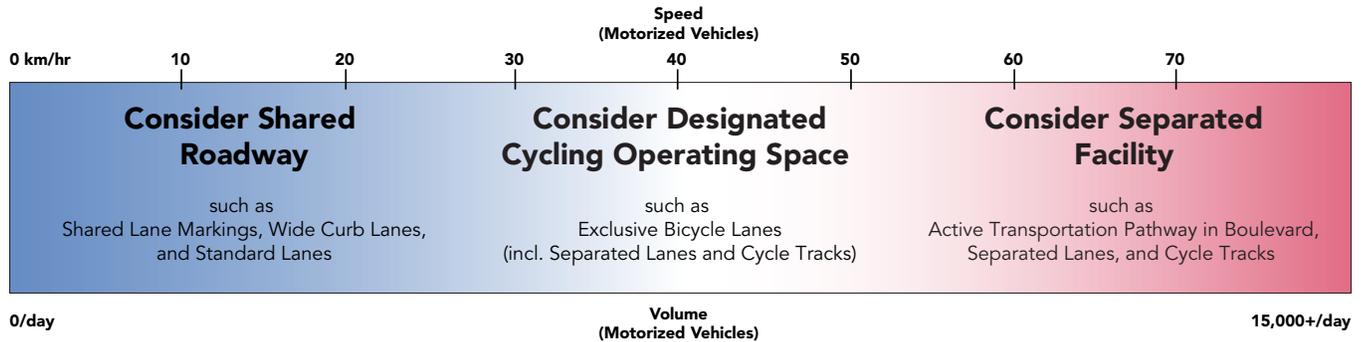
“Urban edge lines” in Toronto provide safe riding space for cyclists.

BICYCLE FRIENDLY STREETS

Even in cases where there are no plans for cycling facilities, the City’s bicycle friendly streets policies, as set out in the Toronto Bike Plan (2001), must be observed. These include wider curb lane widths, standards for the construction of bridges/ underpasses, provisions exempting bicycles from some traffic regulations and maintaining cycling access through traffic calming projects, catch basin cover standards, and bicycle detection at actuated signals. Toronto’s Bicycle Friendly Street Policies are applicable to all street types.

KEY FACTORS – SPEED AND VOLUME OF MOTORIZED TRAFFIC

As mentioned above, the speed and volume of motorized traffic are key factors influencing the context-sensitive design of cycling facilities. Detailed guidance is provided in OTM Book 18. Figure 5.3 illustrates that higher speeds and higher volumes lead to higher risk to cyclists, thereby needing more separation (e.g., wider buffers) and protection (e.g., physical buffers) for safe and comfortable conditions for cyclists of all types (Figure 5.2).



Higher Speed and Volume → Higher Risk → Increase Separation and Protection

Figure 5-3: The Relationship of Traffic Speed and Volume to Types of Cycling Facilities.
Source: Adapted from OTM Book 18.

CYCLIST USER CHARACTERISTICS

In the street design process, it is critical to consider the characteristics and needs of existing and potential users. This includes cyclists of various ages, skill and comfort levels, as well as various trip purposes such as cycling for recreation, commuting to work or school, and other utilitarian purposes like shopping or visiting friends or making deliveries (e.g., cargo bikes). Important considerations include the typical user characteristics, as a starting point for thinking about the minimum space needed. The right amount of space is determined by examining typical cyclists' dimensions, space needed to maneuver, expected cyclist volumes, speed, road geometry, topography and the presence of other users and uses. A variety of factors influences the dimensions when designing cycling facilities. Figure 5.4, adapted from OTM Book 18, illustrates the minimum typical user characteristics for physical space and height.

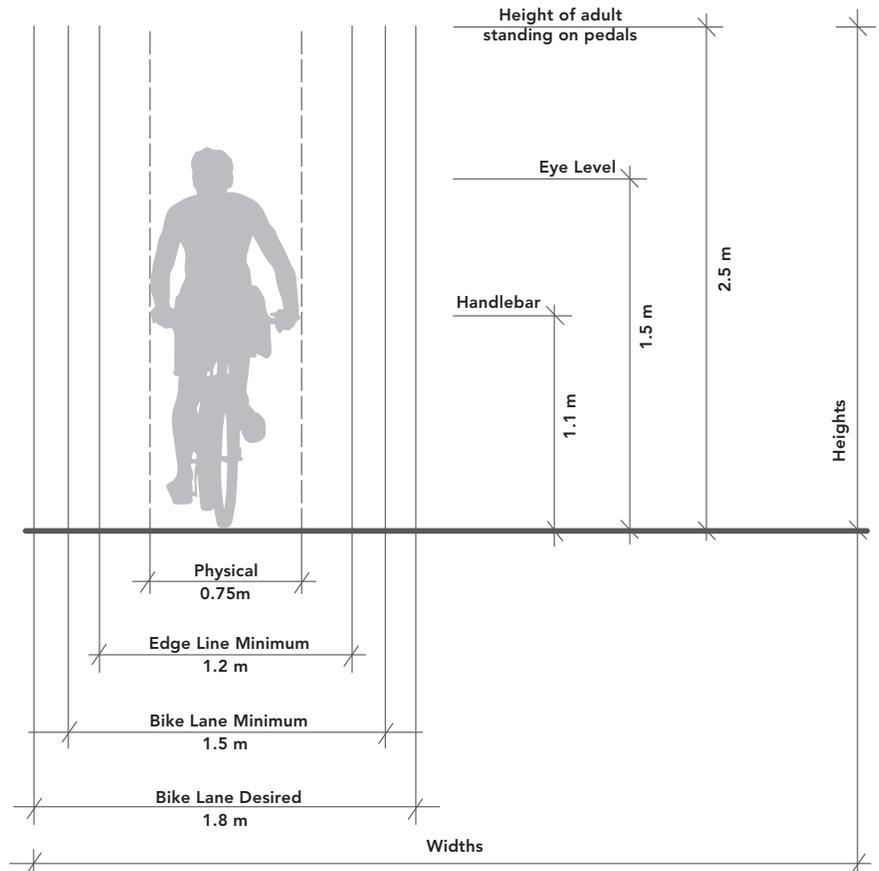


Figure 5-4: Cyclists Operating Space Requirements.
Source: Adapted from OTM Book 18.

5.3

KEY CYCLING ELEMENTS

Cycling facilities, bicycle parking, Bike Share Toronto, and wayfinding are key elements that should be considered for complete streets improvements. Intersection-related topics are covered in Chapter 9 on Intersections design. Cycling facilities can be subdivided into two categories: those on Fast, Busy Streets and those on Quiet Streets.



Cycling facilities can be between the sidewalk and the property line when there are no or few building frontages and when it connects with a multi-use trail such as this one in Scarborough.

CYCLING FACILITIES ON FAST, BUSY STREETS

High motor vehicle speeds and volumes necessitate dedicated cycling facilities. Examples include painted and buffered bicycle lanes, cycle tracks (separated bicycle lanes with bollards, planters, or a row of parked cars between cyclists and moving traffic), and raised cycling facilities (e.g., curb protects cyclists from motorized vehicles, cycling facility in the boulevard, etc). In any of these cycling facilities, it is not lawful for motor vehicles to drive, stop, stand or park. Exceptions may be made for taxi pick-up and drop-off and Wheel Trans boarding.

CYCLING FACILITIES ON QUIET STREETS

Low motor vehicle volumes and travel speeds, may provide a comfortable cycling experience without a formal cycling facility. Some Quiet Streets that are part of the Cycling Network may have dedicated facilities, or a range of design features including traffic calming measures, shared lane pavement markings, and wayfinding. If the route is not a designated "Quiet Street" in the Cycling Network, consider ways to apply the City's Bicycle-Friendly policies. These include wider curb lane widths, standards for the construction of bridges/underpasses, provisions exempting bicycles from some traffic regulations and maintaining cycling access through traffic calming projects, catch basin cover standards, and bicycle detection at actuated signals.

Bicycle lanes are only one form of cycling infrastructure, such as this example in Etobicoke-York.



Bicycle Lanes



Buffered Bicycle Lanes



Cycle Tracks



Raised Cycling Facilities



Contraflow Bicycle Lanes



Routes - Wayfinding



Bicycle Friendly Streets



Bicycle parking may be seasonal or permanent depending on context and demand.



BIKE SHARE TORONTO

BIKE SHARE

Travel by bicycle requires an adequate and convenient supply of Bike Share Toronto bicycles and docking stations and bicycle parking on both private property and in the public right-of-way. Many types of bicycle parking exist from ring-and-post, to bicycle corrals and parking structures, such as secure bicycle stations or bicycle lockers. Bicycle parking in the right-of-way should be considered on every street type, except perhaps some Neighbourhood Residential Streets and Laneways. It is especially important on Main Streets and near destinations, such as in institutional, mixed-use, and commercial areas. Consider seasonal changes in demand for bicycle parking.

Bicycle parking, including the parked bicycles, must not obstruct the pedestrian clearway. Also consider the space needed to access bicycles while being locked or unlocked.

Bike Share Toronto requires unobstructed space within or adjacent to the right-of-way for its docking stations. Stations must be connected linearly and wired to a power source. To optimize station balance, Bike Share stations are installed along a 300m grid. The frequency of stations must be maintained to ensure connectivity and accessibility.



WAYFINDING

Bicycle wayfinding consists primarily of signs and pavement markings that are legible to cyclists while they are travelling. Directional signs focus on routes that are included in the Cycling Network. In addition to providing information to make travel simpler and more convenient, the main benefits of wayfinding include increased safety by facilitating decision making in advance of intersections rather than in intersections, and greater visibility of cycling as a viable travel mode.

MORE INFORMATION

- City of Toronto. [City of Toronto Bike Plan](#). 2001.
- City of Toronto. Toronto Bikeway Design Guidelines. Anticipated 2017.
- City of Toronto. [Toronto Cycling Network Plan](#). 2016.
- City of Toronto. [Toronto Cycling Wayfinding Strategy](#). 2015.
- City of Toronto. [Toronto Multi-Use Trail Design Guidelines](#). 2015.
- CROW-25. [Design Manual for Bicycle Traffic](#). 2007.
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Bicycle wayfinding provides route and distance information to facilitate convenient travel.

