6.4 | Designing for Cyclists



6.4.1 | Overview

Encouraging cycling as an efficient and attractive mode of transportation requires the provision of safe and continuous facilities. Cycling is a healthy, affordable, equitable, and sustainable mode of transportation, with positive impacts on congestion and road safety. Cities that invested in cycling have seen congestion levels decline and streets become safer for all users.[4]

Cycling is also good for the economy. Many recent studies demonstrate the impact of cycling on local economies. Cities that increase the cycle accessibility of their business centers attract new customers, generating more spending in local stores, and ultimately creating jobs and tax revenues. Infrastructure and design can make cycling a popular activity, appealing to a wide range of potential riders.

While cyclists can share the road with motor vehicles on quiet streets with low speeds, navigating larger streets and intersections requires dedicated facilities. Design safe and comprehensive cycle networks for cyclists of all ages and abilities. If cycling is not a safe option, potential cyclists may decide not to ride.

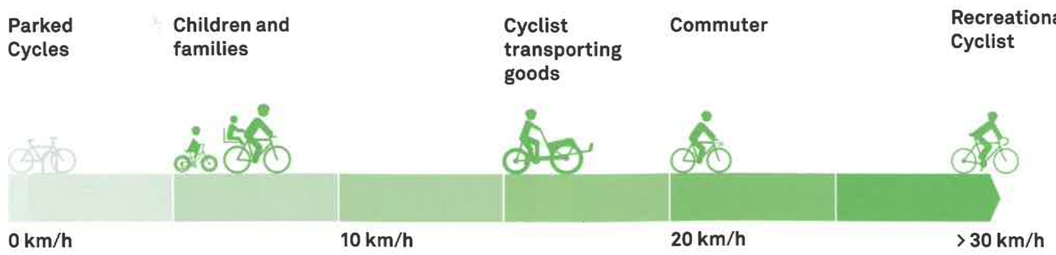
High-volume corridors should provide wider cycle facilities to carry larger volumes. Creating a bikeable city requires secure cycle parking spaces, easy access to transit, and a cycle share system.

Cycle lanes and tracks should allow for social and conversational riding for everyday use as well as long commutes. They should be designed for all types of riders and all levels of comfort, from the 5-year-old to the 95-year-old cyclist.

Speed

Cyclists ride at different speeds depending on their purpose, the length of their total route, their confidence level, and the facility they are using. Young children will ride at a slower speed than a cyclist making a delivery, and visitors will ride differently from locals and commuters. Design cycle facilities to accommodate riders at various speeds. Provide sufficient protection from travel lanes, taking into account speed differentials and vehicle volume.

Electric cycles that travel up to 20 km/h often share facilities with other cycles. Design wider cycle lanes along high-volume corridors to allow fast riders to pass slower riders.

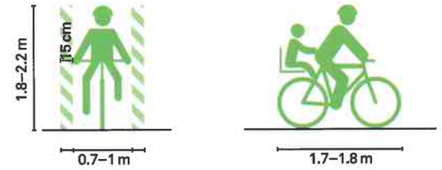


Variations

Cycle facilities should be designed for diverse vehicles and riders, for children on small tricycles, and people carrying goods in big cargo bikes, as well as cycle-rickshaws and pedicabs.

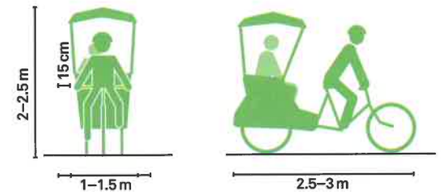
Conventional Bicycles

The most common non-motorized, single-track vehicle.



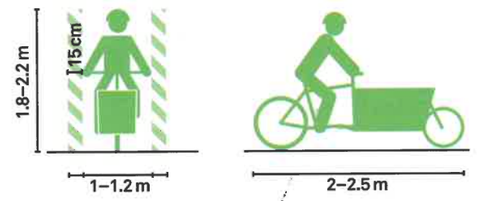
Tricycles, Cycle-Rickshaws, and Pedicabs

Tricycles such as pedicabs and cycle-rickshaws are wider, and in some cases share cycle lane facilities. They typically carry one to two passengers.



Cargo Bikes and Cycle Trucks

Cargo bikes are human-powered vehicles specifically designed for transporting loads. A cargo bike may have different forms and dimensions and can be either a bicycle or a tricycle.



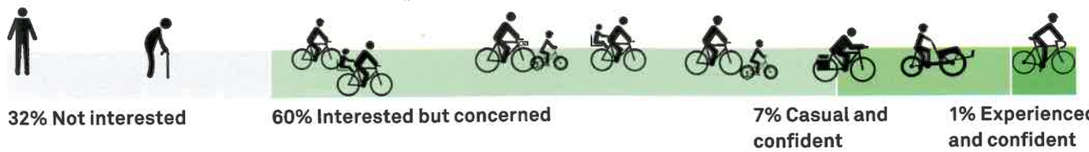
Electric Cycles or E-bikes

These are cycles with electric engines.

Levels of Comfort

Many people are interested in cycling but are dissuaded by stressful interactions with motor vehicles. These potential cyclists, defined as "interested but concerned," account for a majority of the population and vary by age and cycling ability.[5] Experienced and casual cyclists are more traffic tolerant, but they account for a significantly smaller share of the population.

Cycle facilities should be designed not only for the highly capable and experienced cyclist, but also and especially for young children learning to ride, for senior riders, adults carrying children or freight, and workers commuting long distances. These riders need higher degrees of separation and protection from motor vehicle traffic.



6.4.2 | Cycle Networks

In order to promote cycling as a viable transportation option, a comprehensive network of cycle facilities must be planned and designed. A hierarchy of routes should be based on the existing urban street network and key destinations. Integrate cycle networks with transit systems and pedestrian priority areas. The design of cycle networks should consider safety, capacity, and connectivity for all riders. Design for future capacity and mode share goals rather than present-day demands.

Safety

Safety
Cities should design and implement cycle facilities that provide safe routes for cycling for all ages and abilities. Facilities should be well maintained and kept clear of debris and obstacles.

Sightlines
Ensure that facilities provide clear sightlines for the person on a cycle to clearly see pedestrians and motorists as well as parked cars.

Comfort

Comfort and Quality
Provide low-stress facilities for less confident riders. The quality of the facility, the amount of space to ride, and the buffer between moving vehicles will all impact a route's usability and safety. The smoothness of the surface, the clear drainage of water, and added landscaping will all contribute to a quality ride. Trees can add protection and shade in hot climates.

Signage and Communication
Provide clear wayfinding for cycles and signage for drivers to increase awareness among users. Indicate distances, directions, priorities, and zones shared with other users through ground markings and signage. Map the city's cycle network and show route types. Tie cycle network developments with media campaigns and public events such as open streets or ride-to-work/school programs and promote cycle facilities. Signage and communication allow cyclists to better navigate the city and increase overall mode share.

Connectivity

Connected and Continuous
Cycle routes should allow cyclists to reach their destinations. While the types of lanes may vary along the way, ensuring that cycle facilities are continuous is critical to promoting cycling as an attractive and sustainable mode of transportation.

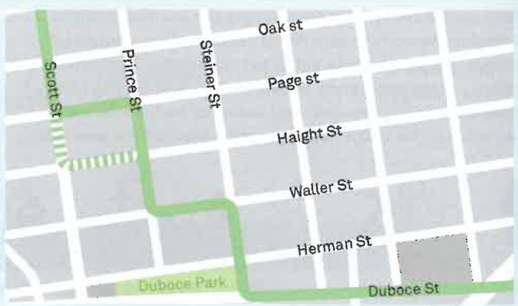
Comprehensive
Ensure that the network covers all neighborhoods and offers equitable access to cycle facilities and infrastructure. Destinations such as transit stations, schools, parks, markets, community centers, factories, and office areas should be connected directly when planning cycle networks.

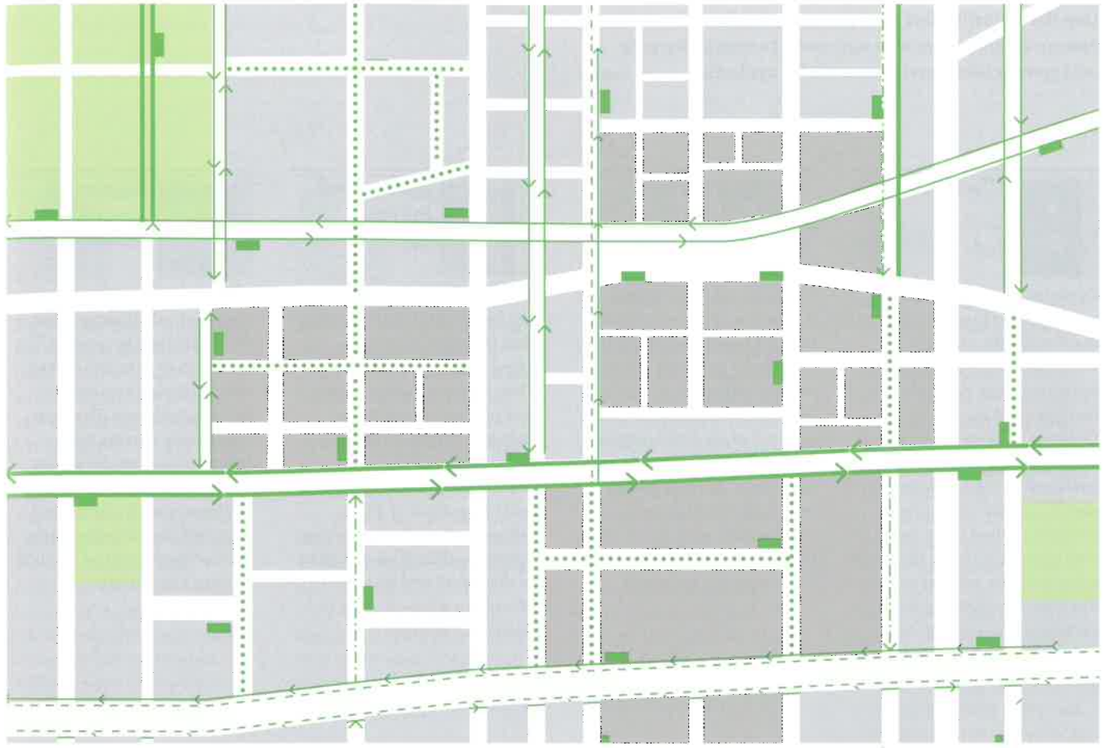
Direct
A cycle network must get riders where they are going in a direct and convenient fashion, avoiding circuitous routes where possible. In cases where steep inclines or hills exist, less direct routes might be preferable if the total path is flatter. Contraflow cycle streets can improve permeability and access for riders when adopted as a citywide approach and supported by increased awareness by motorists.

THE WIGGLE, CYCLE FLAT ROUTE SAN FRANCISCO, UNITED STATES

The Wiggle is the local name given to a portion of San Francisco's cycle network—a relatively flat route between downtown San Francisco and Golden Gate Park, enabling cyclists to avoid some of San Francisco's steep hills. The Wiggle inclines, on average, at 3% and does not exceed 6%, connecting various street blocks in a zig-zag pattern.

Cyclists can now travel the Wiggle between major eastern and central neighborhoods, and major western neighborhoods on connected cycle facilities.





Cycle Networks: Cities should prioritize cycling as a sustainable mode of transportation by ensuring comprehensive cycle networks are planned and implemented. Offering a range of cycle facilities that provide safe, convenient, and connected routes will help cyclists to reach key destinations without the need for motorized travel. Complement cycle networks with cycle parking spaces, clear wayfinding, cycle share programs, and connections to collective transport infrastructure.

Sydney, Australia. A protected cycle track also incorporates green infrastructure.

Copenhagen, Denmark. Wide, raised cycle tracks allow for people to ride side-by-side.

Buenos Aires, Argentina. A two-way cycle lane on a one-way street increases connectivity.

6.4.3 | Cyclist Toolbox

Use the following list of elements as a checklist to ensure a comprehensive approach to designing safe and comfortable environments for cyclists.

Cycle Facilities

Cycle facilities are spaces specifically designed for the movement of cycles. There are two main types of cycle facilities: dedicated facilities and exclusive facilities. Dedicated facilities are portions of the roadway assigned to the preferential use of cyclists. They are generally called cycle lanes or bike lanes. Exclusive facilities are physically separated from the main carriageway through vertical elements and can solely be used by cyclists.

Marked Buffers

At-grade, marked buffers are painted spaces parallel to cycle lanes that separate them from adjacent motor vehicle traffic. They improve comfort and safety for cyclists while discouraging motorists from entering the cycle lane. Buffers should be **1 m** wide and can also be used next to parking lanes to prevent cyclists from being hit by opening car doors.

Constructed Buffers

Constructed buffers are barriers built into the roadbed that provide a physical separation to a cycleway. They improve cyclist safety and prevent intrusion by cars and trucks. Planted buffers also present the opportunity for beautification and integration of green infrastructure. The adjoining cycleway should be designed to drain well and be wide enough to allow cyclists to pass each another.

Segmented Concrete Dividers

Segmented concrete dividers create physical separation of a cycle lane to prevent intrusion of cars and trucks while allowing cyclists to exit the cycleway. They are a relatively narrow, easy-to-install way of increasing cyclist safety and comfort. Cycleways with segmented concrete dividers should be wide enough to allow cyclists to pass each other.

Traffic Diverters

Traffic diverters are street elements that prevent cars from traveling straight, while allowing cycles to do so. They can help maintain low vehicle volumes and reduce vehicle speeds on cycle streets. Some diverter configurations provide opportunities to add vegetation and green infrastructure.

Advanced Stop Bars or Cycle Boxes

Advanced Stop Bars (ASB) provide designated areas ahead of stop lines for vehicles at signalized intersections. They allow cyclists to get ahead of queued vehicles during a red light. They help cyclists make turns across traffic and avoid being hit by vehicles turning across the cycle lane, while reducing cyclist and driver delay. ASB should be at least **3 m** deep, allowing cyclists to maneuver into them and face forward. ASB can be deeper to accommodate higher cycle volumes.

Two-Stage Turn Queue Boxes

Two-stage turn queue boxes are painted waiting spaces that allow cyclists to safely make a turn across oncoming traffic using two signal phases. They are designed to move the cyclist out of the travel path for the first stage of the turn, usually in line with a parking lane, a buffer, or in front of the opposing traffic lane. Once the light changes, the cyclist using the turn queue box can continue in the second direction.

Corner Refuge Islands

Corner refuge islands are concrete barriers at intersection corners with a curved space for cycles between the sidewalk and the roadway. They also provide protected waiting space for cyclists and facilitate two-stage turns. Corner refuge islands, with small turn radii, reduce vehicles speeds and increase cyclist visibility.

Cycle Signals

Cycle signals are traffic signals designed specifically for cyclists. They can be used at any intersection, especially on high volume streets and cycle streets. Cycle signals improve safety and confidence for cyclists at places with large volumes of vehicular traffic or conflict. Cycle signals—particularly those associated with protected facilities—should be part of the normal signal cycle. If signals are actuated, use automatic detection. Avoid the use of push-button activation in urban settings.

Wayfinding, Signages and Markings

Wayfinding, signage, and markings are elements that identify cycle routes to reach major destinations or connecting cycle facilities. These include signs with directions, specially designed street signs, and markings on the road. When well-designed and comprehensive, they serve cyclists at a level similar to transit wayfinding and highway signs. They increase confidence and signal to drivers that they are on a cycle route and should exercise caution.

Cycle Share Stations

Cycle share stations are special cycle racks that act as places to pick up or drop off cycle share bicycles. In many cases, these are connected sets of docks with significant physical presence. Cycle share stations can be an integral part of cycle-friendly streets, allowing for spontaneous trips, and serving as traffic calming measures or providing additional protection from motor vehicles. They should be placed near cycle infrastructure and be clearly visible to pedestrians.

Cycle Bridges and Underpasses

While at-grade facilities for cycles are strongly preferred, sometimes bridges or underpasses can provide direct access for cyclists to cross a waterbody or a rail-road track. They also can improve cycle comfort in climates with extreme temperatures. These should be well-designed, well-lit, and properly maintained to ensure that they are a useful part of the cycle network. Grade changes at bridges should be kept to a minimum. If grade change is substantial, underpasses are preferred for high volume routes since they allow acceleration upon descent.

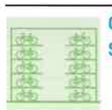
Cycle Racks

Cycle racks are inexpensive street elements that allow cyclists to securely park their cycles. While there are many designs, they are generally made of metal tubing and are bolted to a concrete surface. They are most useful when placed near major destinations or in commercial areas, and should be placed at least **0.75 m** apart. While they create opportunities for unique designs, the functionality and safety of the rack should not be compromised for visual appeal.

Cycle Corrals

A cycle corral is a row of cycle racks placed on the street that occupies space in the parking lane. Existing parking spaces can be used efficiently as cycle parking, which helps free up space on the sidewalks. The cycle racks in the corral should be protected from parked cars by a plastic delineator or parking stops.

Cycle Parking Structures

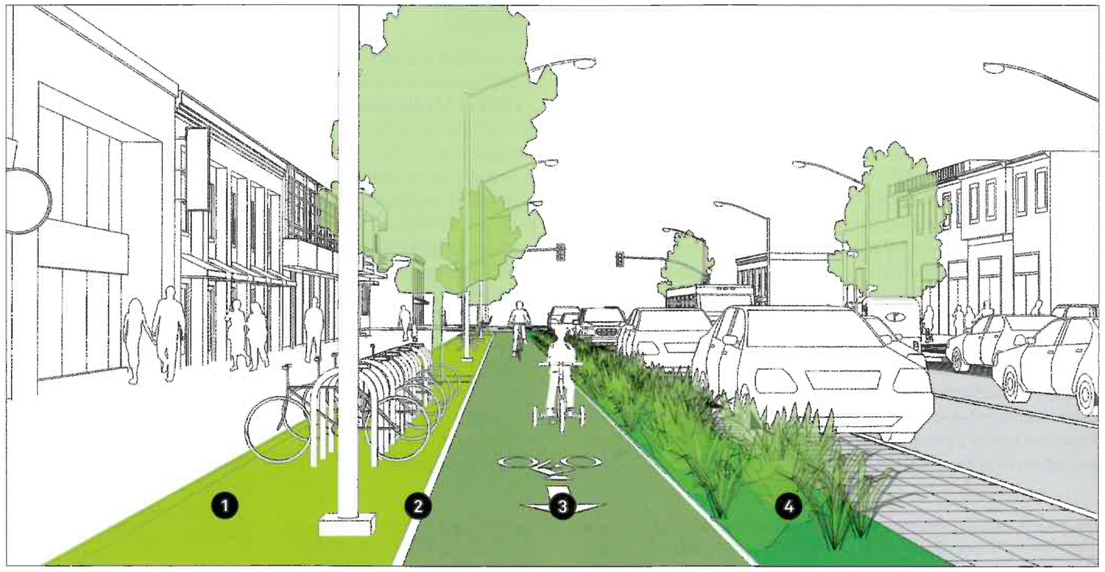


Cycle parking structures are high-quality cycle parking facilities providing a large amount of cycle parking protected from other street elements. They are installed at transit stations or major destinations such as shopping centers, and often use multilevel cycle racks to maximize storage. These structures should be easily accessible by nearby cycle routes and should be paired with wayfinding and signage that directs cyclists.

6.4.4 | Cycle Facilities

Cycle facilities are designated spaces within the street that are specifically designed for the movement of cyclists. Providing these facilities is fundamental to accommodating cyclists of all ages, abilities, and confidence levels. Cycle facilities in certain contexts may also be designed to provide comfortable cycle lanes for cargo bikes, cycle rickshaws, and other such variations.

Evidence shows that where comprehensive cycle facilities are extensively installed throughout the entire street network, the modal share of cyclists dramatically increases and crashes decrease, making streets safer for all users. A variety of facilities can contribute to the overall network, including cycle lanes, cycle tracks, and cycle streets.



Curb Zone

1 When adjacent to sidewalks or pedestrian spaces, cycle facilities should be physically separated for the comfort of both pedestrians and cyclists.

The sidewalk buffer discourages pedestrians from walking in the dedicated cycle facility and discourages cyclists from riding on the sidewalk.

The curb zone can also host important cycle infrastructure elements such as cycle racks, wayfinding maps, and cycle share stations.

Curb

2 If no sidewalk buffer is provided, cycle facilities should be grade separated.

When cycle tracks are raised from the roadbed, a minimum curb reveal of **5 cm** should be provided between the cycle lane and the pedestrian area.

Types:

Vertical

Beveled. Slope Ratio 1:1

Mountable. Slope Ratio 1:4

Cycleway Clear Path

3 The cycle clear path should provide a smooth, continuous cycling path that is free of obstructions. This clear path may vary from **1.8–2 m** for unidirectional paths and may increase in areas of greater demand.

Buffer Zone

4 The buffer zone provides a separation between the cycleway and vehicular traffic or parked cars.

Buffers can be raised or at grade and should be no less than **1 m** wide.

Physically separating the cycle clear path with vertical objects or a raised median maximizes the safety and comfort of people bicycling and driving and should be designed in every street with vehicular speeds more than 30 km/h or with high vehicular traffic.

Facility Types

Cycle Lanes

Also known as conventional bike lanes, these are defined as a portion of the roadway that has been designated by striping, signage, and other pavement markings for the preferential or exclusive use of cyclists. Cycle lanes are typically on the right side of other vehicle lanes in the same direction or left side on one-way streets. Cyclists may have to leave the lane to pass other riders, to make turns, or to avoid obstacles.

MADRID, SPAIN

In an effort to promote cycling in the city, the municipality of Madrid started an ambitious program aiming to double the length of cycle facilities by 2016. In the narrow streets of the center, the Spanish municipality created a network of contraflow cycle lanes in order to increase connectivity and create a safer and more comprehensive cycle network.

Madrid, Spain. A contraflow cycle lane.

Cycle Tracks

These are exclusive cycle facilities physically separated from motor traffic and distinct from the sidewalks. They provide the highest degree of comfort and safety for cyclists. Streets with cycle tracks have a lower injury rate than comparable streets without dedicated facilities.[6] Protected cycle tracks achieve separation through raised buffers or parking lanes while raised cycle tracks are vertically separated to either meet the sidewalk-level or be a half-a-step between the sidewalk and the street level. Materials, curbs, or bollards help to identify the space and prevent intrusion by motor vehicles.

PUEBLA, MEXICO

In Puebla, Mexico, a 4.7-km cycle track was implemented in 2015, connecting a major university to the city center. Left-side, protected cycle tracks were installed along the medians of Boulevard 14 Sur and two other two-way streets by narrowing the motor vehicle lanes to standard widths. Parking stops, reflectors, and paint demarcate the cycle tracks.

Puebla, Mexico

Cycle Streets

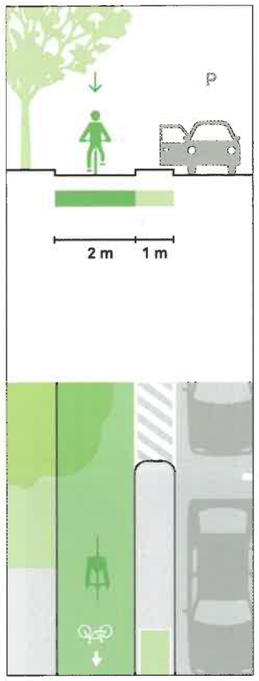
These are streets where cycles share the road space with vehicles, and cars are considered guests. Speeds in these streets should not exceed 30 km/h. Design treatments manage motor vehicle speed and volume by calming or restricting through-traffic, while connectivity remains for cyclists. Cycle streets can play a key role in cycle networks, complementing and providing connections between other cycle facilities.

GOTHENBURG, SWEDEN

This cycle street offers the cyclist a smooth surface for riding in the center of the road, while a car drives on cobblestones lining each side. This design places the cyclists at the center of the street, making them more visible, and requiring drivers to reduce their speed to increase safety.

Gothenburg, Sweden

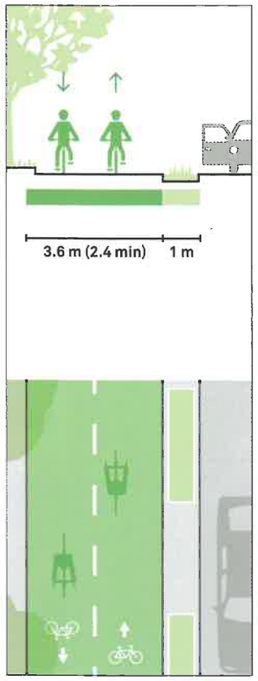
Geometry



Safety ●●●●●
Comfort ●●●●●
Space ●●●●○
Cost ●●●○○

Protected Cycle Track

One-way cycle tracks are protected from vehicular traffic by a parking lane or a raised buffer. The track can be at road level, raised fully to sidewalk level, or partially raised with an intermediate mountable curb. Provide **2 m** cycle lanes for cyclists to pass one another and a **1 m** minimum buffer to reduce the risk of conflict with vehicle doors being opened in parking-protected cycle tracks.



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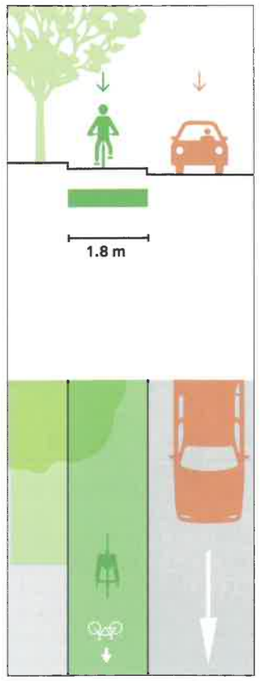
Comfort ●●●●●
Space ●●●●●
Cost ●●●○○

Bidirectional Cycle Tracks

Bidirectional cycle tracks can be located either on the side or in the center of the street. The two cycling directions are separated by a painted dashed line. Two-way cycle tracks are typically assigned to one side of the street, but may be complemented on both sides of wide streets with high cycling volumes or local access needs.



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Comfort ●●●●○
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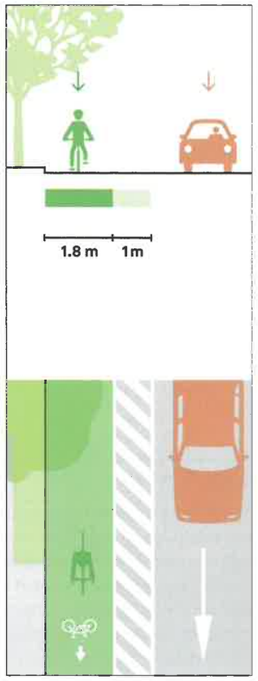
Cost ●●●●○

Raised Cycle Track

Often called Copenhagen-style cycle tracks, these facilities are vertically separated from motor vehicle traffic, raised either to the sidewalk level or an intermediate level. A mountable curb with a **4:1** slope is provided for safe entry and exit. Protection strategies between cyclists and pedestrians may include street furnishings or low vegetation. The overall width should be at least **1.8 m**, with a preferred minimum of **2 m**.



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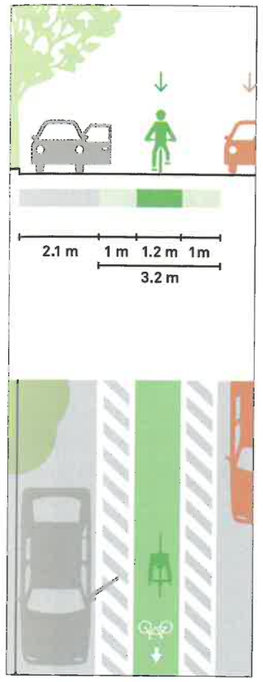
Comfort ●●●●○
Space ●●○○○
Cost ●○○○○

Curbside Buffered Cycle Lane

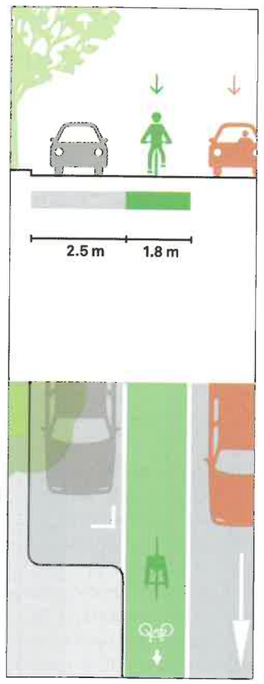
An exclusive clear path of at least **1.8 m** provides a dedicated path with pavement markings and signage adjacent to the curb. An additional buffer space of a minimum of **1 m**, and ideally **1.2 m**, is marked between the cycle lane and the roadway. It is most applicable when speeds are below **40 km/h**. As speeds or volumes increase, vertical separation increases safety and comfort. Cyclists remain visible to adjacent motorists and flexible bollards may be added in some cases.



Safety ●●●○○
Comfort ●●●○○
Space ●●●○○
Cost ●○○○○

Buffered Cycle Lane

These are cycle lanes paired with a marked buffer separating the cycle lane from adjacent motor vehicles. A total cycle lane width of **3.2 m** is recommended to provide adequate buffers between parked cars opening doors on one side and moving vehicles on the other.



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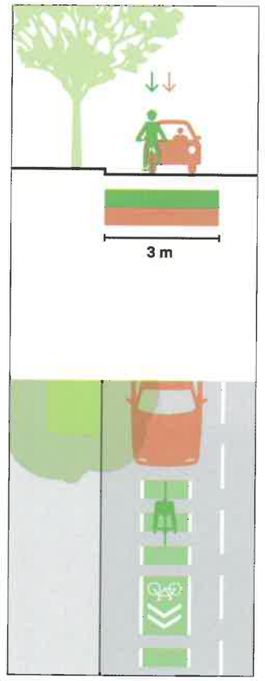
Comfort ●○○○○
Space ●○○○○
Cost ●○○○○

Conventional Cycle Lane

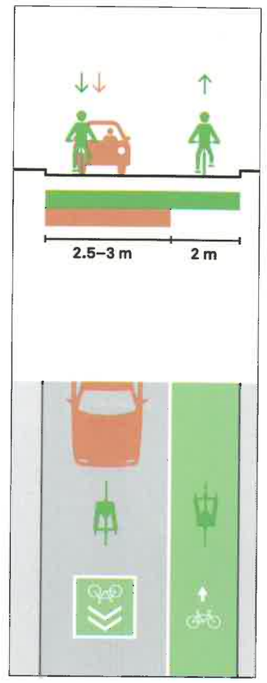
Exclusive space for cyclists is designated through the use of pavement markings and signage. The cycle lane is located adjacent to vehicular traffic and flows in the same direction, next to the parking lane. A minimum width of **1.8 m** should be provided, with a total minimum width of **4.3 m** between the curb and the outer edge of the cycle lane. It is most applicable when speeds are below **40 km/h**.[7] The conventional cycle lane is preferable to no facility at all, but it would be greatly improved by the provision of marked or physical buffers.



Safety ●●●○○
Comfort ●●●○○
Space N/A
Cost ●○○○○

Cycle Street

Also known as a Cycle Boulevard, Fahrradstraße in Germany and Fietsstraat in the Netherlands are quiet streets that accommodate high cycle flows and are accompanied by very low motorized traffic. Cars are invited to use the street as guests, and in some areas they have limited motor vehicle access. Cycle streets can be applicable where street width restricts dedicated cycle facilities.



Safety ●●●●○
Comfort ●●●○○
Space ●○○○○
Cost ●○○○○

Contraflow Cycle Street

Contraflow cycle streets are one-way streets in which cyclists are allowed to ride in both directions. Contraflow cyclists can either ride on a dedicated or an exclusive facility. They are most applicable for small-scale streets in which vehicular speeds are low. These facilities encourage more people to cycle, as they allow cyclists to use safe routes and direct routes, avoiding unnecessary detours. Contraflow cycle streets have been proven to be safer than other one-way streets.[8]