Bicycle Facilities Planning
Overview

- Types of Cyclists
- Purpose for Riding
- Types of Facilities
  - Bike Lanes
  - Bicycle Boulevards
  - Cycle Tracks
  - Intersections
  - Signals
  - Signing and Marking
- Discussion
Not all people view bicycling in the same way. To better understand cyclists needs, the City of Portland developed these 4 categories of cyclists based on public response and engagement. Each have different priorities and needs to consider in planning and facilities design.

• The strong and fearless are often call the vehicular cyclists— they are comfortable riding with traffic on major streets and represent a very small proportion of riders. 
• The next group—enthused and confident—represents a group that likes to ride, rides often and is comfortable in most situations.
• On the other end, the “no-way-no how” are those who will never get on a bike. 
• But that leaves a large group in the middle—usually more than ½ the population—who is interested but concerned. As the title implies they are interested in cycling but have concerns—usually around safety, routes, and wayfinding. This groups is where there is a large opportunity for growth in cycling. Plans and facilities should address this group if increased mode share is the goal.
There are also ways to break down the way bicyclists choose to ride. None of these groups are mutually exclusive, but they do require or use facilities differently.

Utilitarian riders are using their bicycles most like a personal vehicle, for commuting, running errands, and getting around town.

Recreational users you may think of as a “Sunday rider” or “fair weather cyclist”. They are out biking for exercise and fun, special occasions, or events with their family and friends.

Finally, athletic riders are may choose to cycle for events and competition.
Traffic engineers and planners often look at two types of bicycle facilities when creating a bikeway network. Those located on existing street network and those that are off the network—typically paths and trails, and intersection design and signage for facilities.

This module will cover on-street facilities including design, planning considerations, intersections, and signage.

Off street facilities are covered in more depth in the trails module.
Bike lanes designate an exclusive space for bicyclists through the use of pavement markings and signage. The bike lane is located adjacent to motor vehicle travel lanes and flows in the same direction as motor vehicle traffic. Bike lanes are typically on the right side of the street, between the adjacent travel lane and curb, road edge, or parking lane. This facility type may also be located on the left side when installed on one-way streets, or may be buffered if space permits. See contra-flow bike lanes for a discussion of alternate direction flow.

Bike lanes enable bicyclists to ride at their preferred speed without interference from prevailing traffic conditions. Bike lanes also facilitate predictable behavior and movements between bicyclists and motorists. Bicyclists may leave the bike lane to pass other bicyclists, make left turns, avoid obstacles or debris, and avoid other conflicts with other users of the street.

Bike lanes are most helpful on streets with ≥ 3,000 motor vehicle average daily traffic. Bike lanes are most helpful on streets with a posted speed ≥ 25 mph.

Creates separation between bicycles & cars
Buffered bike lanes are conventional bicycle lanes paired with a designated buffer space separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane.

Encourages bicyclists to ride outside of the door zone when buffer is between parked cars and bike lane.

Provides a greater space for bicycling without making the bike lane appear so wide that it might be mistaken for a travel lane or a parking lane.

Provides space for bicyclists to pass without going into auto lane.
Contra-flow bicycle lanes are bicycle lanes designed to allow bicyclists to ride in the opposite direction of motor vehicle traffic. They convert a one-way traffic street into a two-way street: one direction for motor vehicles and bikes, and the other for bikes only. Contra-flow lanes are separated with yellow center lane striping.

The contra-flow design introduces new design challenges but may introduce additional conflict points as motorists may not expect on-coming bicyclists.

They reduces dangerous wrong-way riding; decrease sidewalk riding; influence motorist choice of routes without limiting bicycle traffic.
Left-side bike lanes are conventional bike lanes placed on the left side of one-way streets or two-way median divided streets.

Left-side bike lanes offer advantages along streets with heavy delivery or transit use, frequent parking turnover on the right side, or other potential conflicts that could be associated with right-side bicycle lanes.

- Provides consistent facility configuration in locations where right-side travel lanes are subject to rush hour parking restrictions and other flexible uses.
- Fewer bus and truck conflicts as most bus stops and loading zones are on the right side of the street.
- Minimizes door zone conflicts next to parking because of fewer door openings on the passenger side of vehicles.

When to use:
- On one-way streets or median divided streets with frequent bus stops or truck loading zones on the right side of the street.
- On streets with high parking turnover.
- On streets with rush hour parking restrictions.
- On streets with high volumes of right turn movements by motor vehicles.
- On streets with a significant number of left-turning bicyclists.
- On streets where traffic enters into an add lane on the right-hand side, as from a freeway off-ramp.
Bicycle Boulevards are also called Local Street Bikeways, Bike/Walk Streets, Bicycle priority streets, and Neighborhood Greenways.

Whatever it is called, they share similar design elements and are used to create attractive, safe facilities for both cyclists and other non-auto travelers. They are designed to be on low traffic volume streets that have low speeds, a typical residential, neighborhood street is often thought of when describing Bicycle Boulevards. To create the boulevard, elements of traffic calming should be included to further reduce traffic speed and discourage heavy traffic along these routes.

Bicycle Boulevards should also be distinguishable from other streets for both cyclists and motorists through the usage of signs and pavement markings (seen in the above photo). Pavement markings can supplement wayfinding and will also help bicyclists position themselves properly to share the lane width motor vehicles.
Cycle tracks are relatively common in many European cities and are becoming more popular within the United States. They act as a hybrid between an off-street, separated path and bike lane. It is lane protected from traffic on the street infrastructure.

This separation from traffic increases perceived comfort of cyclists, making it a more attractive facility to more levels of cyclists. The separation also increases safety for cyclists: “Compared with bicycling on a reference street...these cycle tracks had a 28% lower injury rate.”

These are also known as “on-street bike paths” in New York City. They will be on the street level and use different methods to distinguish them as exclusive use for bikes and protect from traffic. Could have pavement markings to separate from parked cars, or bollards and other design elements to further separate.

Since the lane is protected, there is a decreased risk of “dooring” or interference with motor vehicles. The increase in comfort for cyclists and the increased safety makes a cycle track a more attractive route option for many levels of cyclists.

Good option to use on streets with many lanes, high traffic volumes, and generally stressful bike environments. Still relatively new in the United States so many standards come from international examples. Portland, San Francisco, and New York City all use cycle tracks.
Good option for streets with higher speeds and fewer cross streets or driveways.

When constructing a new road, a raised cycle track can be less expensive than a standard bicycle land and require less maintenance since there is no motor vehicle wear on the cycle track.

Photo example is on Cully St in Portland
This is a good option for a street where there is not enough room for a one-way track on either side of the road.

On one-way streets, reduces out of direction travel by providing contra-flow movement.
Intersections:
• Bike boxes
• Intersection Crossing
• Two Stage Turn
• Median Refuge Island
• Through Bike Lanes
• Combined bike turn lane
• Cycle track Intersection
Bike boxes move cyclists to the front of traffic at signalized intersections, which allows for higher visibility of the cyclists. This visibility helps prevent conflicts between cyclists and motor vehicles turning right at the intersection.

Groups bicyclists together to clear an intersection quickly, minimizing impediment to transit or other traffic and reducing the signal delay for cyclists.

Contributes to the perception of safety among users of the bicycle network. “77% of cyclists felt bicycling through the intersections was safer with the bike boxes” Monsere, C., & Dill, J. (2010). *Evaluation of Bike Boxes at Signalized Intersections*. Final Draft. Oregon Transportation Research and Education Consortium.

Typically used at intersections with high volumes of cyclists and motor vehicles, especially where there may be turning conflicts.
Intersection crossings make the bike lane visible through the intersection by the use of pavement markings. They help guide the cyclists and also make the area more visible for automobiles. This should raise awareness for both of the potential conflict area.
Also called a hook turn, box turn, or Copenhagen left. Here the cyclist moves to the right before realigning themselves to go straight across the intersection safely making a left hand turn.
This is used more often for pedestrians on wide streets. Can also be used for trails crossing a roadway.
When traveling in a bike lane, approaching a vehicular turn lane can present a challenge and be a source of potential conflict between cyclists and automobiles. A through bike lane allows bicyclists to align themselves to get through the intersection safely and clarifies the travel movements for both bikers and drivers (by signifying an appropriate location for motorists to safely merge across the bike lane into the turn lane).

A combined bicycle lane/turn lane places a suggested bike lane within the inside portion of a dedicated motor vehicle turn lane. A dashed line can either delineate the space for bicyclists and motorists within the shared lane or indicate the intended path for through bicyclists. This treatment includes signage advising motorists and bicyclists of proper positioning within the lane. Maintains bicyclist comfort and priority in the absence of a dedicated bicycle through lane.

Guides bicyclists to ride in part of the turning lane, which tends to have lower speed traffic than the adjacent through lane, allowing higher speed through traffic to pass unimpeded.
This treatment reduces turn conflicts for bicyclists and can provide connections to intersecting bicycle facility types. To achieve this intersection, protected cycle track barriers are typically removed and a raised cycle track is brought down to street level. The bicycle lane then becomes adjacent to the shared motor vehicle travel.

Now becomes a more traditional bike lane that can use similar strategies to reduce conflicts and increase safety and comfort of cyclists. Can be used where cycle tracks approach intersections where turning movements across the path of the bicyclist (either left or right) is allowed.
Determining which type of signal or beacon to use for a particular intersection depends on a variety of factors. These include speed limits, average daily traffic (ADT), anticipated bicycle crossing traffic, and the configuration of planned or existing bicycle facilities.

A bicycle signal head can be used at signalized intersections to assist the traffic flow and give guidance to bicycle signal phases. They are used at intersections where a stand-alone bike path or multi-use path crosses a street, especially where the needed bicycle clearance time differs substantially from the needed pedestrian clearance time or at intersections with contraflow pathways.
Signal detection and actuation by bicycle at traffic signals alerts the traffic signal of a bicycle needing to cross. This can be done by push button or having it automated with in-pavement signals that are calibrated to activate at the detection of a bicycle.

Proper detection will need to both accurately detect the cyclist and provide guidance to the biker on how to activate the detection (how to position the bicycle or which button to push)

Signal detection can be:
- Loop – Induction loop embedded in the pavement
- Video – Video detection aimed at bicyclist approaches and calibrated to detect bicyclists
- Push-button – User-activated button mounted on a pole facing the street
- Microwave – Miniature microwave radar that picks up non-background targets
Active warning beacons are user-actuated amber flashing lights that supplement warning signs at unsignalized intersections or mid-block crosswalks. Beacons can be actuated either manually by a push-button or passively through detection.
Hybrid beacons were developed specifically to enhance pedestrian crossings of major streets, however several cities have installed examples of hybrid beacons explicitly incorporating bicycle movements. Used to improve non-motorized crossings of major streets in locations where side-street volumes do not support installation of a conventional traffic signal (or where there are concerns that a conventional signal will encourage additional motor vehicle traffic on the minor street). Hybrid beacons may also be used at mid-block crossing locations (e.g., trail crossings).

The hybrid beacon can significantly improve the operations of a bicycle route, particularly along bicycle boulevards or neighborhood greenway corridors. Because of the low traffic volumes on these facilities, intersections with major roadways are often unsignalized, creating difficult and potentially unsafe crossing conditions for bicyclists.
Signage and markings can help bring awareness to the presence of a bicycle facility and distinguish that facility from other uses. Bikeway markings represent any device applied onto the pavement surface and intended to designate a specific right-of-way, direction, potential conflict area, or route option. These markings must take into consideration the use of particular colors, materials, and designs, as well as the legibility of these elements for motorists and pedestrians. Markings may be used to augment a particular lane, intersection, or signal treatment. In all cases, markings must strive for a high level of visibility, instant identification, and take into account both motorist and bicyclist movements in relation to the marking placement.

A bicycle wayfinding system consists of comprehensive signing and/or pavement markings to guide bicyclists to their destinations along preferred bicycle routes. Signs are typically placed at decision points along bicycle routes – typically at the intersection of two or more bikeways and at other key locations leading to and along bicycle routes.
Colored pavement within a bicycle lane increases the visibility of the facility, identifies potential areas of conflict, and reinforces priority to bicyclists in conflict areas and in areas with pressure for illegal parking.

Though rarely done in North America, color can be applied along the entire length of bicycle lanes to increase the overall visibility of the facility. Motorists are expected to yield right of way to bicyclists at these locations. Along bikeway corridors, color should be applied either in intersection conflict areas, or between conflict areas, or both; whichever approach is preferred, it is important to be consistent.
Sharrows can be used along bicycle boulevards and other roadway facilities where vehicles and cyclists are sharing a roadway. It can act as a reminder to vehicles that bicycles have a legitimate place on the roadway. Their placement also helps align bikers properly in the roadway to avoid being in the “door zone” and be visible to traffic. Supportive of a larger bikeway network and can be used as a wayfinding device.
Discussion