APPENDIX J
Sample Design Standards for Active Transportation Facilities

Sample Design Standards

As there are no universally accepted design standards for Active Transportation Facilities, this appendix outlines some standards used elsewhere, which might provide some guidance as The City of Winnipeg expands its Active Transportation Network. The information in this appendix expands on the design standards described in the 1993 Winnipeg Bicycle Facilities Report. Nothing has fundamentally changed since the 1993 report so the design standards contained therein still apply and are not repeated here.

Sample Maintenance Standards

Vélo Québec (2003) suggests that the level of maintenance required depends on the type of bikeway, its environment and how heavily it is used.

> A maintenance program involves different types of activities: ongoing activities that should be done regularly throughout the season; season; seasonal activities – for example, when the path is opened or closed for the season; major work, most notably resurfacing and repairs to bridges or tunnels. (Vélo Québec, 2003)

The National Center for Bicycling and Walking (NCBW) suggests that some bicycling maintenance requirements can be made with slight adjustments. " For example if street sweeping crews pay a bit more attention to the right edge of the road, it can benefit bicyclists greatly. They also recommend the following objectives as possible solutions for maintenance issues:[1]

1. To maintain roadways and bikeways to a relatively "hazard free" standard:
    - By sweeping pavement edges and paved shoulders with sufficient care.
    - By patching surfaces as smoothly as possible and by requiring other agencies or private companies to do likewise whenever they dig up a road or trail.
    - By making sure pavement overlay projects feather the new surface into the existing one or otherwise do not create new linear joints.
    - By replacing such hazards as dangerous grates or utility covers as the opportunity arises.
    - By patching potholes in an expeditious manner.
    - By routinely cutting back all encroaching vegetation, especially on trails or popular bike routes.
2. To encourage bicyclists to report maintenance problems and other hazards:
    - By developing a "bicycle spot improvement" form and distributing copies throughout the bicycling community.
    - By making sure returned forms are acted upon in a timely fashion.
3. To design and build new roadways and bikeways in such a way as to reduce the potential for maintenance problems in the long term:
    - By using edge treatments, shoulder surfaces, and access controls that reduce the potential accumulation of debris.
    - By using materials and construction techniques that increase the longevity of new trail surfaces.

[1] Source: Bicycle-Related Maintenance Chapter (NCBW, n.d.)

4. To include maintenance costs and clearly spelled-out maintenance procedures in all bicycle facility projects:
    - By including reasonable estimates of the maintenance costs in the project's budget.
    - By establishing clear maintenance responsibilities in advance of construction.

Examples of Standards for Widened Curb Lanes

The *1993 Winnipeg Bicycle Facilities Study* recommended a lane width of 4.3 metres for a widened curb lane/shared roadway, which falls within the recommendations made by CIP (2004) and TAC (1999) (see table J-1). The literature indicates that lane width standards need to be adjusted depending on the situation. They may vary depending on the grade and curvature of the road, the speed and volume of motor vehicle traffic, and whether or not parking is allowed in the curb lane.

The *Guide for the Development of Bicycle Facilities* (AASHTO, 1999) recommends

> 4.2 m (14 ft) of usable lane width for shared use in a wide curb lane. Usable width normally would be from edge stripe to lane stripe or from the longitudinal joint of the gutter pan to lane stripe (the gutter pan should not be included as usable width). On stretches of roadway with steep grades where bicycles need more manoeuvring space, the wide curb lane should b slightly wider where practicable (4.5 m (15 ft) is preferred). (AASHTO, 1999)
>
> Widths greater than 4.8 m (16 ft) encourage the undesirable operation of two motor vehicles in one lane. In this situation, an informal bike lane or shoulder bikeway should be striped. (Source: Montgomery County Park & Planning - *Countywide Bikeways Functional Master Plan, Planning Board Draft*, May, 2004)

The *Community Cycling Manual* (2004) prepared by the Canadian Institute of Planners (CIP) recommends a right lane width of 4.3 metres. Lane widths wider than 4.5 metres or more, encourage motor vehicle drivers to consider this space suitable for two cars, creating a dangerous situation for cyclists. The Community Cycling Manual (1990) recommended a minimum lane width of 4 metres when bicycles and parked cars share a lane. If parking is banned during the normal rush hours the curb lane can be reserved for bicycle rush hour traffic. In this instance the recommended lane width is 3.0 metres.

Table J-1 - Bike Lane and Shared Street Lane Width

Classification	Lane Width (m) Design Domain
Bike lane, one-way exclusive [c]	1.5[a]-2.0 [a]
Bike route and shared roadway right lane (aterial)	
- AADT [a] 0-1000	Standard roadway lane – 4.0
- AADT [a] 1000-3000	Standard roadway lane – 4.3
- AADT [a] 3000-6000	4.0 - 4.5
- AADT [a] >6000	4.3 - 4.8

Notes: a. Add 0.5 m if AADT [b] exceeds 6000 or if trucks exceed 10%, add an additional 0.5 m if roadway speed is 100 km/h or greater.
b. AADT (Annual Average Daily Traffic) is the volume of traffic in the shared lane
c. Applies to shoulder bikeways as well.

Source: Geometric Design Guide for Canadian Roads (1999)

Examples of Standards for Bicycle Lanes

The recommended lane width for Bicycle Lanes varies slightly amongst sources. There is fairly good consensus with the minimum curb lane width being 1.5 metres (TAC, 1999; CIP, 2004; Drdul, 2004; AASHTO, 1999) although the AASHTO standard is 1.2 metres unless parking is permitted, then the bicycle lane width should be 1.5 metres. Width of the gutter is not included in the 1.5 metres. The maximum lane width according to the *Community Planning Manual* (CIP, 2004) is 3 metres wide in areas where there is heavy bicycle traffic, to allow cyclists to pass each other without crossing into the next lane. Drdul (2004) recommends that the maximum lane width be no more than 2 metres, "so as to avoid two-way bicycle travel and motorists parking in the bicycle lane." Drdul (2004) also recommends that the minimum bicycle lane width on roads with posted speeds of 70 km/hr or higher be 1.8 metres. Where bicycles and parked cars share a lane, the minimum lane width should be 4 metres. This assumes a 2.4 metre, parking bay and leaves 1.6 metres for the bicycle. (CIP, 2004, Drdul, 2004)

> Bike lanes should be delineated from the motor vehicle travel lanes with a 150 mm solid white line. An additional 100 mm solid white line can be placed between the parking lane and the bike lane, providing added separation from motor vehicles. (AASHTO, 1999)

> Bike lanes should be provided with adequate drainage to prevent ponding, washouts, debris accumulation and other potentially hazardous situations for bicyclists. The drainage grates should be bicycle-safe. (AASHTO, 1999)

Examples of Standards for Shoulder Bikeways

The Bicycle Facilities Design Guideline (2004) put forth by Richard Drdul Community Planners in Vancouver recommends the following specifications be taken into consideration when designing Paved Shoulder Bikeways:

For roads without curbs & gutters such as rural collector roads (no curbs), rural arterial roads (no curbs), rural highways (no curbs), freeways.

Widths:	- Minimum of 1.5 m wide - Minimum 2.0 m on roadways with posted speeds in excess of 70 km/h - Minimum 2.5 m on roadways with posted speeds in excess of 80 km/h
Parking:	Minimum 2.4 m should be allowed for parked vehicles, in addition to the width required for the paved shoulder. Parking is located to the right of the paved shoulder facility for the cyclist
Signage:	- Bicycle route sign. - No stopping or no parking signs at regular intervals, every 250 m or less (unless separate parking lane provided)
Facility Ends:	Where a paved shoulder ends & a cyclist must ride within a traffic lane, a warning sign should be posted in advance to advise cyclists that the shoulder is ending, & motorists that cyclist may be present on the roadway. (Drdul, 2004)

Example of a Raised Pavement Bicycle Lane (Danish Cycle Track)

The recommended width for the raised pavement bicycle lane is 2.2 metres, with a minimum width of 1.7 m. If a raised sidewalk is also attached, the width of the bicycle lane can be 1.7 metres and he width of the sidewalk should be 1. 5 metres. A lane width of 2.2 metres permits cyclists to safely overtake each other, without having to go onto the roadway (Roads Directorate, 2000).

> On free sections of road, curb heights along the roadway should measure between 7 and 12 cm and between 5 and 9 cm between the cycle track and footway (sidewalk). These heights give a number of advantages. Most motorists refrain from parking on the cycle track. Vehicles exit from and entry to properties take place at low speeds. Drainage functions well. Cyclists rarely cycle on the footway, and pedestrians will register when they leave the footway. The heights represent a positive and negative balance between positive and negative factors… (Roads Directorate, 2000)

Examples of Standards for Bicycle Paths

Recommended standards for Bicycle Path design are specified in the Geometric Design Guide for Canadian Roads (TAC, 1999) and can be found in Table J-2

Table J-2 - Bike Path Lane Width

Classification	Lane Width (m) Design Domain
two-way exclusive	2.5-3.5
two-way, shared with pedestrians	3.0-4.0
one-way, exclusive	1.5-2.0
one-way, shared with pedestrians	2.0-3.0
Note: A horizontal clearance of 600 mm is maintained between a bikeway and a lateral obstruction. Curbing, in excess of 150 mm in height, is regarded as a lateral obstruction.	

Source: Geometric Design Guide for Canadian Roads (1999)

Examples of Standards for Overpasses and Underpasses

Pedestrian/Cycling Overpasses benefit from natural lighting, but are very costly to construct.

> A bicycle overpass should allow a clearance of 5.3 m above roadway or 7. 0 m above a railway, while a tunnel requires only 3.0 m clearance Vélo Québec (2003). It should be 4.0 or more metres wide when there is significant pedestrian traffic. To make it possible for cyclists to access the overpass with minimal effort, grades are limited to 6%. To maintain this value a 6 m rise (equivalent to a clearance of 5 m above a roadway and a structure 1 m thick), would require a 100 m ramp. Ramps can be straight, curved or spiral in shape. Spiral or U-shaped ramps take up less space and force cyclist to slow down when descending. When there is too little space to build a ramp, a turning stairway with landings and ramps along the side of the stairs is used to facilitate bicycle Vélo Québec, 2003).

Although the ramps along the side of stairs are beneficial for cyclists, they do nothing to help other small wheel users, such as wheelchairs, in-line skaters, strollers or walkers.

Pedestrian/ Cycling Underpasses are preferable due to their lower cost and protection from the elements in Canadian weather.

> The grade on approach should not exceed 6%. The tunnel width will depend on several factors: the tunnel shape (rectangular, elliptical, arched, etc.), design speed, and the presence of pedestrians or in-line skaters. The recommended width is 5.0 m or greater: 3.0 m for the bike path itself and 1.0 m clearance on either side. Tunnels should be at least 3.5 m because of the walls, and 4.5 m when pedestrians will also use the tunnel and a height of 2.75 m minimum. Arched or elliptical shapes are preferable in order to maximize natural light. Artificial lighting is usually required at the centre of the tunnel to ensure visibility (Vélo Québec, 2003).

Example of Standards for Staircase Ramps

The *Go For Green Community Cycling Manual* (2004) recommends that each ramp should be at least 15 cm wide and that the ramp be concave, so that it will help guide the bicycle wheels on the ramp.

Example of Pavement Marking Standards

Drdul (2003) recommends that bicycle symbols be placed at regular intervals (every 200 m), as well as in advance of all intersections and major driveways. Vélo Québec (2003) emphasizes that

> The durability of the markings depends on the quality of materials used and winter conditions. The most commonly used marking materials cannot resist snow removal or abrasives. Their lifespan is therefore less than a year.

A more durable product is more costly, but makes it possible to keep the markings year round. Vélo Québec also states that dual-component products offer a substantially longer useful life reaching up to six years in Canada's climate, but they can cost three to 20 times more than alkyd paint.

An illustration of a Bike lane symbol is provided in Figure J-1. This example is taken from the City of Chicago's *Bike Lane Design Guide* (2002). They based their choice of bike lane symbol on the design used in Toronto, because it is simple and clearly recognizable to both motorists and cyclists.

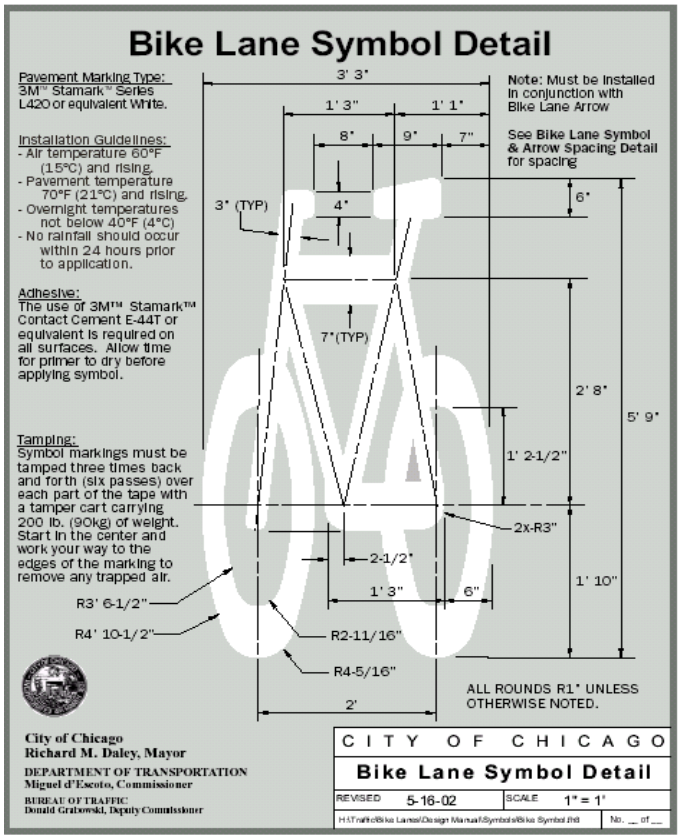


Figure J-1: Sample Design Standard for Pavement Markings
Source: City of Chicago

Examples of Signage Standards

It is important that bikeway signage be consistent with regular roadway signage (Vélo Québec, 2003; CIP, 2004). In Canada, the *Bikeway Traffic Control Guidelines for Canada* (TAC, 1998) is a recommended source for bikeway signage. Consistent signage allows cyclists to follow the rules of the road, no matter where they may chose to cycle.

Other considerations for signage include the frequency and lateral placement of signs. The Go for Green Community Cycling Manual provides some guidelines (see Figures J-2, J-3 & j-4). An example of what might be used is illustrated in The City of Langley Transportation Master Plan (2004):

> **Frequency**
> Although it is important not to clutter a transportation corridor with signs, signage must appear frequently enough to provide a clear message to cyclists. In the cases where regulatory or warning signs are going unnoticed, additional signs at different locations may be required. For guide signs, such as the Bicycle Route Marker Sign (IB-23), signs should be placed at intervals frequent enough to keep cyclists aware of the changes in route direction and to remind motorists of the presence of cyclists on the road. Bicycle route signage should appear along a route at least every 100-200 metres, depending on specific circumstances. For example, an urban street with commercial uses and

numerous driveways would necessitate a more frequent use of route signage than every 100 m. However, a rural cross section roadway with few driveways would only require a route sign every 200 m. These intervals do not include signage placed in advance of and after intersections. It is important to note that signage can be used with bicycle stencils to enhance the awareness of a bicycle route at the same location. However, in most cases, the two methods can be used separately, thereby making more efficient use of resources.

Lateral Placement

Signs should be placed near the edge of the nearest traffic lane, with the near sign edge no less than 2.0 m, but no more than 4.5 m, away from the nearest traffic lane. With multi-use pathways, the minimum distance can be reduced to 1.0 m. (The City of Langley, 2004)

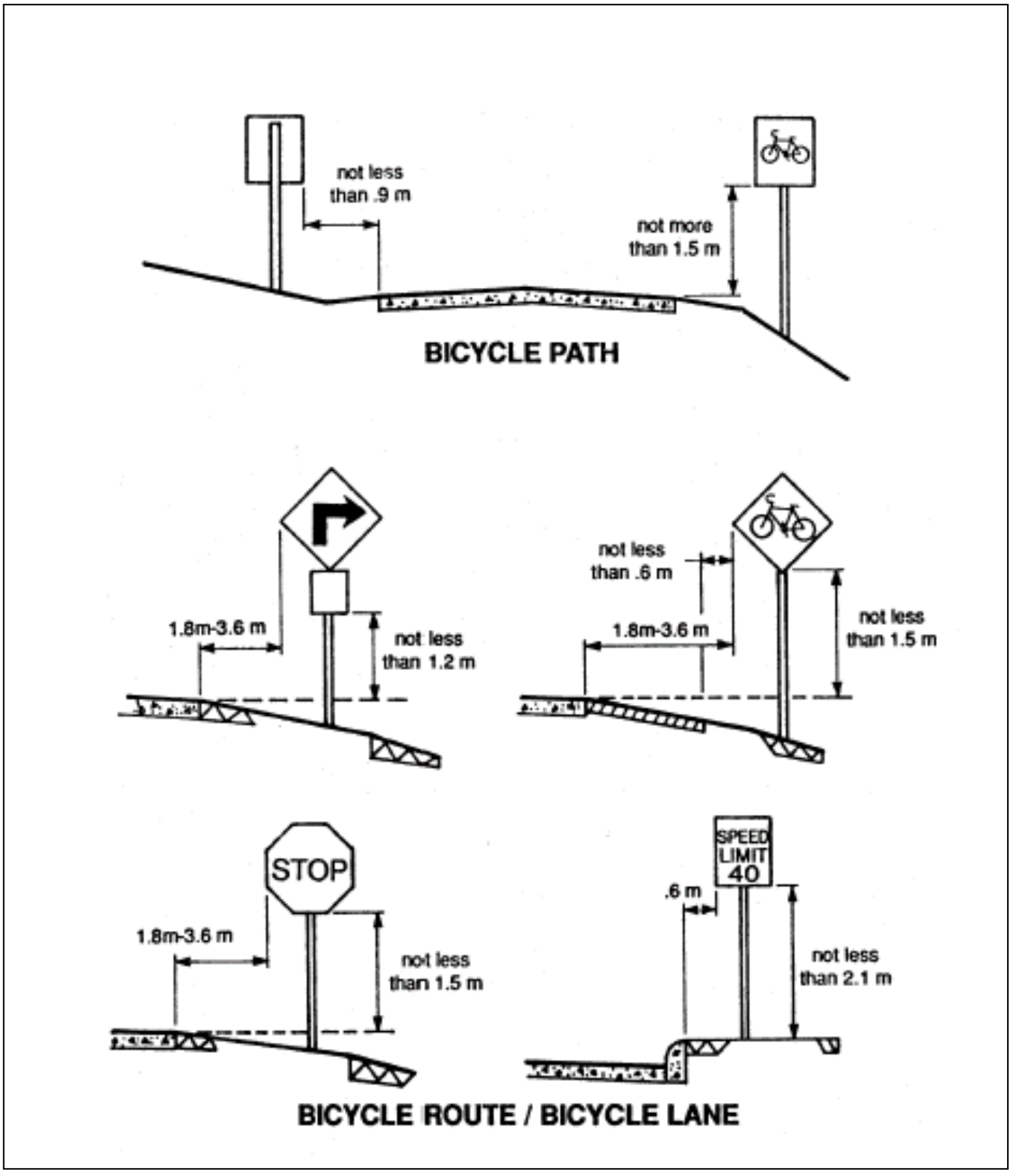


Figure J-2: Bikeway Signing- Bicycle Route/Lane (Source: Go for Green Community Planning Manual, 2004)

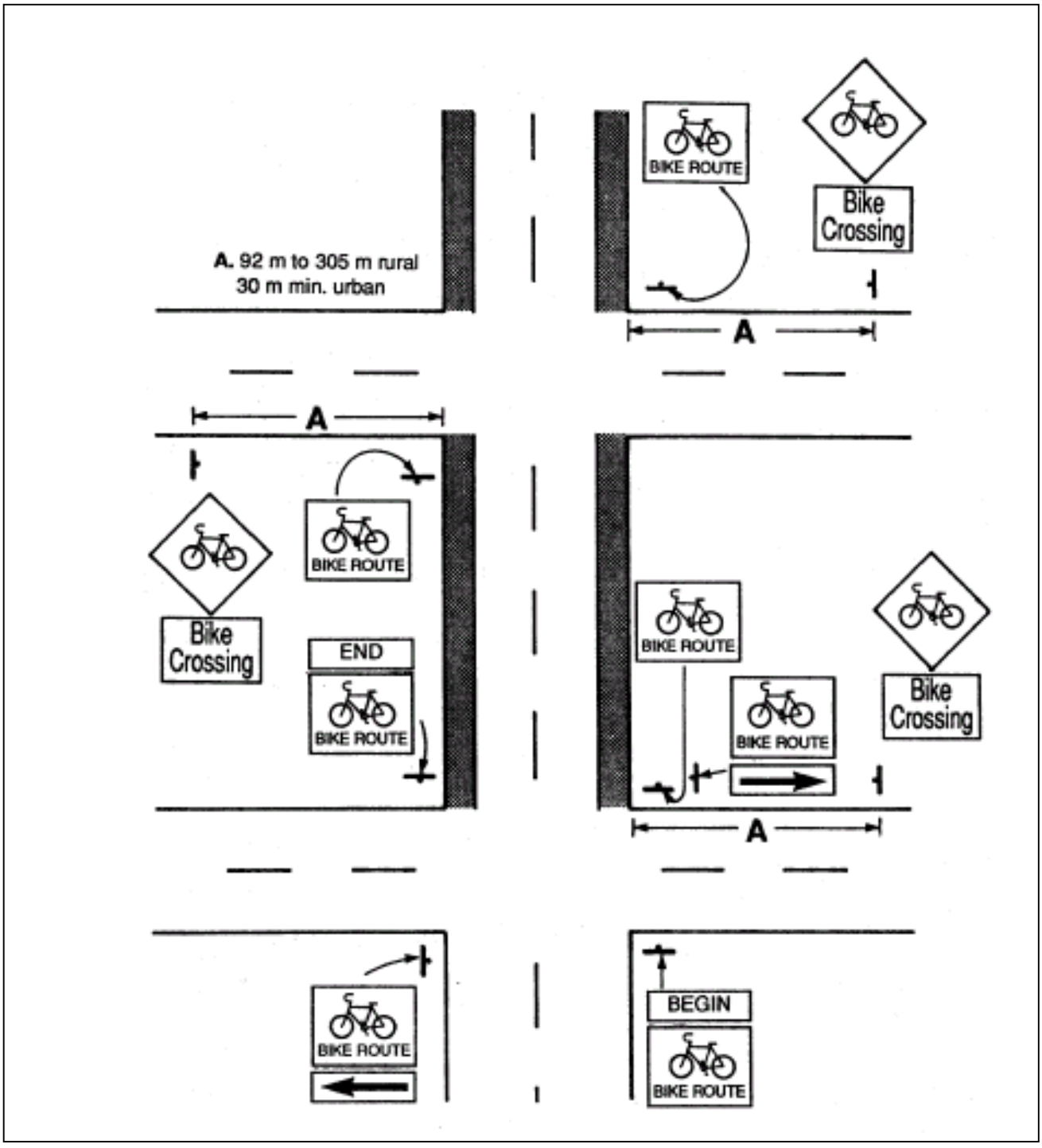
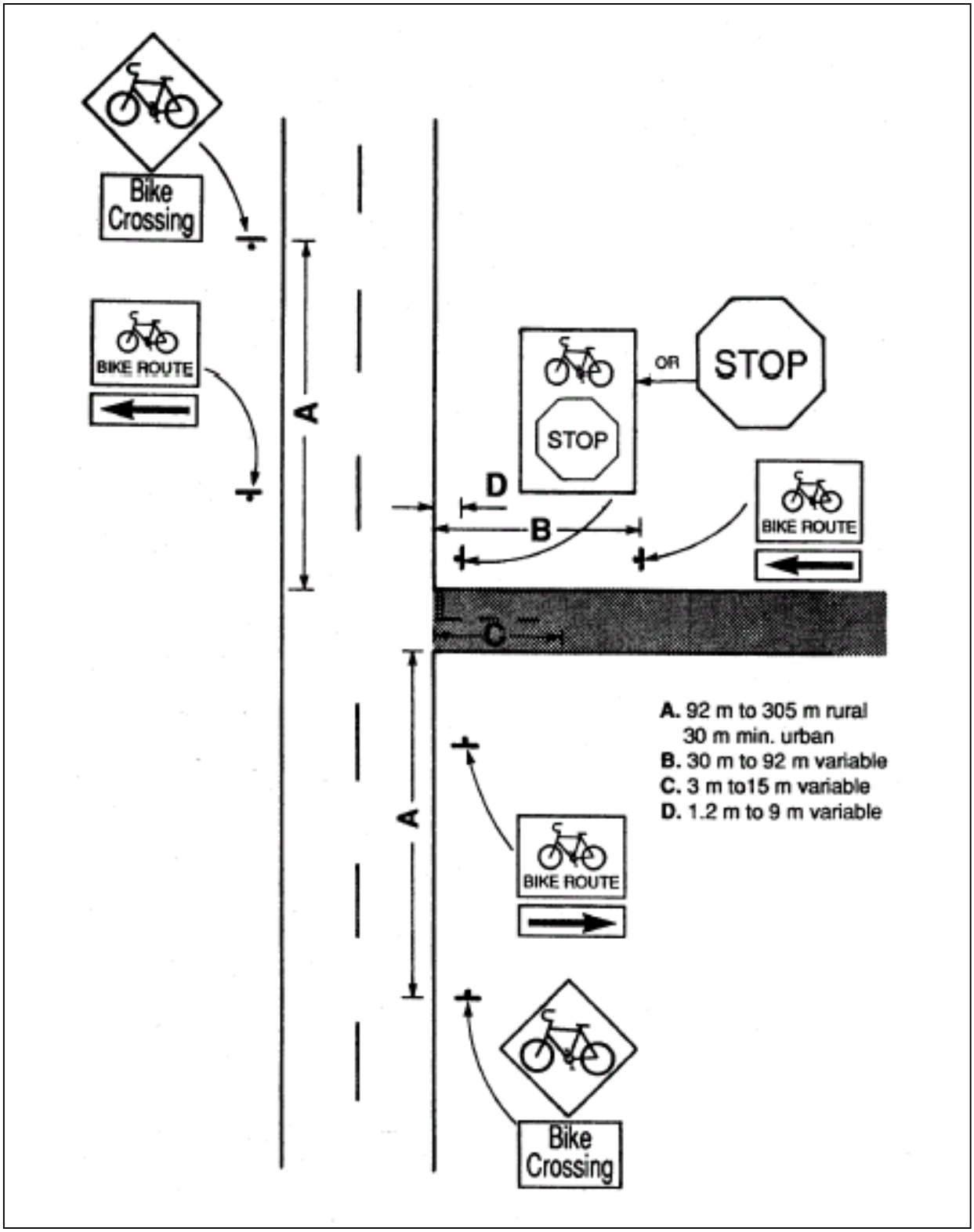


Figure J-3 Bikeway Signing- Bicycle Route/Lane (Source: Go for Green Community Planning Manual, 2004)

Figure J-4 Bikeway Signing- Separate Bicycle Path (Source: Go for Green Community Planning Manual,



2004)

Principles for Pedestrian Facility Design

The following design principles represent a set of ideals, which should be incorporated, to some degree, into every pedestrian improvement, as outlined by the City of Portland in the *Portland Pedestrian Design Guide*. They are ordered roughly in terms of relative importance.

1. The pedestrian environment should be safe.
Sidewalks, pathways and crossings should be designed and built to be free of hazards and to minimize conflicts with external factors such as noise, vehicular traffic and protruding architectural elements.
2. The pedestrian network should be accessible to all.
Sidewalks, pathways and crosswalks should ensure the mobility of all users by accommodating the needs of people regardless of age or ability.
3. The pedestrian network should connect to places people want to go.
The pedestrian network should provide a continuous direct routes and convenient connections between destinations, including homes, schools, shopping areas, public services, recreational opportunities and transit.
4. The pedestrian environment should be easy to use.
Sidewalks, pathways and crossings should be designed so people can easily find a direct route to a destination and delays are minimized.
5. The pedestrian environment should provide good places.
Good design should enhance the look and feel of the pedestrian environment. The pedestrian environment includes open spaces such as plazas, courtyards, and squares, as well as the building facades that give shape to the space of the street. Amenities such as street furniture, banners, art, plantings and special paving, along with historical elements and cultural references, should promote a sense of place.
6. The pedestrian environment should be used for many things.
The pedestrian environment should be a place where public activities are encouraged. Commercial activities such as dining, vending and advertising may be permitted when they do not interfere with safety and accessibility.
7. Pedestrian s improvements should be economical.
Pedestrian improvements should be designed to achieve the maximum benefit for their cost, including initial cost and maintenance cost as well as reduced reliance on more expensive modes of transportation. Where possible, improvements in the right-of-way should stimulate, reinforce and connect with adjacent private improvements.

Source: Portland Pedestrian Design Guide (City of Portland, 1998)