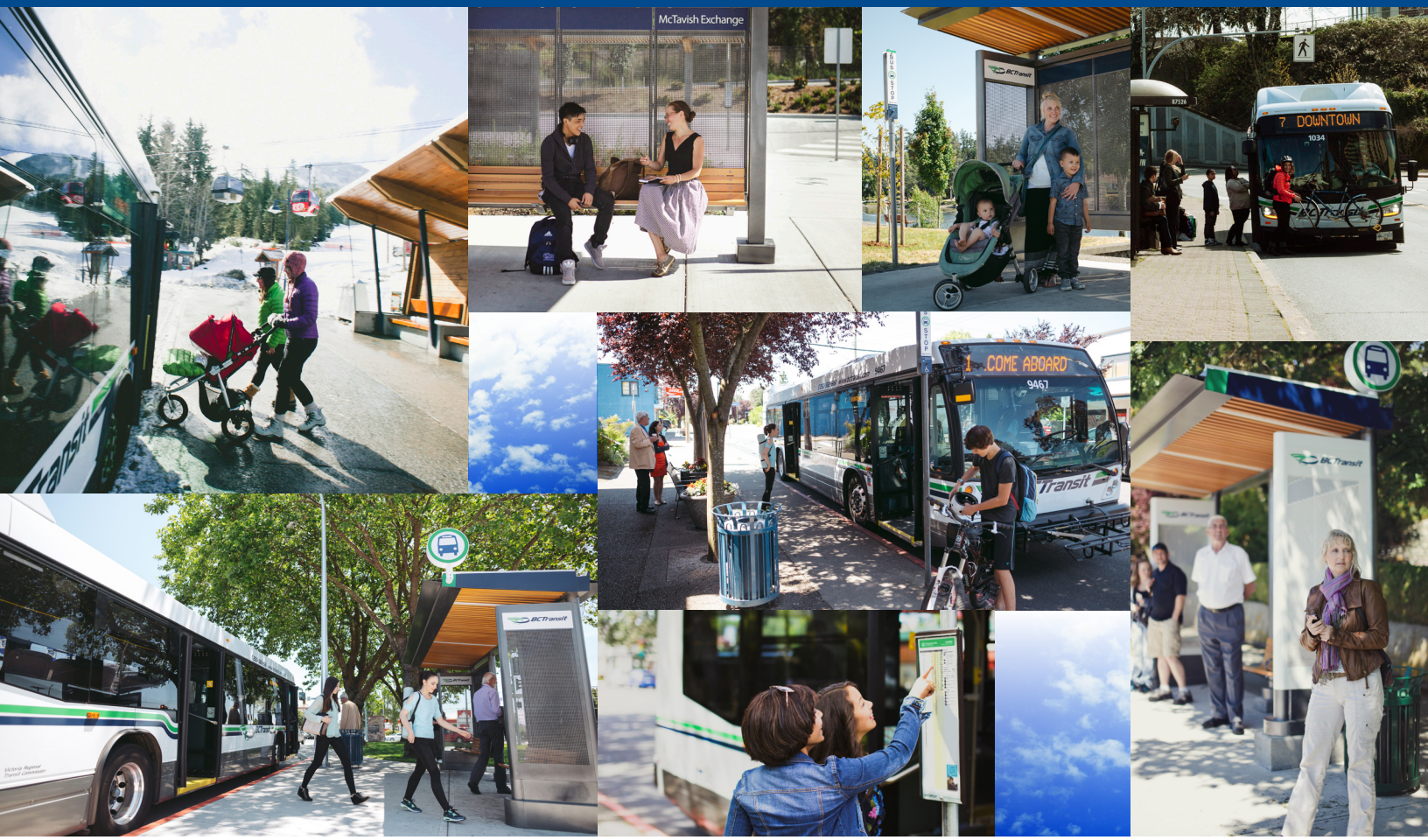




MARCH 2018

# BC Transit Infrastructure Design Summary



The purpose of this document is to provide a quick reference summary to the more comprehensive BC Transit Infrastructure Design Guidelines for the planning and design of transit infrastructure. The document provides general information on transit infrastructure such as bus stops and bus lanes. For more detailed information please use the BC Transit Infrastructure Design Guidelines at <https://bctransit.com/servlet/documents/1403640670226>.

## 1. Role

Bus stops are where transit customers and transit vehicles meet and interact. They not only frame the transit user experience, but form the most visible fixed indicator of transit service in the community. Stops are also tools to attract riders, improve operational efficiency, build the brand identity of a system and foster local economic development. As such, it is important to provide a bus stop that is attractive and allows customers to easily board and alight the transit vehicle.

### 1.1 General Components

Safety is a core value of BC Transit and is key whenever designing a bus stop for our customers or vehicles. Specific attributes of the stop locations are necessary in providing a safe and secure location for customers and allow for our transit vehicle dimensions.

- Barrier-free bus stops where customers can easily and safely access pathways, crosswalks, sidewalks with curb ramps for accessibility
- A safe waiting environment with adequate lighting
- Landing pad for customers to board and alight the vehicle
- Shelter and bench to provide a comfortable waiting environment
- Bus stops should be located after a crosswalks or an intersection
- Sight distances should be achieved for motorists approaching the bus stop as well as transit customers crossing the road from the bus stop
- An appropriate bus stop sign pole
- A red painted curb to identify the bus stop as a no stopping area for other motorists

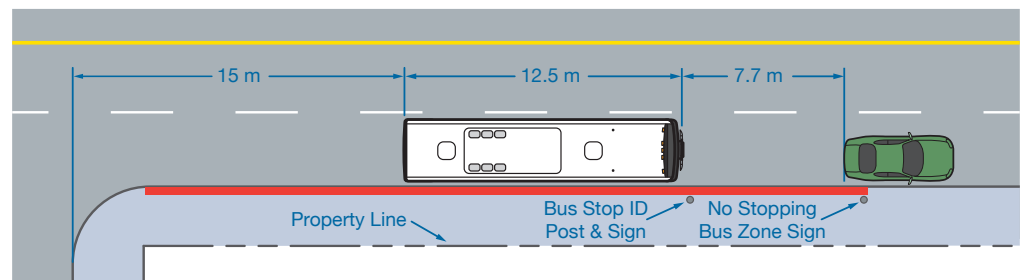
## 2. Location

### 2.1 Bus Stop Locations

The location of a bus stop is dependent on the physical landscape and orientation of the intersection.

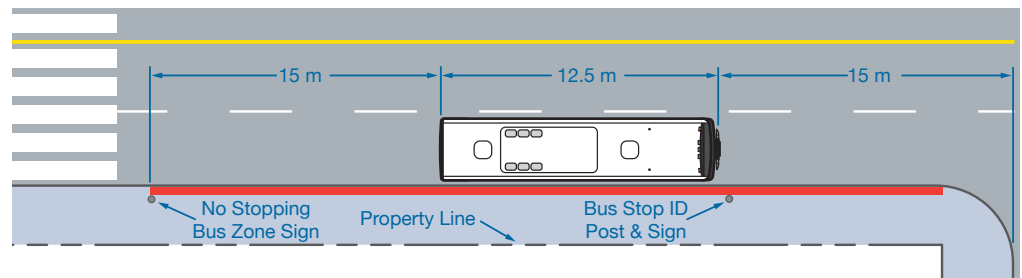
**2.1.a. Far-Side:** BC Transit strongly recommends bus stops be located after an intersection, driveway or crosswalk (far-side). This location allows for transit vehicles to move through intersections more efficiently and for other road users to safely pass a bus while it is stopped.

© Figure 1: Far-Side Bus Stop Configuration



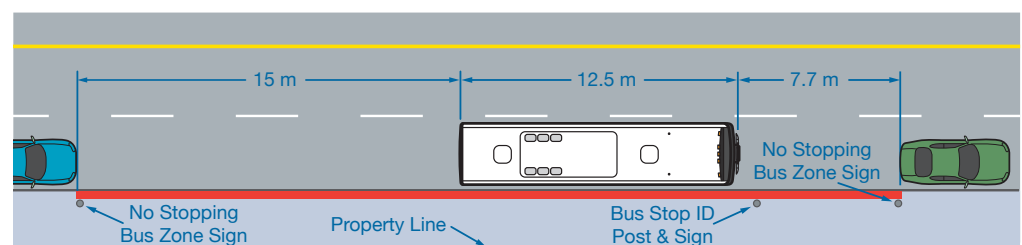
**2.1.b. Near-Side:** If locating at the far-side is not possible, or to aid with specific transfers, a near-side stop is located before an intersection.

© Figure 2: Near-Side Bus Stop Configuration



**2.1.c. Mid-block:** This stop is considered when physical or environmental conditions prohibit locating a stop near-side or far-side of the intersection, or on blocks that are relatively long. In this case, the stop should be paired with a mid-block crosswalk that should be located behind the bus stop zone so that pedestrians do not walk in front of the transit vehicle.

© Figure 3: Mid-Block Bus Stop Configurations



## 2.2 Stop Intervals

Based on the type of transit service on a route, there are different spacing intervals in which bus stops should be placed.

**Table 1: Service Type and Appropriate Stop Intervals**

Service	Stop Interval	Description
<b>Rapid Transit</b>	800 m to 2 km apart	Limited stops at key locations
<b>Frequent Transit</b>	300 m to 500 m apart	Frequent stops along a corridor
<b>Local Transit</b>	250 m to 300 m apart	Frequent stops along a corridor
<b>Targeted Transit</b>	–	Varies depending on service
<b>Custom Transit</b>	–	Not applicable

## 2.3 Bus Stop Sighting Distance

Placement of bus stops should take into account the necessary sight line distances for the customers and transit operator safety. Proper distance allows the transit operator to react to any unanticipated hazards and adjust accordingly upon arrival at the stop.

**Table 2: Minimum Stopping Distance for Transit Buses in Service**

Initial Operating Speed (km/h)	Perception and Reaction Time (sec)	Perception and Reaction Distance (m)	Brake Distance (m)	Minimum Stopping Sight Distance (m)
40	2.5	28	56	84
50	2.5	35	88	123
60	2.5	42	126	168
70	2.5	49	172	221
80	2.5	56	225	281
90	2.5	63	284	347

## 3. Layout

A minimum of 25 m curb must be painted red to indicate a bus stop. See figures below for more details based on bus stop configuration and layout.

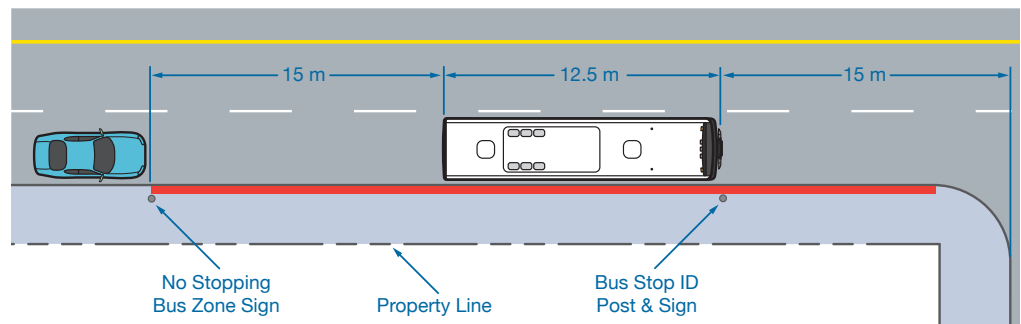
### 3.1 Configurations

There are different bus stop configurations that should be considered based on roadway and intersection layout

#### 3.1.a. At curb: bus stop located at the curb travel lane of a roadway

- i. There is limited room to provide a bus bulge or bay

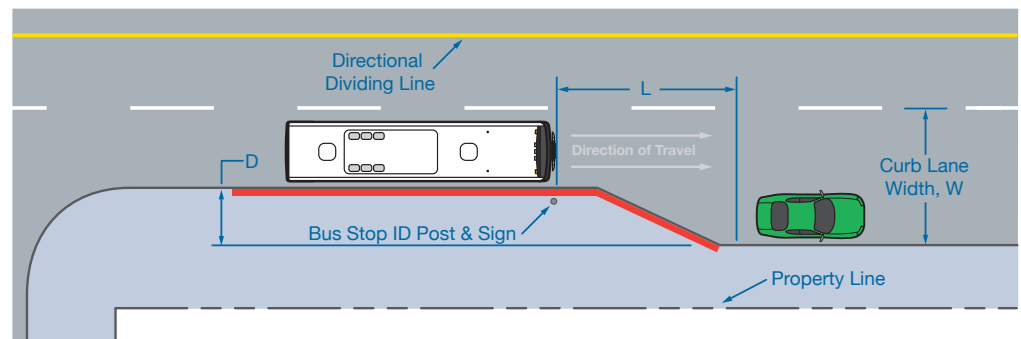
© Figure 4: Bus stop at curb [BCT IDG, pg. 63]



#### 3.1.b. Bus bulge: bus stop located at a widened piece of sidewalk which protrudes into the parking lane on a road.

- i. Desirable to provide high visibility priority for transit along a corridor
- ii. On-street parking is provided along a corridor
- iii. Provides additional room for street furniture

© Figure 5: Bus bulge (See Table 3)



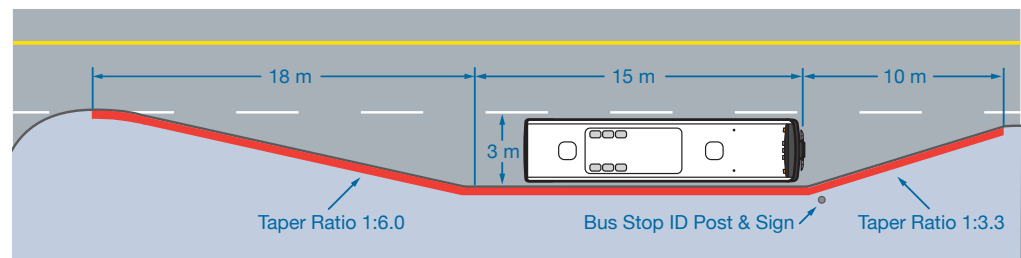
☐ **Table 3: Bus Bulge Configurations**

Width of Curb Lane Width (m)	Distance Between Bus ID and End of Parked Car L (m)	Depth of Bus Bulge D (m)
<b>5.5</b>	3.0	1.9
	7.0	2.3
<b>5.6</b>	5.0	2.3
	7.0	1.9
<b>5.7</b>	5.0	1.0
	7.0	1.9

**3.1.c. Bus bay:** bus stop located at a short pull-over zone, adjacent to the main travel lanes, where buses can stop and pick up customers without interfering with the regular flow of traffic. This configuration is used when:

- i. Roadway speed greater than 60 km/h
- ii. Roadway with high traffic volumes
- iii. Roadway has a single travel lane in each direction where passing sight distance is not available for vehicles approaching a stopped bus

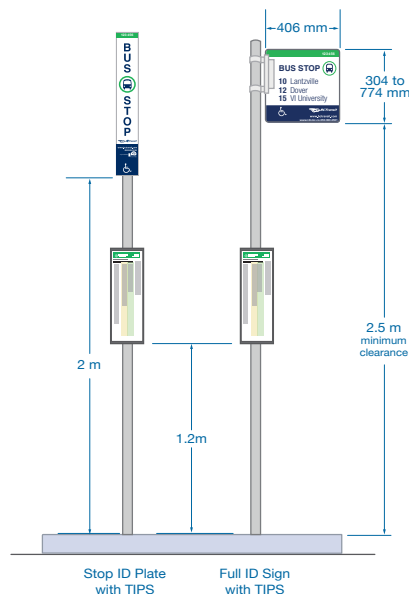
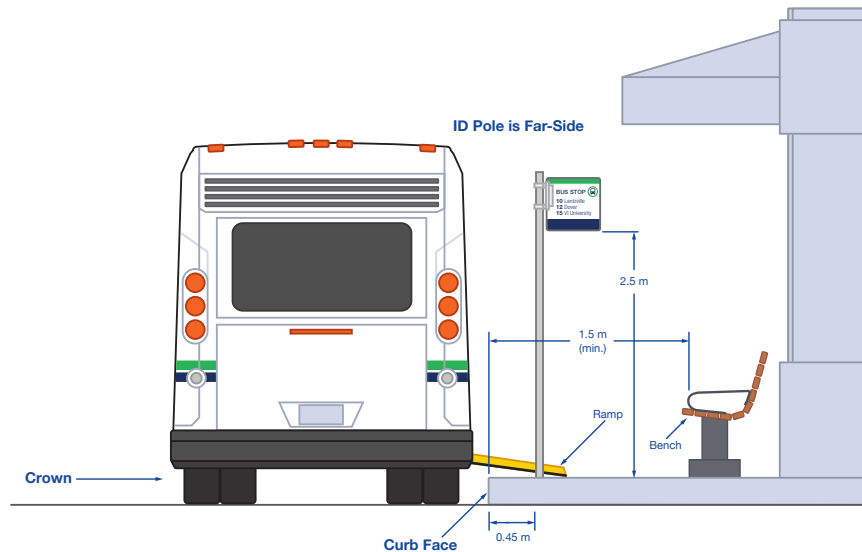
☉ **Figure 6: Bus stop (with bus bay)**



### 3.2 Bus Stop ID Pole

- Bus stop ID pole should be placed at 0.45 m from the curb and must be 2.5 m of height from the ground level to the bottom of the sign (See Figure 7)
- When buses stop, the front of the bus must be parallel to the bus stop ID pole, thus bus stop ID poles must be located top left with respect to a landing pad (See Figure 8)
- Bus stop flag sign must be mounted on the left of pole, perpendicular to the road. Strip sign to be mounted in the centre of the pole, 2.5 m from the ground (See Figure 7)
- In instances where the sidewalk is narrow, the bus stop ID pole can be placed at the back of the sidewalk. The flag sign should still be visible from both directions and not obstructed by the bus shelter or utility poles.

© Figure 7: Bus Stop ID Pole



### 3.3 Amenities

There are a number of different amenities that can be provided at a bus stop depending on the type of service that serves the stop. These amenities are important to the transit user experience and can enhance the overall transit experience. The table below describes the type of amenities that are appropriate for the different types of service levels (See Figure 8).

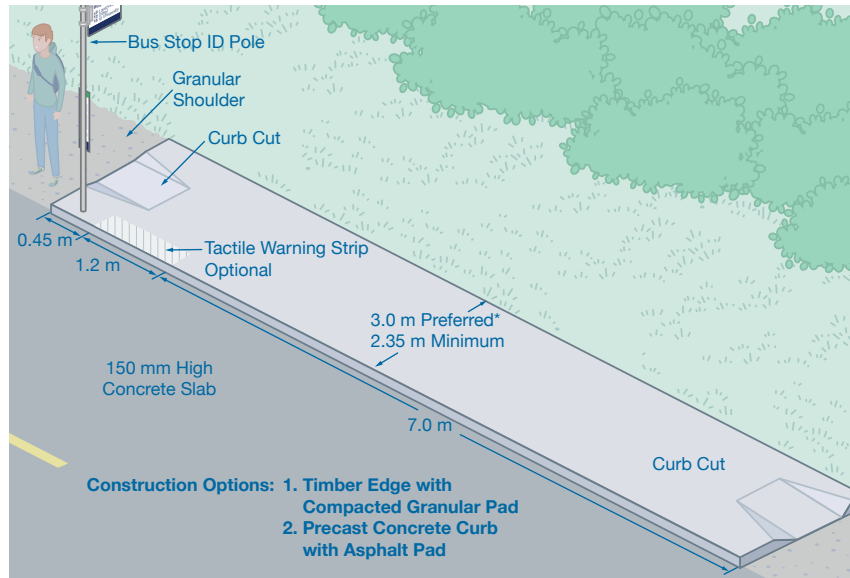
**Table 4: Transit Service Type and Associated Stop Amenities**

Service	Amenities
<b>Rapid Transit &amp; Transit Exchanges</b>	<ul style="list-style-type: none"> <li>• Premium transit shelters</li> <li>• An elevated boarding platform</li> <li>• Off-board fare payment</li> <li>• Real time schedule information</li> <li>• Bike storage</li> <li>• Customer wayfinding information</li> <li>• Universally accessible</li> <li>• May include Park &amp; Ride facilities</li> </ul>
<b>Frequent Transit</b>	<ul style="list-style-type: none"> <li>• Transit shelters</li> <li>• Bike storage</li> <li>• Quality customer information (such as transit schedule and map information)</li> <li>• Universally accessible</li> <li>• May include Park &amp; Ride facilities</li> </ul>
<b>Local Transit</b>	<ul style="list-style-type: none"> <li>• Transit Shelter</li> <li>• Universally accessible</li> <li>• Bench</li> </ul>
<b>Targeted Transit</b>	<ul style="list-style-type: none"> <li>• Transit Shelter</li> <li>• Universally accessible</li> <li>• Bench</li> </ul>
<b>Custom Transit</b>	<ul style="list-style-type: none"> <li>• Not required</li> </ul>

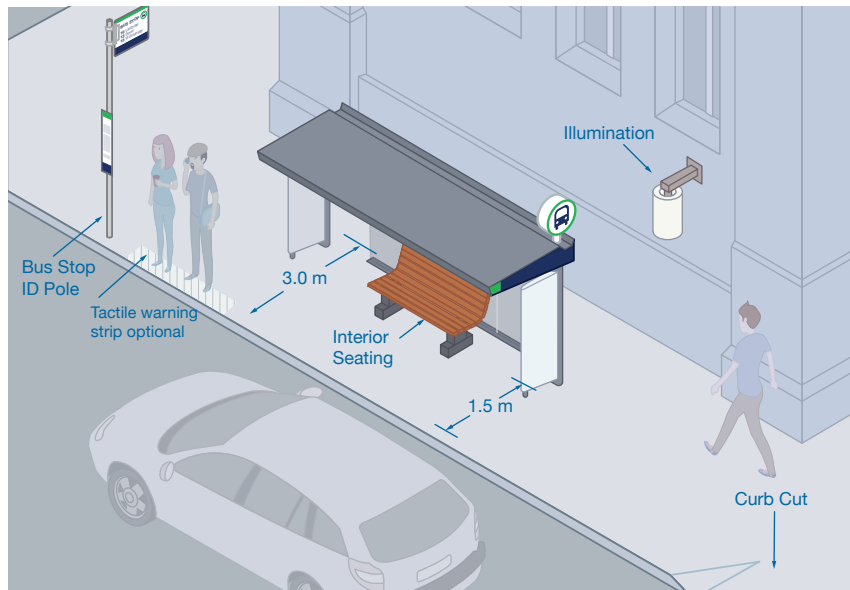


© Figure 8: BC Transit Design Guidelines for Accessible Bus Stops

**Rural**



**Urban**



\* 3.0 m width is preferred when there is street furniture and a bus shelter.

### 3.4 Accessibility

It is important to consider the collective needs of the entire community, including persons with any form of disability or special need.

#### 3.4.1 Minimum Standard

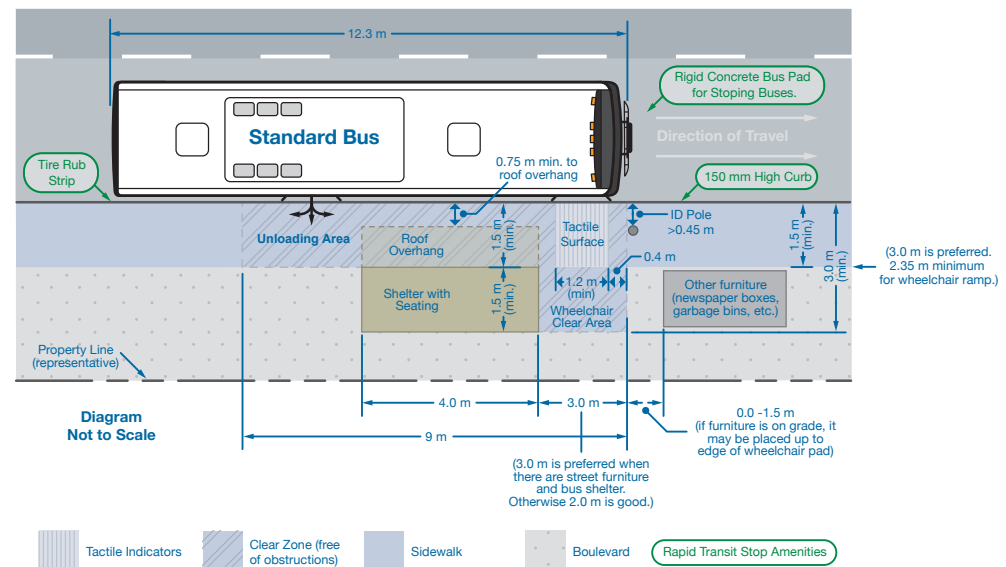
- Bus stop ID pole/sign that indicates an accessible stop
- A solid and level wheelchair landing pad and a curb letdown in the vicinity of the bus stop should be provided, regardless of the land use
- Sufficient street lighting, near-by street light, and/or shelter built-in light
- Customer landing pad

#### 3.4.2 Further Improvements

- Tactile warning strip
- Wayfinding signage – tactile and visual media that includes bus schedule and points of interest within walking distance
- Tactile information panels – Braille lettering for visually impaired to call BC Transit and determine schedule

### 3.5 Typical Bus Stop and Furnishing Layout

© Figure 9: Bus Stop with Amenities Layout



\* 3.0 m width is preferred when there are street furniture and bus shelter.

- The landing pad should be 9 m to cover the front and rear door. The single-decker bus door spacing (front door centre to rear door centre) of a Nova bus is 5.8 m and a New Flyer is 6.3 m.

#### 3.5.1 Special Considerations for Rapid Transit

- Tactile warning strip
- Tire Rub Strip
- Live bus schedule
- Level door boarding is not advised due to mixed fleet types

- Bus stop platform and access facilities to service the expected number of riders without overcrowding or spillback to accommodate future growth
- Rigid pavement pad for stopping buses
- Orange bus lollipop sign indicating rapid transit
- Highway taper designed for allocated speed limit

### 3.6 Special Considerations for Double-Deck Bus

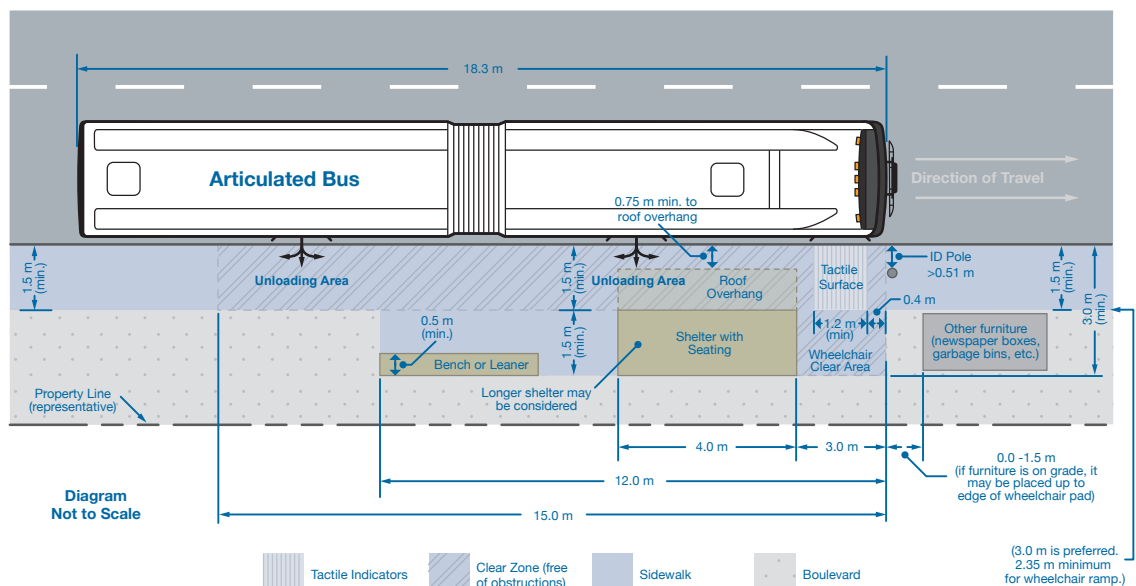
- Overhead clearance should be provided with a vertical clearance greater than 4.8 m where double-deck buses are expected to operate.
- In some instances, the camber of the road causes a double decker to tilt sideways while at bus stop, 0.25 m right side and 4.80 m vertical clearance must be provided to prevent conflict with tall objects such as utility poles and untrimmed trees.
- The landing pad should be 9 m to cover the front and rear door. It must be noted that double-deck buses have a reduced length between the front doors and rear doors, when compared to a conventional transit bus. The double decker door spacing (front-door center to rear-door center) is 4.3 m.

### 3.7 Special Considerations for Articulated Buses

Articulated buses are not currently operated by BC Transit, but as ridership grows and service improvements are made, it is important to consider the future use of a bus stop and the range of different vehicles that might service the location.

- Distance between the sign pole and curb face must be no less than 0.51 m
- Landing pad to cover all three doors

© Figure 10: Sidewalk Adjacent to Curb with Amenities Behind Sidewalk (Articulated Bus)



\* 3.0 m width is preferred when there are street furniture and bus shelter.

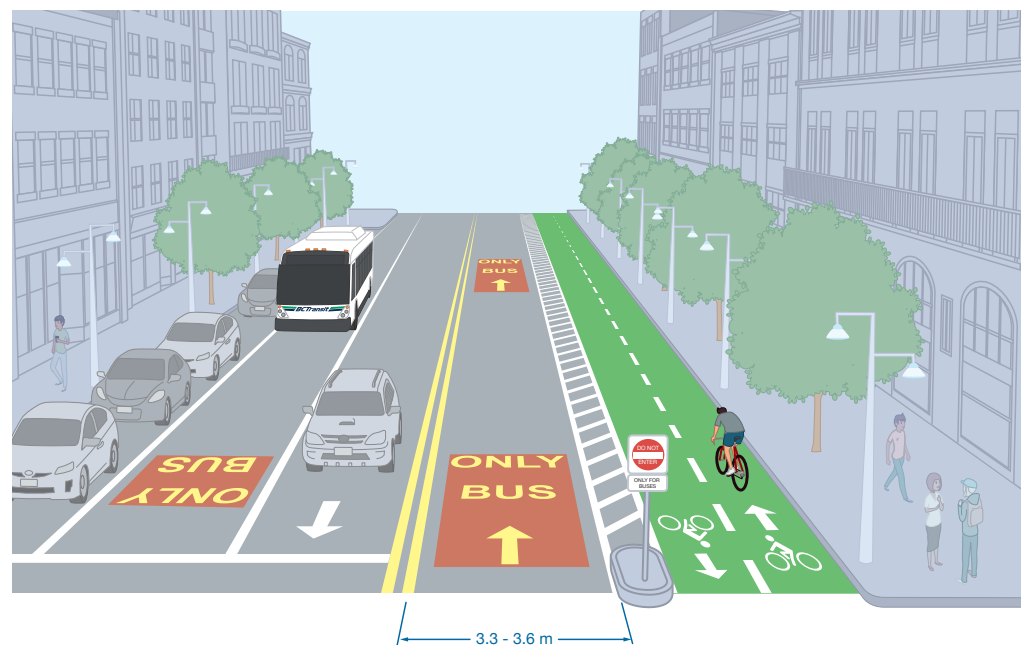
## 4. Lane Integrations

### 4.1 Bus Lane Width

The widest bus in the BC Transit fleet, the Nova Bus, has a total width of 3.2 m. Roadways should be designed to accommodate the widest bus in the fleet.

- The desired lane width is 3.5 m, minimum is 3.3 m
- The desired lane width for a shared travel/parking lane ranges from 5.8 to 6.2 m
- Provide a 6.5 m width where an on-street bus layover is provided to maintain a comfortable distance between the layover bus and a bus passing by
- A desired minimum shared lane width of 4.5 m (bike with bus or other high occupancy vehicle in the same lane)

© Figure 11: Curbside Transit Lane Dimension



### 4.2 Bus Lanes

- Designate lanes using a solid white line and a stenciled "BUS ONLY" marking at intersections on every 200 m
- Signage must designate the transit lane as restricted
- Place signs either on the curbside or overhead

### 4.3 Special Consideration for Integration with Bike Lanes

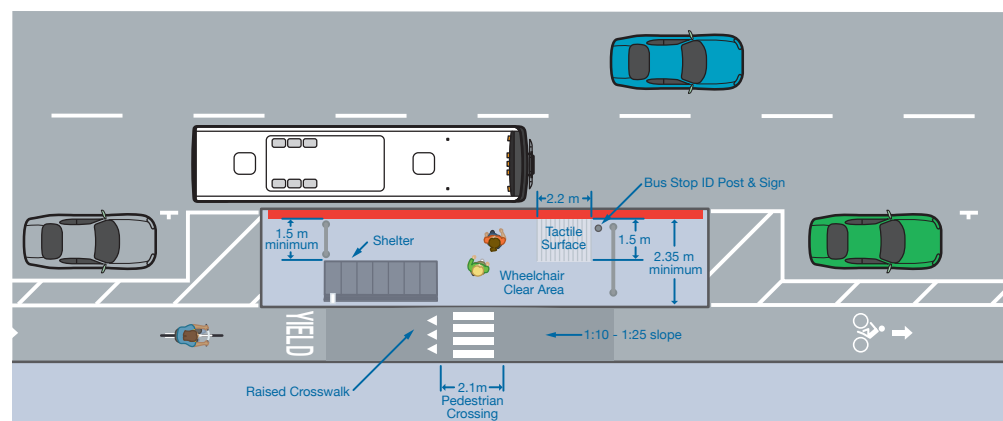
Source: US Federal Highway Administration – Separated Bike Lane Planning and Design Guide

As the desire for complete streets and integration of cycling and transit connectivity increases, there are considerations that need to be made for bus stops located alongside cycling corridors.

The key design considerations for the design of bus stops where a bike lane is present are as follows:

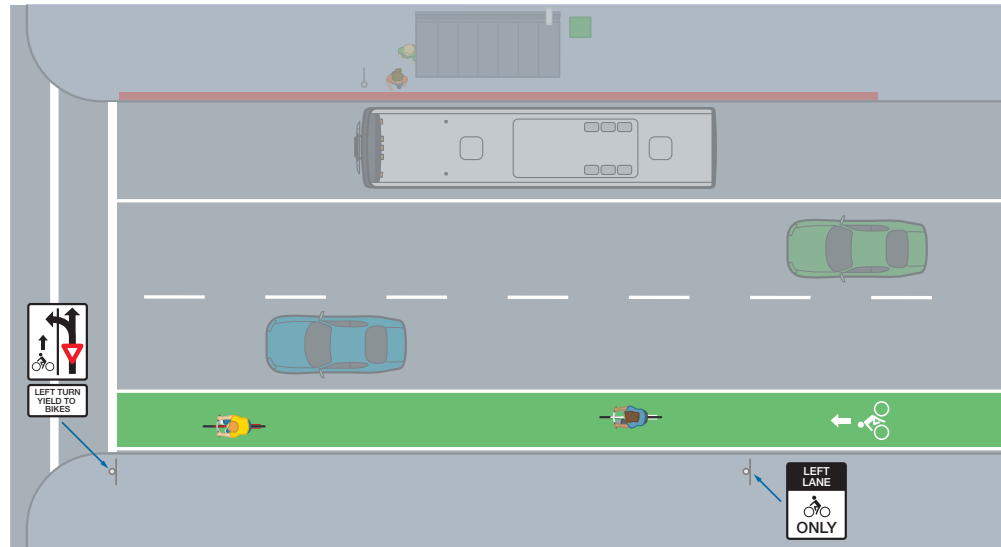
1. Right Side of the Street: This design should be used at locations where buses stop in a travel lane. In this design layout, no sidewalk space is removed and more on-street parking is available. Separating bicycles from the vehicle travel lane also eliminates “leapfrogging” when buses and cyclists are constantly passing each other at each stop. This configuration improves cyclist comfort and bus operating speeds

© Figure 12: Bus stop with bike lane integration



2. Left Side of the Street: BC Transit recommends locating bike lanes on the left side of a one-way street. This location provides fewer conflicts between cyclists and road vehicles.

© **Figure 13: Left side bike lane**



## Glossary

<b>Articulated Bus</b>	A single-deck bus design, that comprises of two rigid sections linked by a pivoting joint to allow higher customer capacity, while still allowing the bus to maneuver adequately on the roads of its service route
<b>At-Curb</b>	Bus stop on the curb travel lane of a roadway
<b>Bus Bay</b>	A short pull-over zone, adjacent to the main travel lanes, where buses can stop and pick up customers without interfering with the regular flow of traffic
<b>Bus Bulge</b>	A widened piece of sidewalk which protrudes into the parking lane on a road
<b>Bus stop sighting distance</b>	Distance that allows for safe stopping to board and alight customers
<b>Double Decker</b>	Low floor two story or decks bus with high customer capacity
<b>Far-Side</b>	Bus stop after an intersection
<b>Mid-block</b>	Bus stop middle of a block
<b>Near-Side</b>	Bus stop before an intersection
<b>Taper Ratio</b>	Is the section of a curb extension where the road width transitions from a wider width to a narrower width

## Reference

For further details, refer to

- BCT IDG: BC Transit. Infrastructure Design Guidelines. November 2010. [PDF]  
<https://bctransit.com/servlet/documents/1403640670226>
- TransLink UABSDG: TransLink. Universally Accessible Bus Stop Design Guidelines. June 2007. [PDF]  
[https://www.translink.ca/~media/Documents/riders\\_guide/access\\_transit/Universally%20Accessible%20Bus%20Stop%20Design%20Guidelines.ashx](https://www.translink.ca/~media/Documents/riders_guide/access_transit/Universally%20Accessible%20Bus%20Stop%20Design%20Guidelines.ashx)
- NACTO TSDG: National Association of City Transportation Officials. Transit Street Design Guide. April 2016. [Hardcover].
- NACTO UBDG: National Association of City Transportation Officials. Urban Bikeway Design Guide. April 2011. [PDF]  
[http://www.ocpcrpa.org/docs/projects/bikeped/NACTO\\_Urban\\_Bikeway\\_Design\\_Guide.pdf](http://www.ocpcrpa.org/docs/projects/bikeped/NACTO_Urban_Bikeway_Design_Guide.pdf)