BCDCOG

Transit and Bus Stop Design Guidelines

October 2021

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BERKELEY-CHARLESTON-DORCHESTER
COUNCIL OF GOVERNMENTS

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2 BUS STOP SPACING AND PLACEMENT

This chapter explains where bus stops should go, from the corridor to the site: How far apart should they be from one-another? Where, relative to the intersection? And what other factors are important?

The information in this chapter helps plan optimal bus stop locations for fixed-route service. It also ensures that enough space is allocated for bus stops at an early design stage. This is particularly relevant for planning entire corridors or multiple stops surrounding new developments. However, it can also be used for a single bus stop.

This chapter includes the following two sections:

- **Bus Stop Spacing** discusses the recommended distance between bus stops, as well as considerations for stop pairing and high transfer activity stops.
- **Bus Stop Placement** discusses factors to be considered in selecting new bus stop locations along a route.

BUS STOP SPACING

Key Takeaways

- Aim for stop spacing of 1,300 feet for local fixed routes.
- When possible, pair inbound and outbound bus stops, so that riders can get on and off the bus on opposite sides of the street, in same general area.
- In places with lots of transfers between routes, place bus stops as close to one another as possible, to make transfers easier for riders.

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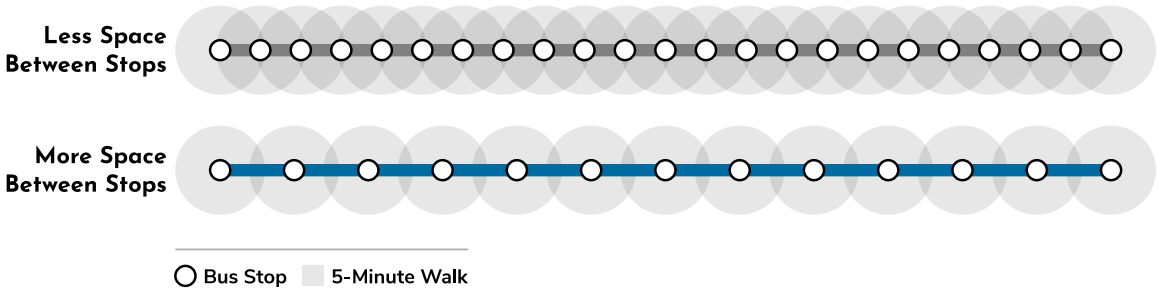
The distance between stops significantly impacts travel times. More closely spaced stops provide customers with shorter walk times, but they also increase travel times and are the major reason that transit is slower than automobile travel. Each additional stop requires the bus to decelerate, come to a complete stop, load and unload riders, and then accelerate and re-merge into traffic. Most customers want transit service that balances convenience and speed, and the number and location of stops is a key component of determining that balance.

Figure 2-1 Too Closely Spaced Bus Stops Slow Service without Significantly Increasing Access to Transit



Spacing Guidelines

The ideal spacing of bus stops is based on the density of population and employment around a stop. In areas where there are more people living and working, bus stops should be closer together. The BCDCOG Spacing Guidelines below recommend an average stop spacing of 1,300 feet for local fixed routes. For express routes, stops are only placed at the route termini and, if applicable, a central point in downtown Charleston (e.g. the Visitors' Center).

Figure 2-2 presents guidelines for the space between stops and stops per mile for CARTA's fixed route bus service. Guidelines for maximum stops per mile and minimum spacing between stops are included for areas where walking conditions are poor or

there are other significant operating considerations limiting placement (see also Chapter 7 – Operational Considerations)

Figure 2-2 Recommended and Maximum Stop Spacing for Local Fixed Routes

Bus Stop Spacing Standard	Local Fixed Routes
Recommended Stops per Mile	4-6
Recommended Spacing between Stops	1,300 feet
Maximum Stops per Mile	8
Minimum Spacing between Stops	660 feet

These guidelines do not apply to express routes, whose stops are only placed at the route termini and, if applicable, a central point in downtown (e.g., the Visitors' Center).

In dense or sparse areas or corridors, a variation to the standard is warranted. CARTA staff use professional judgement for spacing, especially with placing at large attractors and trip generators. They work to adjust spacing to accommodate accessing key destinations, which might result in stop spacing that falls below the minimum guidelines.

Stop Pairing

Whenever possible, bus stop locations should be paired, so that customers board and alight on opposite sides of the same street in the same vicinity when making a round trip. This allows the transit service to be more intuitive and maximizes convenience for the greatest number of users.

Stops with High Transfer Activity

At locations where transfer activity between routes is heavy, bus stops for the intersecting routes should be located as close to each other as possible in order to shorten travel for passengers transferring between routes.

BUS STOP PLACEMENT

Key Takeaways

- When possible, make bus stops accessible by a sidewalk in good condition, between the bus stop and the nearest intersection.
- Bus stop placement should be responsive to major activity generators and should have a direct, accessible path to them.
- When possible, place bus stops on the far side of intersections.

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In addition to spacing, existing conditions such as roadway type, sidewalk conditions and land use affect where new or moved bus stops are placed and how they are designed. Additional considerations that impact the safety, convenience, and accessibility of a stop, such as placement relative to street intersections must also be considered. The following is an overview of several factors that influence the placement of bus stops.

Environmental Context

The environmental context of an area impacts bus stop placement. Environmental factors, such as surrounding land use, street network, and the infrastructure conditions surrounding a bus stop are often important considerations for placement and design of bus stops.

Land Use and Activity Generators

Placing bus stops near activity centers, such as shopping areas, civic buildings, schools, medical centers, or multi-unit residential complexes attracts ridership by enhancing the convenience of transit service.

In areas where there are several activity centers in close proximity, such as a block with several popular shopping destinations, bus stop placement will depend more on bus stop spacing and other factors. However, for major activity generators (industrial areas, the airport, malls, hospitals, etc.), the stop should be located close to the entrance of the destination.

Street Network

The functional class designation of a bus stop's roadway indicates the general characteristics of a roadway including its intended purpose and typical roadway speed. It can impact both design and operation of bus service and stops. For example, wider streets (often a higher functional class) may allow for curb extensions (also called bulb-

outs) at bus stops, which create more space for amenities and reduce the pedestrian crossing distance. However, wider streets also typically have higher speeds, which increase the sight distance needed for bus operators and make it harder for pedestrians to cross the roadway. As such, adjacent roadway speed and width should be considered when siting and designing a bus stop.

Driveways

Driveways and other curb cuts near bus stops can pose safety hazards for boarding and alighting passengers and transit vehicles. There are six principles that guide the siting of bus stops in relation to driveways,[1] enumerated as follows and illustrated in Figure 2-3 and Figure 2-4.

1. Avoid restricting sight distances for exiting vehicles.
2. Avoid blocking a driveway that provides the only access to a property
3. Avoid unloading passengers into driveways.
4. Stop on the far side of a driveway if there is adequate sidewalk length close to the intersection.
5. Allow for safe sight distances for exiting vehicles.
6. Where there are two driveways in a constrained location near an intersection and the best stop location is on the far side of the second driveway, a transit vehicle may block the second driveway.

There may be locations where it is not possible to meet all six principles for driveway arrangements to create or preserve equal access to the transit stop. Safety and accessibility are the most important considerations when siting stops around driveways and curb cuts.

[1] These principles are adapted from MDOT MTA's Bus Stop Design Guide (2019).

Figure 2-3 Undesirable Driveway Arrangements

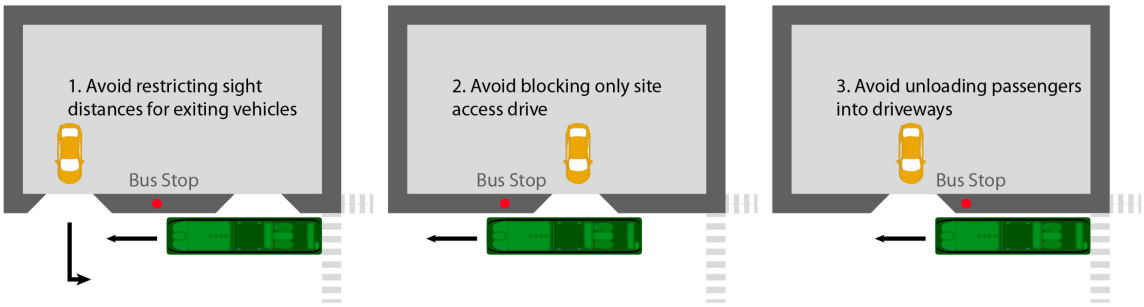
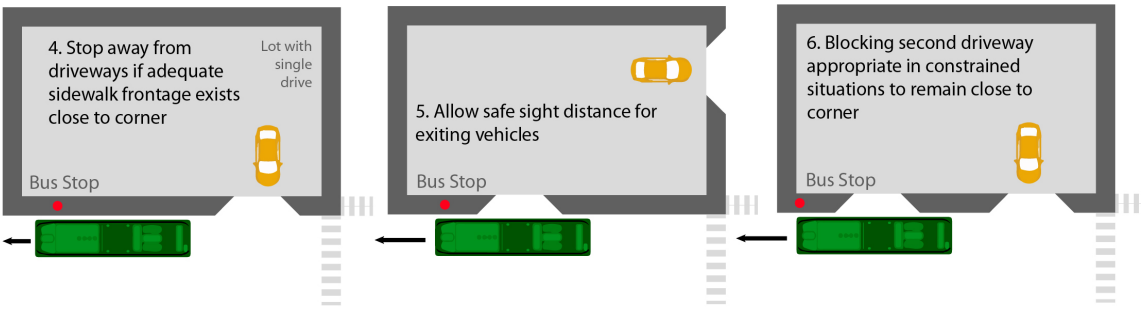


Figure 2-4 Acceptable Driveway Arrangements



Getting to and from the Bus Stop

Most people traveling to and from the bus stop are pedestrians or users of a wheeled mobility device, such as a wheelchair or bicycle. Therefore, the conditions of the sidewalk and connections with the surrounding area are important determinants of transit access and affect the prioritization of bus stop improvements.

At the least, a stop should be accessed by a sidewalk in good condition between the bus stop and the closest intersection. In addition, a safe, nearby street crossing with curb cuts for wheelchairs is required; almost all riders will need to make round trips using a pair of bus stops. For denser areas where it is likely that many people visit multiple destinations in a single bus trip, priority should be given to making sure that there is an accessible path throughout the area. For bus stops which serve mostly a single destination, the focus can be on a path between that destination and the bus stop.

Bicycling and transit can complement each other, and the reach of the transit service can be greatly extended by providing connections so that people can combine these two modes in a single trip. Particularly in more outlying locations where the transit network is less dense, people may be more likely to access the bus stop by bicycle. Generally, bicycle lanes and separated paths increase bicycle usage by making riders

safer and more comfortable. Wherever possible, bus stops should be placed close to this bicycle infrastructure, especially at places where a stop can facilitate bicycle connections to areas without transit service. In addition, some stops may warrant more bicycle parking. See Chapter 3 – Bus Stop Configuration for bus stop guidelines for designing bus stops that interact with on-street bicycle infrastructure.

Bus Stop Location Relative to Intersection

Bus stop position directly impacts the convenience and accessibility of the transit system. Determining the proper position of bus stops involves choosing between near-side, far-side and mid-block stops. While many other factors should be considered when choosing a bus stop position, including adjacent land use, space availability, and pedestrian access, the location of the stop relative to the intersection is an important consideration. If all other factors were similar, far-side stops would be preferable, since they encourage people to cross behind the bus and not in front. However, there are often complicating factors. The Bus Stop Configuration section (Chapter 3) of this document provides drawings for how bus stops should fit at each possible bus stop position.

Figure 2-5 Near-Side, Far-Side, and Mid-Block Bus Stops

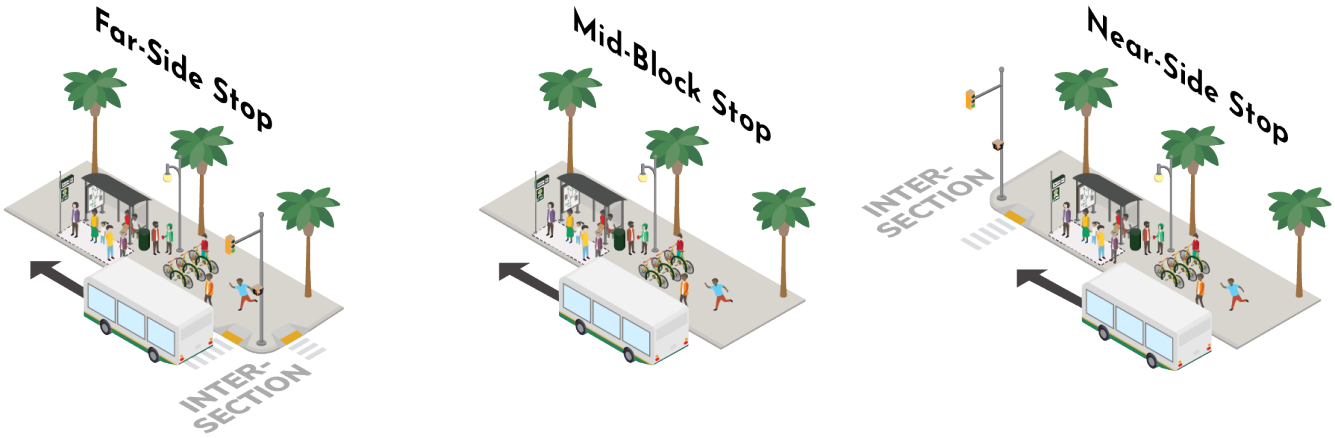


Figure 2-6 Near-Side Stop in Charleston

Near-Side

Near-side bus stops are located before an intersection, allowing passengers to load and unload while the vehicle is stopped at a red light or stop sign (see Figure 2-4). Near-side bus stops can minimize interference when traffic is heavy on the far-side of an intersection. At stop-controlled locations, near-side stops eliminate "double stopping," as passengers can board the bus during the stop. Additionally, at near-side stops, gaps in traffic flow are created for buses re-entering traffic at the intersection and passengers access the bus closest to the crosswalk.

The stop configuration can generate conflicts with right turning vehicles. Delays associated with loading and unloading passengers may lead to unsafe driving practices, where right turning vehicles drive around the bus to make a right turn in front of the bus. Additionally, buses serving near-side stops may restrict sight distances for crossing pedestrians and vehicles.

Far-Side

Far-side bus stops are located after an intersection, allowing the bus to travel through the intersection before stopping to load and unload passengers. When the bus pulls away from the stop to reenter traffic at an intersection controlled by a traffic signal, the signal generates gaps in traffic allowing buses to reenter the traffic lane. Far-side stops also require shorter deceleration distances and encourage pedestrians to cross behind the bus. Far-side bus stops support the use of a broad array of active transit signal priority treatments and take up the least amount of curbside space. Additionally, far-side stops provide additional right turn capacity at the intersection by eliminating bus blockage in the curb lane on the approach to the intersection.

However, during peak travel periods, when traffic is heavy and bus queuing is possible, intersections may be blocked by buses waiting to access a far-side bus stop. Queued buses may restrict sight distances for crossing pedestrians and vehicles. Additionally, stopping far-side after stopping for a red light may interfere with bus operations as well as general traffic flow.

Figure 2-7 Far-Side Stop Located at Calhoun Street at Meeting Street

Mid-Block

Mid-block bus stops are located between intersections. Mid-block stops minimize sight distance problems for vehicles and pedestrians. Additionally, passenger waiting areas located mid-block often experience less pedestrian congestion. However, mid-block stops require both deceleration and acceleration areas, requiring additional distances for no parking restrictions or increased turnout construction costs. Mid-block stops also increase walking distances for patrons crossing at intersections, or result in patrons illegally crossing the street mid-block.

Mid-block stops should generally be used under special circumstances, such as where large destinations justify high-volume access or when the distance between adjacent intersections exceeds stop spacing recommendations.

Figure 2-8 Mid-Block Stop on Sam Rittenhouse Boulevard (Driveway shown behind stop is not an intersecting street)