DELAWARE VALLEY
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REGIONAL
PLANNING COMMISSION

SEPTA BUS STOP DESIGN GUIDELINES

DECEMBER 2019 SECOND EDITION

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DELAWARE VALLEY **dvrpc** REGIONAL PLANNING COMMISSION

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Purpose and Introduction

The purpose of this report is to provide municipalities in the Southeastern Pennsylvania Transportation Authority (SEPTA) service area, local developers, and other local partners a consistent set of guidelines for designing surface transit stops. While the focus of this document is on bus stops, many of the elements addressed here also apply to trackless trolley and mixed-traffic trolley stop locations. For more specific information about trolley stop guidelines please reference the following reports:

- *Modern Trolley Station Design Guide—SEPTA City Transit Division* (2017)[1]; and
- *Modern Trolley Station Design Guide—SEPTA Suburban Transit Division Routes 101 and 102* (2018).[2]

This document is an update to the SEPTA Bus Stop Design Guidelines published in 2012. To determine the content that needed to be added and updated, a survey was sent to the counties, municipalities, local consulting firms, transportation management associations, and other partners in SEPTA's network. A summary of the survey is in Appendix B. SEPTA staff summarized the feedback they had received over the years on the 2012 publication. The response from both sources is incorporated into this 2019 version of the report.

This document is intended to guide local comprehensive plans, land development ordinances, site or subdivision plans, and transportation and mobility plans. These guidelines are based on a review of standards and best practices applied nationally, discussions with planning partners, and survey feedback from municipalities in the SEPTA service area.

SEPTA recognizes that every location in their network is unique, and that a given transit stop's jurisdictional and physical context may offer opportunities to meet these guidelines in some ways but not in others. As a result, this should be viewed as a guiding document, offering templates for desirable facilities and bus stop elements wherever it is possible to provide them. The guidelines detailed here will lead to a higher-quality, more consistent, more accessible, and better-connected network of stop facilities over time.

Structure of Guide

There are four inter-related components that together comprise a transit stop.

1. **Stop placement.** This section helps one to identify the best location for a stop based on existing conditions. It aims to compare where it makes sense to put a stop relative to other stops, to the nearest intersection, and the surrounding land and development uses.
2. **In-street design.** This section guides one to evaluate how much space should be allocated for the transit vehicle to pull over to the curb for passenger loading and unloading, and to exit and re-enter the flow of traffic.
3. **Curbside design.** This concerns the spatial design of a bus stop or station, which is broken up into two parts for the purpose of this report. This section helps one to understand how much space they have and what type of stop they may want to explore further.
4. **Stop elements.** This section describes stop features and comforts that provide added convenience and comfort for the passenger.

This report's structure follows the same order, with a fifth section that contains case studies for common design challenges and solutions. To discuss details for a specific location or route, please email serviceplanning@septa.org.

What Is a High-Quality Bus Stop?

A high-quality bus stop is one that is well connected to the neighborhood or community it serves, accommodates the needs of all transit passengers safely and comfortably, and permits efficient and cost-effective transit operations.

Each potential bus stop location has a set of constraints depending on space, potential users, land use density, land use context, and more. Recognizing these constraints while still creating a space that is comfortable for passengers to wait in up to the maximum time between buses (or headway) is an ideal way to approach creating or relocating a bus stop. Creating high quality bus stops for passengers improves the overall experience of SEPTA's transportation network.

[1] DVRPC, *www.dvrpc.org/Reports/15014.pdf (2017).*
[2] DVRPC, *www.dvrpc.org/Reports/17010.pdf (2018). .*

CHAPTER 1: STOP PLACEMENT

Source: DVRPC (2018).

Transit Stop Characteristics

There are a variety of characteristics that help determine where a transit stop should be located, including land use context, the location of other transit stops and connecting transit services, service standards, passenger safety, and traffic conditions. To highlight these, this chapter is broken into sections: stop spacing, stop rebalancing, bus stop pairs, and typical stop types, with accompanying diagrams. SEPTA's *Service Standards and Process* report (adopted in 2019) provides details about stop spacing and rebalancing. The final section is a process diagram to show how one could go about requesting a bus stop within SEPTA's existing network.

STOP SPACING

Stop spacing refers to the distance between stops along a route and reflects a trade-off between transit accessibility (convenient access to frequent stops) and operating efficiency. Additional stops along a route make that route more accessible by walk-up riders but cause the route to operate more slowly for riders already on the vehicle. This impairs the transit service's efficiency and cost effectiveness and makes it less attractive to riders.

The distance between bus stops should, in part, be determined by the physical characteristics of the area the route serves. In areas where there is strong pedestrian infrastructure (good sidewalks, crosswalks, and traffic control devices), stops can be placed farther apart because there are fewer barriers to pedestrian access and mobility. For parts of the region less hospitable to pedestrians, stops should be placed wherever practical for ease of access, with the safety of customers and operators serving as the most important inputs.

There are other factors that may contribute to stop spacing along a specific route, such as a high number of stop signs or the need to provide access to specific destinations, but in general, stops will be spaced at a minimum of 500 feet apart from each other, with the preference being to locate them at controlled locations with crosswalks whenever possible.

STOP REBALANCING

As part of SEPTA's ongoing schedule reliability evaluations, SEPTA Service Planning staff may review the stops on a specific route or set of routes. Stop rebalancing is a key component in improving reliability and improving travel speeds. The elimination of bus stops may be deemed appropriate based on a number of factors, including:

- proximity to other stops;
- Americans with Disabilities Act (ADA) access;
- ridership (customer boards and alights); and
- the safety of and access to the stop (sidewalks, crosswalks, traffic control devices, lighting).

If for any of the above reasons it is determined that a stop should be eliminated, SEPTA Service Planning will develop a Stop Rebalancing Plan in conjunction with SEPTA Surface Transportation Staff and work with local officials on the appropriate steps to take to consider customer feedback and alternative measures.

BUS STOP PAIRS

Bus stops are typically located in pairs, one on each side of the street on two-way streets and in one-way road couplets. SEPTA recommends that bus stops be in pairs and close together along the route to ensure simplicity in planning the return trip. However, it is not always possible to do this based on the conditions of the street and existing right-of-way; therefore, each location should be individually considered.[1]

TYPICAL STOP TYPES

Bus routes should have clearly marked stops. The placement should serve the maximum number of potential passengers without causing additional delay to the route or obstructing the intersection. There are three locations along a block where a stop can be placed. All have advantages and disadvantages depending on the context.

Near-Side Stop

Occurs when the bus stops *before* the intersection.

Far-Side Stop

Occurs when the bus stops *after* proceeding through the intersection.

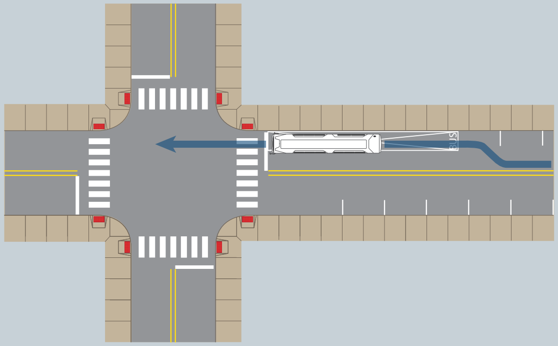
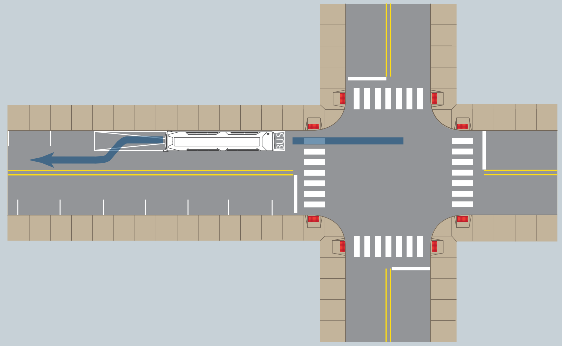
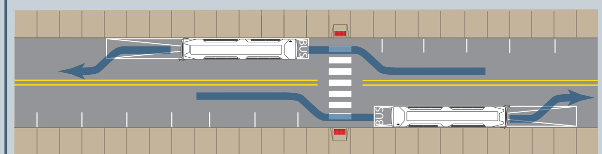
Midblock Stop

Occurs when the bus stops in between intersections, usually in a well-defined area. A midblock stop is only encouraged where it is necessary, such as on long blocks with high ridership or where there are major destinations midblock.

Refer to Tables 1 and 2 for advantages and disadvantages for each stop type.

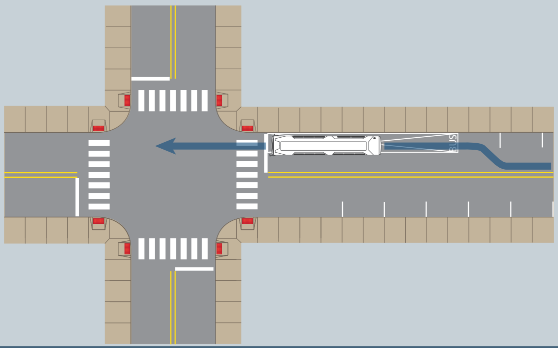
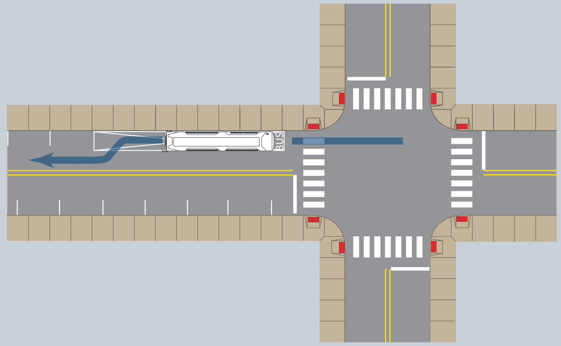
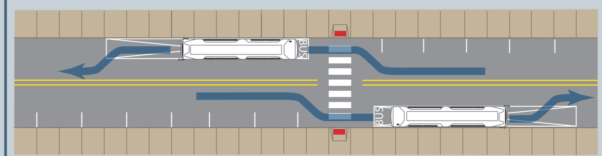
[1] *Guidelines: Design and Placement of Transit Stops, Washington Metropolitan Area Transit Authority (2009).*

Table 1 | Advantages for Typical Stop Locations

Near-Side Stop	Far-Side Stop	Midblock Stop
		
Advantages	**Advantages**	**Advantages**
› Minimizes traffic interference during peak traffic flow hours, such as vehicles queuing into the intersection if a bus is at a far-side stop. › Bus operator can use the intersection for acceleration space. › Avoids double stopping for both signal and passenger movements. › The bus operator has the advantage of full view of intersection activity. › Can be coordinated with a far-side stop for a crossing route to allow passengers to transfer without crossing the street. › Passengers are able to board the bus closer to the crosswalk.	› Minimizes conflicts with right-turning vehicles. › Minimizes sight line conflicts for drivers and pedestrians. › Encourages pedestrians to cross more safely behind the bus. › Stopping at the far side of the intersection creates a shorter deceleration zone for the stop area because the intersection absorbs some of the space requirement. › The gap in traffic flow created by the signal allows the driver room to pull back into the travel lane. › Most effective stop location if combined with Transit Signal Priority (TSP): preferential treatment for transit vehicles at traffic signals (typically extended green phase). › Passengers are able to alight the bus closer to the crosswalk.	› Minimizes sight line obstructions for both driver and passengers when bus stops on far side of crosswalk. › Because the stop is located away from intersection activity, conflicts with intersection traffic are minimized. › A more spacious waiting area may be provided because the stop is located outside intersection sidewalk congestion. › Works well when a high volume of passengers board and alight, or the bus has an extended dwell or layover time. › Greater passenger convenience at key midblock trip generators.

Source: DVRPC (2012).

Table 2 | Disadvantages for Typical Stop Locations

Near-Side Stop	Far-Side Stop	Midblock Stop
		
Disadvantages	**Disadvantages**	**Disadvantages**
› Conflicts between the bus and right-turning vehicles may arise. › The bus can physically obscure general traffic sight lines for both intersection movements and signals. › Multiple buses queuing during peak hours may obstruct traffic. › Crossing pedestrian sight lines are obstructed. › May present a conflict between pedestrians crossing the intersection and passengers waiting to board the bus.	› If the bus is unable to fully pull through the intersection during peak hours, traffic conflicts may occur ("blocking the box"). › A bus stopped near the intersection may block sight lines for pedestrians and vehicles crossing the intersection. › Can cause the bus to double stop (once for the light and once for passenger activity). › Rear-end crashes may be more frequent if distracted drivers do not realize the bus is stopping beyond the intersection.	› Presents safety concerns if a midblock crosswalk is not provided. Midblock crosswalk should be designed using best practices for pedestrian safety.[1] › Requires more physical space for the bus to accelerate and decelerate. › Reduces space available for on-street parking because this stop type requires a longer bus zone.

Source: DVRPC (2012).

[1] *NACTO, Urban Street Design Guide, Midblock Crosswalks (2016).*

Requesting a New Bus Stop

The purpose of this section is to provide municipalities, developers, advocacy groups, counties, neighborhood organizations, private groups, and local citizens with a resource to request a new bus stop. While adding a bus stop to the existing network can seem complex, providing transparency for the process may help those interested in requesting or moving a stop. Steps to create a new SEPTA bus stop within the existing service area are summarized in Figure 1. **Requests should be made early in the design and development process so that stop requirements can be incorporated into the site design. The best way to contact SEPTA is via their Customer Service center at www.septa.org/cs/contact or by phone at (215) 580-7800.**

NEW STOP REQUESTS

A gap in the transportation network is relevant and should be addressed so that a community is better served. Before reaching out to SEPTA consider who this new stop will serve. Is there another stop nearby? Are there travel patterns that already serve the same potential passengers? Will people use the stop, or is it an area without sidewalks and primarily dominated by personal vehicle travel?

Per SEPTA's Service Standards and Process, requests for a stop greater than 1,000 feet from the closest existing stop will be evaluated, with the final determination made by SEPTA Surface Transportation. Ideally bus stops should be located at well-lit and busy locations, where there is a safe area to exit from both sets of doors. Any request within 500 feet of an existing stop will not be considered, unless there is a better alternative to the closest stop, a roadway configuration or other changes necessitate moving or installing a new stop, or a new development warrants an additional stop.

ADDING A BUS STOP VERSUS REROUTING

To add a new bus stop, it is first necessary to determine if the location is on an existing SEPTA bus route or not. Therefore, in Figure 1, step 1 asks if the new bus stop location requires a bus to deviate from its route (or reroute) or is in line on the existing route. Each option is described next.

Adding In-Line or Off-Line Bus Stops

If the answer to Step 1 is no, this new stop does not require rerouting. The request will be forwarded to both the SEPTA Service Planning and SEPTA Operations departments. An example of an in-line stop is to add a new bus stop along a corridor that an existing route runs but does not stop. A new bus stop may be warranted if a there is a new or existing major generator. Examples include an institution (school, hospital, recreational facility) or development (office, retail, or residential), triggering a reason for people to go to this existing or new location. In-line stops are preferable whenever adding stops along a route.

Off-line stops are out of the path of the roadway and are often designated as “bus only” locations, such as within a transportation center, shopping center, or park-and-ride facility. Although off-line facilities may have more space available and consequently permit the provision of more amenities, bus route deviations into off-line facilities can add to a route's travel time. Off-line stops are acceptable when considering new terminus points.

Steps 2 and 3 involve coordinating SEPTA's Operations and Service Planning departments. The role of both departments is to determine if there is a warranted purpose to create or relocate a stop, and if the location is feasible based on its accessibility for a bus and the safety of riders and the vehicle.

Rerouting to Create a Bus Stop

If the answer to Step 1 is yes, rerouting would be required to fulfill the request. This can be a change such as pulling into a shopping plaza or office complex. The next step is to contact Customer Service**.** Once a stop request is received, it will be forwarded onto both the SEPTA Service Planning and SEPTA Operations departments. From there it will go through internal processes. The Service Planning Department will determine whether the route change meets their Service Standards.[1] The Operations Department will complete a full safety assessment.

When SEPTA Service Planning is evaluating proposed routings, a field analysis will be done in conjunction with SEPTA Surface Transportation to ensure that SEPTA vehicles can safely make the proposed turning movements. When evaluating proposed midroute deviations, an analysis will be done to determine the deviation's impact on existing riders by estimating how much excess time it will cost them versus how many new potential riders the deviation could generate. An equation[2] will be used to evaluate the impact of a specific deviation and determine whether a proposed service deviation is reasonable. The additional travel time for all through passengers should not exceed three passenger-minutes per each rider boarding or alighting along the proposed deviation. Additional analyses may be needed to add this new stop to the network.

ALTERNATIVES TO A NEW BUS STOP

Creating a new bus stop is not the only way to provide better access to public transit in a community. Providing new multimodal access to connect existing SEPTA stops with unserved or underserved communities may be what is needed to get people to transit stops to get to their destinations. Designing and building multimodal connections should be considered simultaneously when requesting a stop. Examples include new crosswalks, multiuse trails, sidewalks, and bike lanes. Guidance for this type of improvement can be found in a number of resources.[3,4,5]

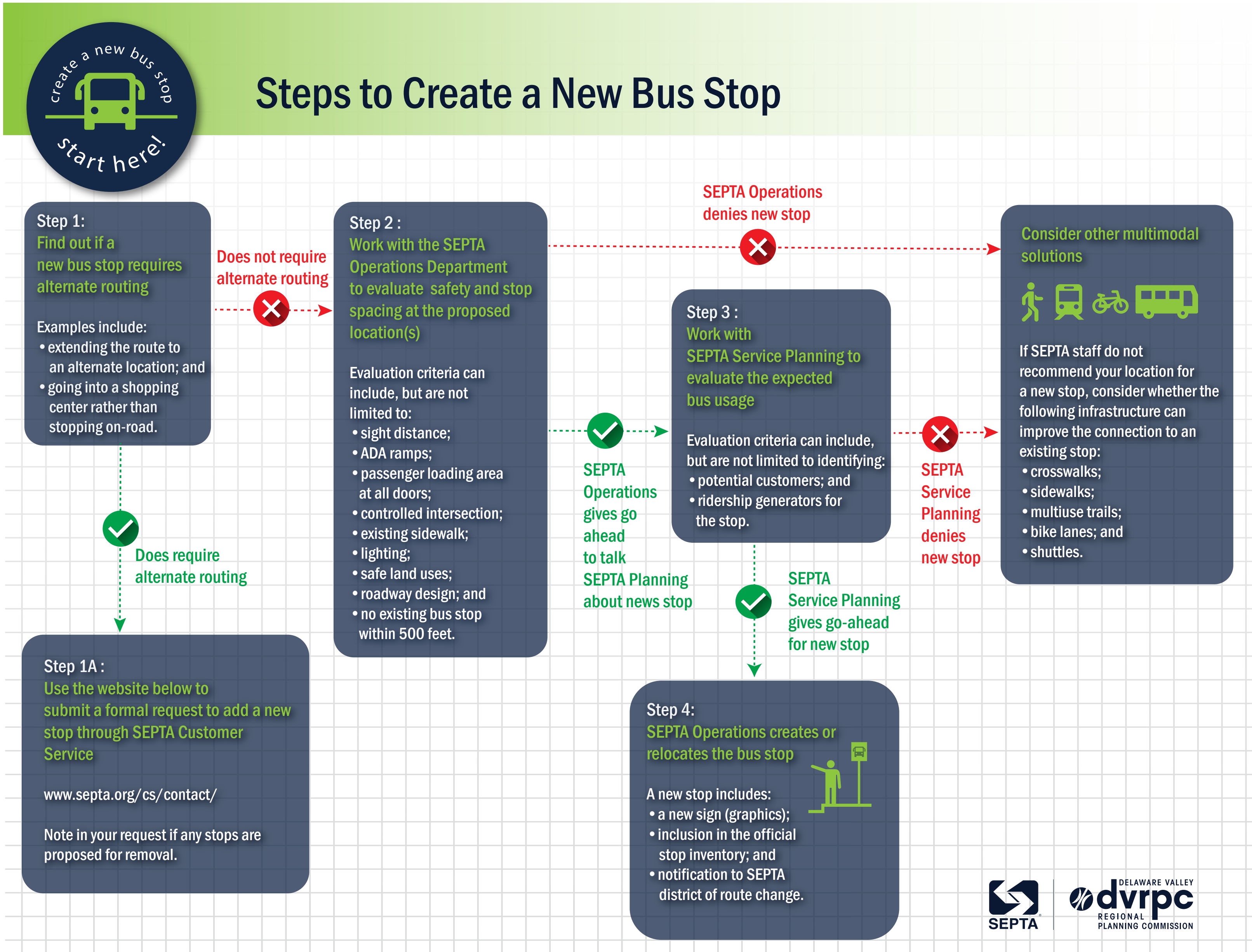
[1,2] *SEPTA Service Standards and Process* (2019).

[3] *Bike To Ride: An Idea Book of Regional Strategies for Improving Bicycling Access to Transit*, Atlanta Regional Commission (2016).

[4] *Manual on Pedestrian and Bicycle Connections to Transit*, FTA Report No. 0111, Federal Transit Administration [FTA] (2017).

[5] *Bus Infrastructure Design*, TransLink (Revised 2018).

Figure 1 | Steps to Create a New In-Line or Off-Line Bus Stop



CHAPTER 2: IN-STREET DESIGN

Source: DVRPC (2018).

A bus zone is the primary in-street area devoted to bus movements, which allows the vehicle to pull over to the curb for the purpose of loading and unloading passengers. The geometry of the street needs to accommodate both transit and general traffic. In addition, a stop location must be designed to accommodate sufficient space for vehicle deceleration and acceleration (to exit and re-enter traffic flow) and clear area to discharge and receive passengers efficiently and safely within the roadway. Due to the variation of roadway geometry in SEPTA's network, there are different ways to accommodate bus stops within the bus zone.

The first part of this chapter is broken into two sections, the first explains the typical bus zone configuration options and the advantages and disadvantages of each one. The second is a reference section that includes detailed tables (8-13) of bus zone configurations with all the dimensions for each type.

The sections address bus stop configuration options but are divided based on reader preference; some may find they only need the detailed dimensions, while others want to know more background.

The final two sections of this chapter are engineering considerations for SEPTA buses including horizontal and vertical clearances, turning radii, pedestrian sight lines and distances, and roadway paving surfaces.

Typical Bus Zone Configuration Options

Typical bus zone types fall into two major categories: in-line (or on-line) and off-line, with respect to the roadway. In-line stops are designed as part of the street and participate in the general pattern of traffic flow. The loading and unloading of passengers occurs at the roadway edge. This section illustrates and describes typical alternatives for in-street stop design. More detailed dimensional specifications for each stop type can be found in the following section (beginning on page 16).

Off-line stops are out of the path of the roadway and are often designated as "bus only" locations, such as within a transportation center, shopping center, or park-and-ride facility. Passenger loading takes place in designated areas. In Chapter 5 there are case studies that illustrate how to provide an off-line stop, if necessary. Although off-line facilities may have more space available and consequently permit the provision of more amenities than do in-line facilities, bus route deviations into off-line facilities can add to a route's travel time. Therefore, in-line stops are generally preferable.

Bus curbing at shoulder bus shelter, West Goshen, Pennsylvania

Source: Chester County Planning Commission (2010)

CURBSIDE OR SHOULDER STOP

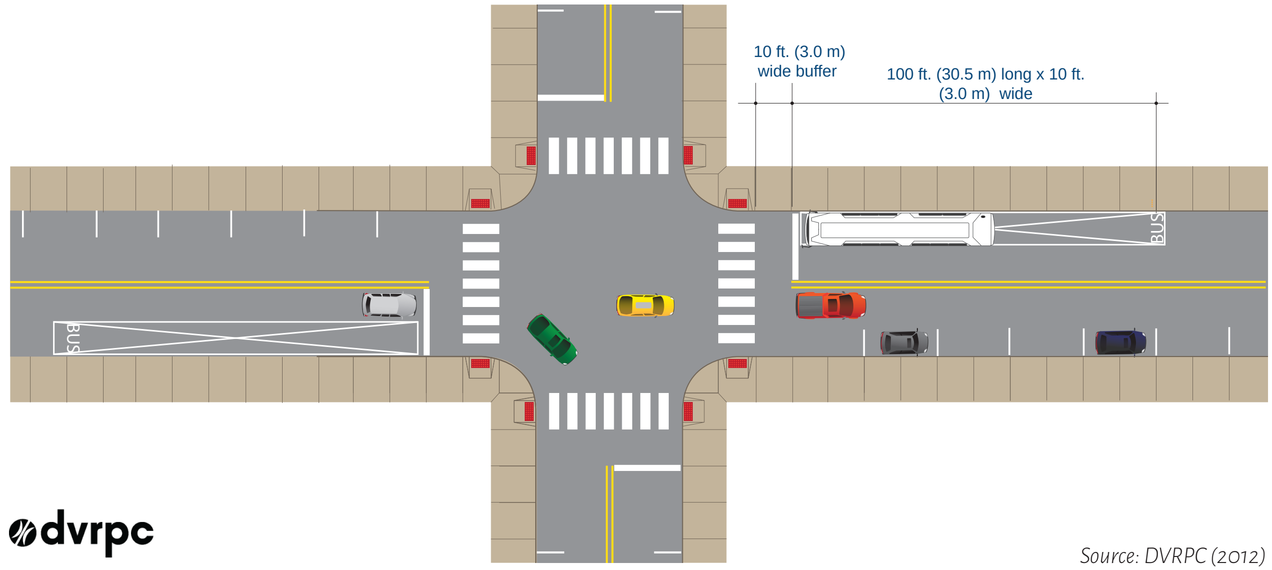
The in-line curbside stop is the most common bus stop type within SEPTA's system.

The bus zone is located in the road, usually in a parking and/or loading lane area, with a typical width of 10 feet (3 meters). **Ideal curbside bus zone length** is 100 feet (30.5 meters) for **near-side stops**, 90 feet (27.4 meters) for **far-side stops**, and 150 feet (45.7 meters) for **midblock stops**. Bus zone decisions are made by municpal traffic experts in coordination with SEPTA. The line striping plans are signed by an engineer at the city/county/state level, depending upon the road ownership.

Contextual examples are shown in Figures 2 through 4. An additional 20 feet (6.1 meters) should be provided for routes with articulated buses, plus appropriate transition zones where traffic speeds are higher. Advantages and disadvantages of a curbside or shoulder stop are listed in Table 3.

The bus zone treatment typically includes painted roadway markings and a sign marking the area as a "no stopping" or "no parking" location. The parking lane should ideally be marked in order to identify the loading and maneuvering area for transit vehicles.

Figure 2 | Typical Near-Side Curbside Configuration



Source: DVRPC (2012)

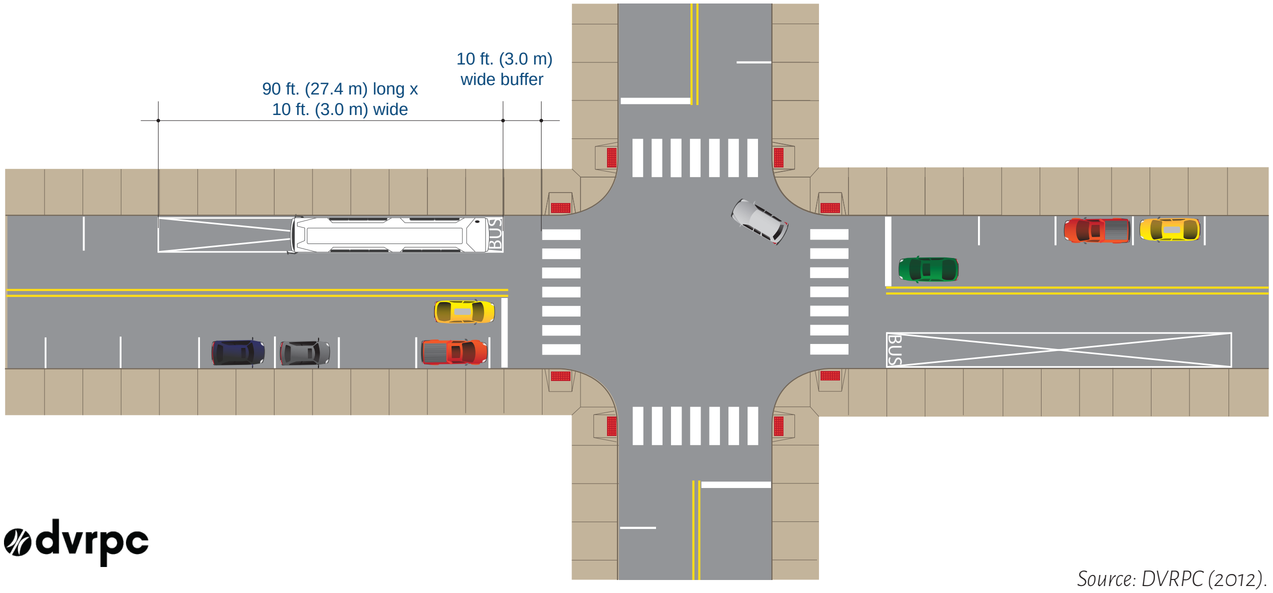
Table 3 | Advantages and Disadvantages of Curbside or Shoulder Stop

Advantages	Disadvantages
Provides easy access for bus drivers	Can cause traffic to queue behind stopped bus when the bus is unable to curb, causing additional traffic congestion
Results in minimal bus delay	Drivers may attempt to make unsafe maneuvers around stopped buses
Simple in design	Can cause delay if bus operator has difficulty getting back into traffic
Easy to relocate	
Easy and inexpensive to install	

Note: See Chapter 1 for the advantages and disadvantages of stop placement, including: near-side, far-side, and midblock.

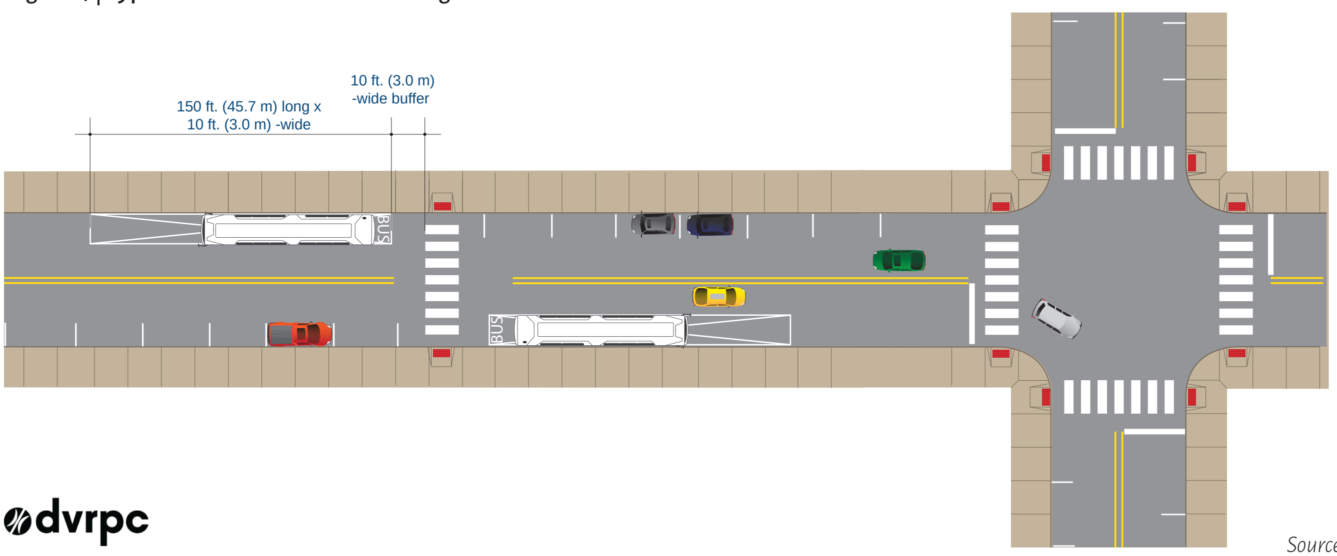
Sources: TCRP Report 19 (1996) and FTA Stops, Spacing, Location and Design Website (2016).

Figure 3 | Typical Far-Side Curbside Configuration



Source: DVRPC (2012).

Figure 4 | Typical Midblock Curbside Configuration



Source: DVRPC (2012).

BUS BAY OR TURNOUT

The bus bay or turnout is a location off line with respect to the travel lanes, with a special curbed pull-out for buses, or inset into the curb, with two tapered ends. The bus bay allows general traffic to pass around a loading bus. Examples of bus bays within SEPTA's network and how they are functioning operationally can be found in Appendix D.

This configuration is best used where an intersection presents a particular hazard or conflict with transit operations, traffic speeds are more than 35 miles per hour (mph), and long dwell times are common (high-activity location), or as a system layover stop. **Typical dimensions** are 170 feet (51.8 meters) long by 10 feet (3 meters) wide. Table 4 and Figure 5 demonstrate advantages and disadvantages of a bus bay and illustrate an example.

Far-side bus turnout on City Avenue

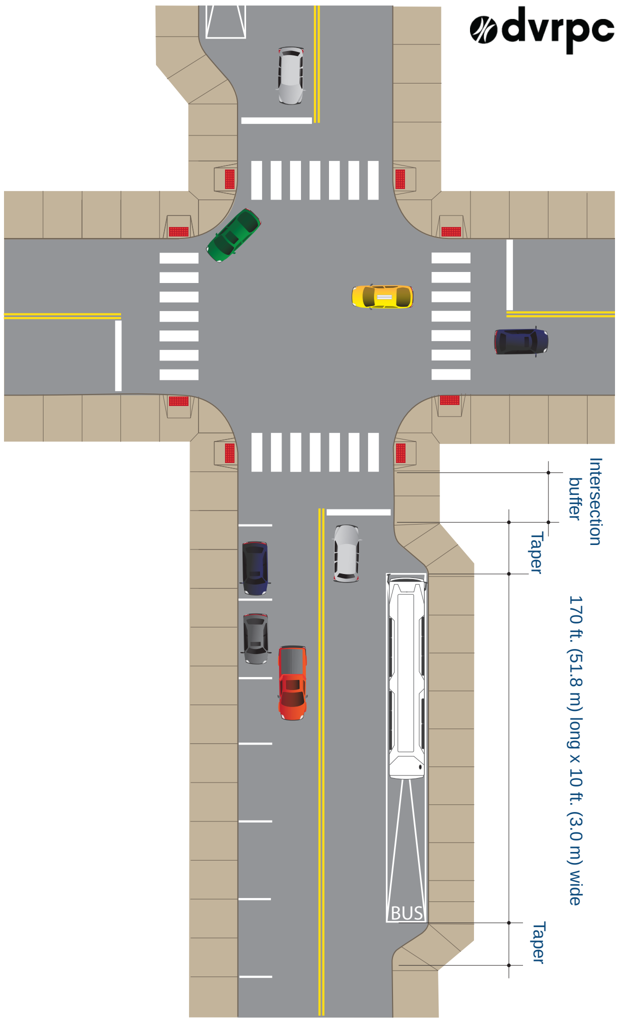
Source: SEPTA (2012).

Table 4 | Advantages and Disadvantages of Bus Bays

Advantages
Interferes less with right-turning vehicles at the intersection, when compared with curbside stops
Minimizes traffic delay
Potentially allows for bus layover to occur because the vehicle is out of the flow of traffic.
Provides protected area for both the stopped bus and bus passengers
Disadvantages
Bus operators may have difficulty when re-entering traffic, especially during peak hours; a bus may also block traffic if a bay is not properly entered by a bus operator
Expensive to install compared with curbside stops
Difficult and expensive to relocate compared to curbside stops
Much longer bus zone space needed to ensure access is sufficient for vehicles to re-enter traffic

Sources: TCRP Report 19 (1996) and FTA Stops, Spacing, Location and Design Website (2016).

Figure 5 | Near-Side Bus Bay Example



Source: DVRPC (2012).

OPEN BUS BAY

The open bus bay is a variation on the bus bay that provides more maneuverability toward the upstream side of traffic flow because there is only one tapered end. Table 5 describes the advantages and disadvantages of an open bus bay. An open bus bay only has one side that has a cut, as shown in Figure 6.

Table 5 | Open Bus Bay Advantages and Disadvantages

Advantages
Allows the bus to decelerate as it moves through the intersection
Allows general traffic to pass a loading bus and minimizes traffic delay
Interferes less with right-turning vehicles at the intersection
Provides protected area away from moving vehicles for both the stopped bus and bus passengers
Disadvantages
May present problems to bus drivers when attempting to re-enter traffic, especially during periods of high roadway volumes
Expensive to install compared with curbside stops
Difficult and expensive to relocate

Sources: TCRP Report 19 (1996) and FTA Stops, Spacing, Location and Design Website (2016).

When used within a transportation center setting, such as SEPTA's Norristown Transportation Center, a "sawtoothed" arrangement is typical due to the efficient use of constrained curb space. Sawtooth bays are generally wide and require shorter curbside distances.[1] Dimensions are 120 feet (36.5 meters) for a standard bus—add 20 feet (6.1 meters) for an articulated bus—plus length for acceleration and deceleration zones where required by travel speeds.

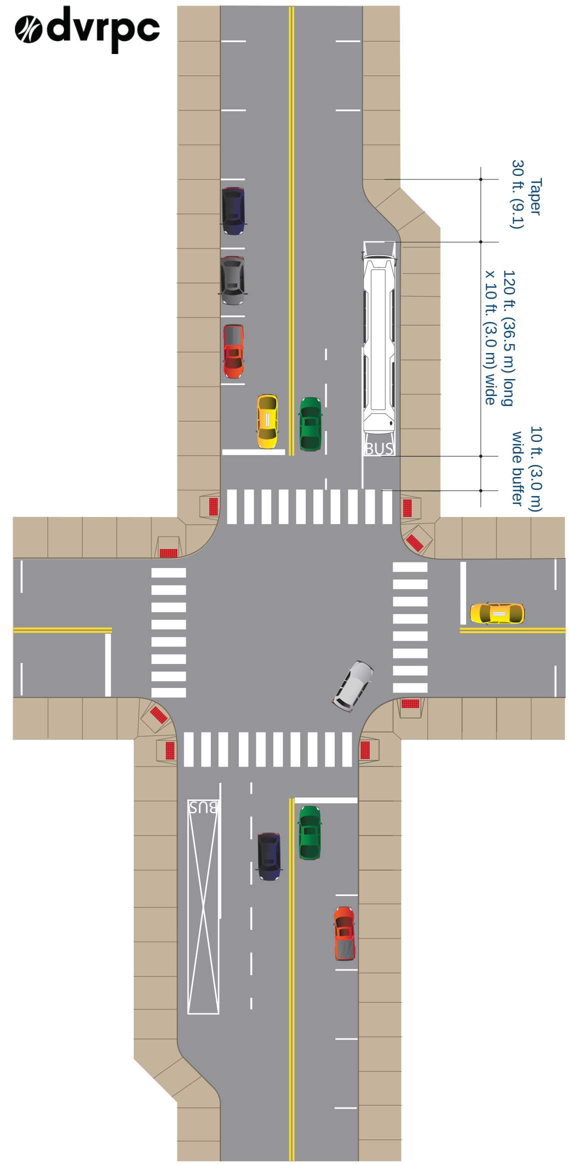
Open bus bays can be accommodated at intersections. Figure 6 shows a far-side example, and the intersection is used as the deceleration zone. A near-side open bus bay can also be used effectively as a queue-jump lane in a TSP scheme.

Sawtooth open bus bays at Norristown Transportation Center

Source: DVRPC (2012).

[1] Washington Metropolitan Area Transit Authority, *Development of Guidelines for the Design and Placement of Transit Stops for WMATA* (2009).

Figure 6 | Far-Side Open Bus Bay Example



Source: DVRPC (2012).

CURB EXTENSION OR BUS BULB

A curb extension (or "bus bulb") is a modification of the sidewalk to extend the bus loading and waiting area into the roadway. Because a curb extension can be as short as 15 feet (4.6 meters), it can conserve curbside space for parking relative to a curbside stop with a bus zone. Curb extensions are most appropriate for near-side stops where there is a parking lane or multiple travel lanes, travel speeds are lower than 30 mph, and pedestrian volumes are high or the sidewalk is narrow. Tables 6 and 7 and Figure 7 relay information that will be valuable for planning this stop type.

Table 7 | Advantages and Disadvantages of a Curb Extension

Advantages
Bus pull-out zone is not required
Bus does not have to re-enter traffic; therefore, delay is not caused
Serves as a pedestrian safety amenity due to shorter crossing distance
Provides additional space that can be repurposed for bus passenger amenities, such as additional waiting space, possibly in the form of shelters
Divides waiting bus passengers from other pedestrians
Disadvantages
Can cause traffic to queue behind a stopped bus, thus causing a traffic delay
May cause drivers to make unsafe maneuvers when changing lanes in order to avoid a stopped bus
Costs more to install compared with curbside stops, particularly for addressing street drainage requirements

Sources: TCRP Report 19 (1996) and FTA Stops, Spacing, Location and Design Website (2016).

Table 6 | Curb Extension Dimensions for Various Vehicle/Door Configurations

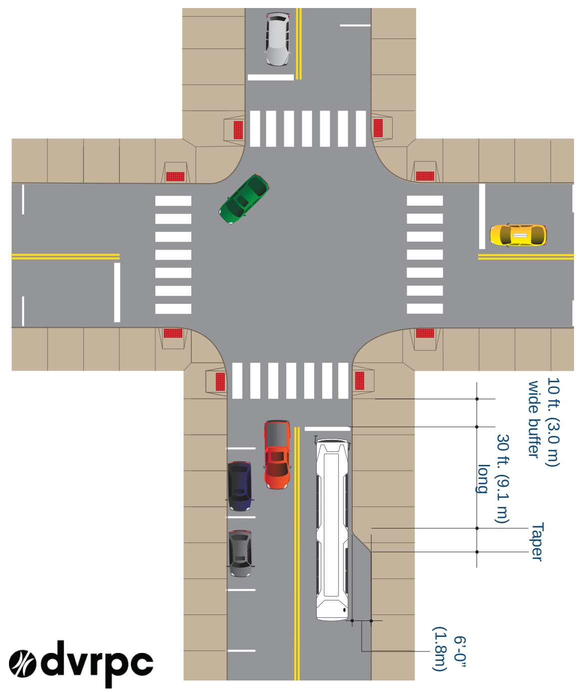
Vehicle	Vehicle Length	Doors Served	Bulb Length (ft.)*	Bulb Length (m)*	Bulb Width (ft.)	On-street parking displaced**
All Vehicle types: front doors only (min length)	Varies	1	15	4.6	6	1 space
Standard bus/trackless	41.5 ft.	2	30	9.1	6	2 spaces
Articulated bus/trackless	62 ft.	2-3	50	15.3	6	3 spaces
Kawasaki LRV Series 100, Single-end	50 ft.	2	32	9.7	8.5	2 spaces
Kawasaki LRV Series 100, Double-end	53 ft.	2	50	15.3	8.5	3 spaces
Conceptual LRV (5 door)	80 ft.	Front 2 only	45	13.7	8.5	3 spaces

Source: DVRPC (2012, 2019).

* Plus 10-foot safety buffer from the crosswalk

**Assuming 20 feet length per parking stall, rounded up to the next stall

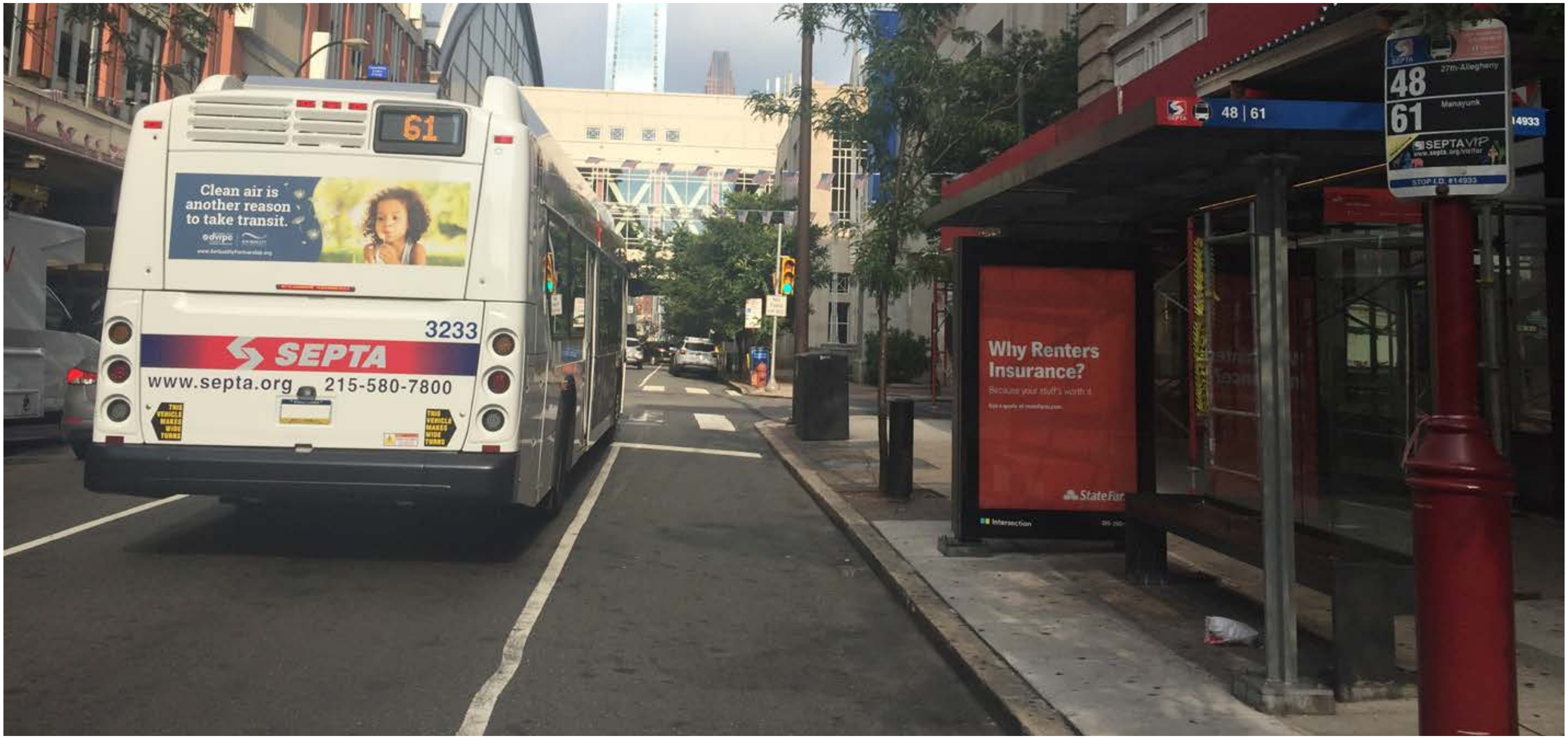
Figure 7 | Near-Side Curb Extension Example



Source: DVRPC (2012).

Near-side bus bulb on John F Kennedy Boulevard, Philadelphia, PA

Source: SEPTA (2012).



Bus stop on 11th and Arch, Philadelphia, PA

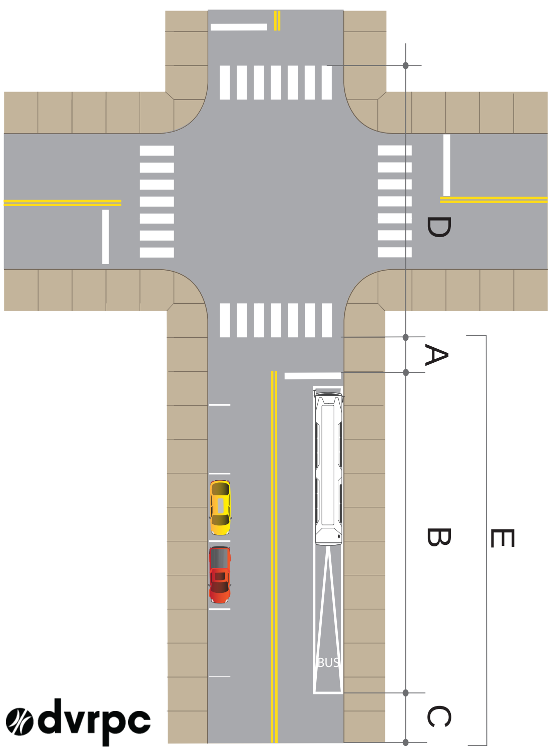
Source: DVRPC (2019).

DETAILED DIMENSIONAL SPECIFICATIONS

Tables 8-13 provide dimensional specifications for transit stops and stop-related bus and traffic circulation of many of the same stop types described earlier. Each example has dimensional specifications grouped by operating context (for streets with on-street parking and other minor and major roadways).

This section is not intended to be exhaustive since every situation has unique characteristics. Rather, it should be used as guidance to inform design decisions based on local needs.

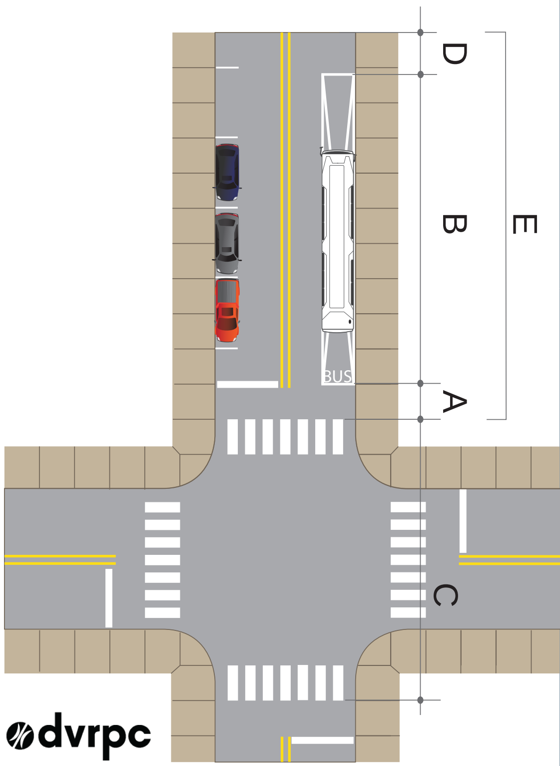
Table 8 | Dimensional Specifications for Near-Side Curbside or Shoulder Stop

Stop Configuration	Roadway Characteristic	Minimum Safety Buffer	Primary Bus Zone Length	Additional Deceleration Space	Additional Acceleration Space	Equivalent Parking Spaces
Curbside or shoulder stop (near side)		**A**	**B**	**C**	**D**	**E**
	<u>Urban street with on-street parking:</u> typical posted speeds 25–30 mph; bus enters stop area at 10 mph	10-ft. (3.0-m)-safety buffer behind crosswalk	100-ft. (30.5-m) length x 10-ft. (3.0-m) width in parking lane; add 20 ft. (6.1 m) for articulated bus*	No additional space required	N/A: Uses intersection to accelerate	Up to 5 spaces needed to create bus zone
	<u>Minor road with no on-street parking:</u> typical posted speeds 25–35 mph; bus enters stop area at 15 mph		100-ft. (30.5-m) length x 10-ft. (3.0-m) width in shoulder; add 20 ft. (6.1 m) for articulated bus*	50-ft. (15.2-m) transition		None; road shoulder is used
	<u>Major road with no on-street parking:</u> typical posted speeds 35–45 mph; bus enters stop area at 20 mph		100-ft. (30.5-m) length x 11-ft. (3.4-m) width in shoulder; add 20 ft. (6.1 m) for articulated bus*	100-ft. (30.5-m) transition		

Source: DVRPC (2012).

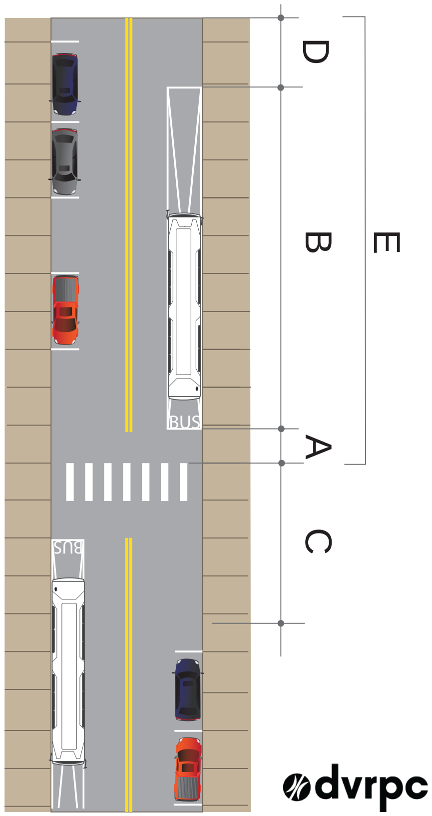
**The standard bus zone length in the City of Philadelphia has been 60 feet for standard buses and 90 feet for articulated buses. This practice will remain in place for city stops, with new bus zones meeting the standards in this table wherever possible.*

Table 9 | Dimensional Specifications for Far-Side Curbside or Shoulder Stop

Stop Configuration	Roadway Characteristic	Minimum Safety Buffer	Primary Bus Zone Length	Additional Deceleration Space	Additional Acceleration Space	Equivalent Parking Spaces
Curbside or shoulder stop (far side)		**A**	**B**	**C**	**D**	**E**
	<u>Urban street with on-street parking:</u> typical posted speeds 25–30 mph; bus enters stop area at 10 mph	10-ft. (3.0-m)-safety buffer beyond crosswalk	90-ft. (27.4-m) length x 10-ft. (3.0-m) width in parking lane; add 20 ft. (6.1 m) for articulated bus*	N/A: Uses intersection to decelerate	No additional space required	Up to 5 spaces needed to create bus zone
	<u>Minor road with no on-street parking:</u> typical posted speeds 25–35 mph; bus enters stop area at 15 mph		90-ft. (27.4-m) length x 10-ft. (3.0-m) width in shoulder; add 20 ft. (6.1 m) for articulated bus*		50-ft. (15.2-m) transition	None; road shoulder is used
	<u>Major road with no on-street parking:</u> typical posted speeds 35–45 mph; bus enters stop area at 20 mph		90-ft. (27.4-m) length x 11-ft. (3.4-m) width in shoulder; add 20 ft. (6.1 m) for articulated bus*		100-ft. (30.5-m) transition	

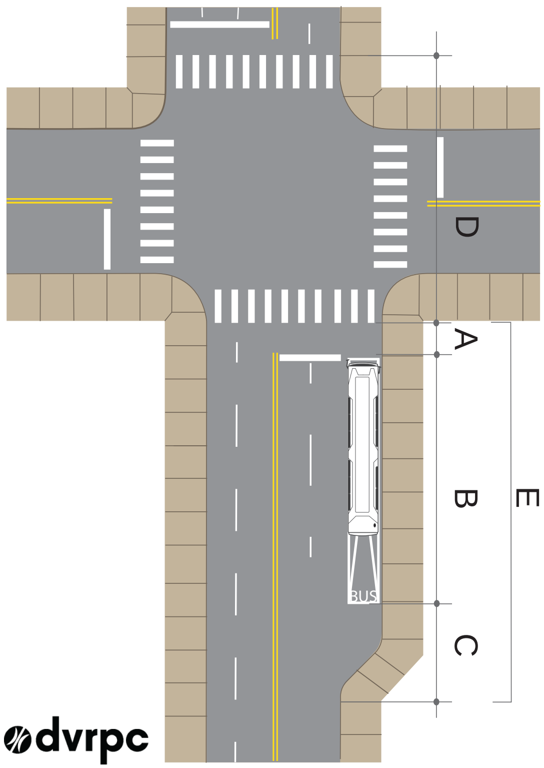
Source: DVRPC (2012).
**The standard bus zone length in the City of Philadelphia has been 60 feet for standard buses and 90 feet for articulated buses. This practice will remain in place for city stops, with new bus zones meeting the standards in this table wherever possible.*

Table 10 | Dimensional Specifications for Midblock Curbside or Shoulder Stop

Stop Configuration	Roadway Characteristic	Minimum Safety Buffer	Primary Bus Zone Length	Additional Deceleration Space	Additional Acceleration Space	Equivalent Parking Spaces
Curbside or shoulder stop (midblock)		**A**	**B**	**C**	**D**	**E**
	<u>Urban street with on-street parking:</u> typical posted speeds 25–30 mph; bus enters stop area at 10 mph	10-ft. (3.0-m)-safety buffer beyond crosswalk	150-ft. (45.7-m) length x 10-ft. (3.0-m) width in parking lane; add 20 ft. (6.1 m) for articulated bus*	No additional space required	No additional space required	Up to 8 spaces needed to create bus zone
	<u>Minor road with no on-street parking:</u> typical posted speeds 25–35 mph; bus enters stop area at 15 mph		150-ft. (45.7-m) length x 10-ft. (3.0-m) width in shoulder; add 20 ft. (6.1 m) for articulated bus*	40-ft. (12.2-m) transition	50-ft. (15.4-m) transition	None; road shoulder is used
	<u>Major road with no on-street parking:</u> typical posted speeds 35–45 mph; bus enters stop area at 20 mph		150-ft. (45.7-m) length x 10-ft. (3.0-m) width in shoulder; add 20 ft. (6.1 m) for articulated bus*	90-ft. (27.4-m) transition	100-ft. (30.7-m) transition	

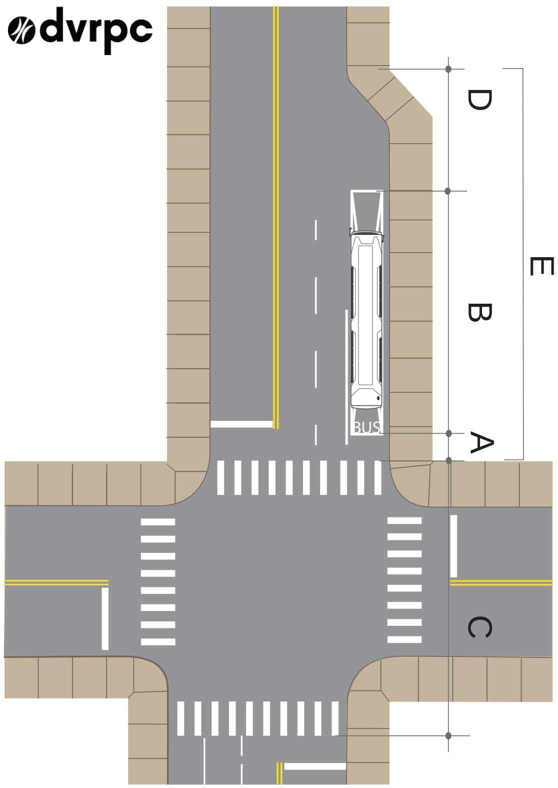
Source: DVRPC (2012).
**The standard bus zone length in the City of Philadelphia has been 60 feet for standard buses and 90 feet for articulated buses. This practice will remain in place for city stops, with new bus zones meeting the standards in this table wherever possible.*

Table 11 | Dimensional Specifications for Near-Side Open Bus Bay Stop

Stop Configuration	Roadway Characteristic	Minimum Safety Buffer	Primary Bus Zone Length	Additional Deceleration Space	Additional Acceleration Space	Equivalent Parking Spaces
Open bus bay stop (near side)		**A**	**B**	**C**	**D**	**E**
	Urban street with on-street parking: typical posted speeds 25–30 mph; bus enters stop area at 10 mph	10-ft. (3.0-m)-safety buffer from crosswalk	120-ft. (36.5-m) length x 10-ft. (3.0-m) width in bus bay; add 20 ft. (6.1 m) for articulated bus	50-ft. (15.2-m) taper	N/A: Uses intersection to accelerate	Up to 9 spaces
	Minor road with no on-street parking: typical posted speeds 25–35 mph; bus enters stop area at 15 mph		120-ft. (36.5-m) length x 10-ft. (3.0-m) width in bus bay; add 20 ft. (6.1 m) for articulated bus	40-ft. (12.2-m) transition plus 50-ft. (15.2-m) taper		N/A
	Major road with no on-street parking: typical posted speeds 35–45 mph; bus enters stop area at 20 mph		120-ft. (36.5-m) length x 11-ft. (3.4-m) width in bus bay; add 20 ft. (6.1 m) for articulated bus	90-ft. (27.4-m) transition plus 55-ft. (16.8-m) taper		

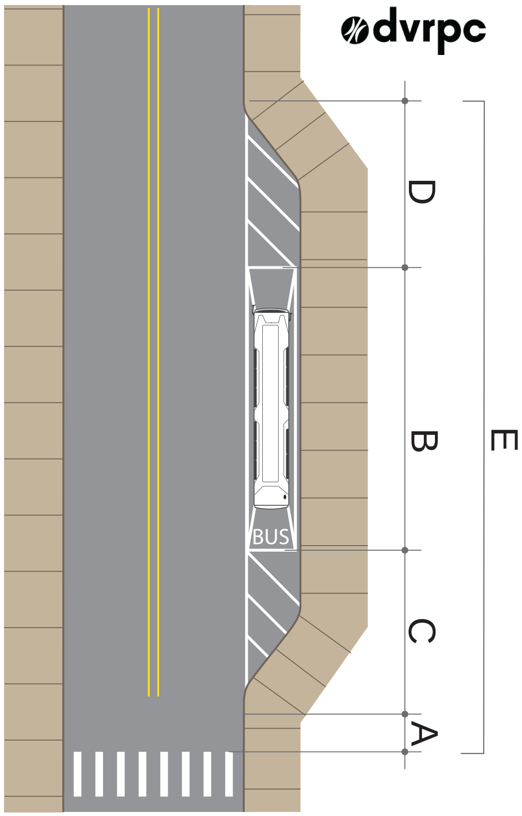
Source: DVRPC (2012).

Table 12 | Dimensional Specifications for Far-side Open Bus Bay Stop

Stop Configuration	Roadway Characteristic	Minimum Safety buffer	Primary Bus Zone Length	Additional Deceleration Space	Additional Acceleration Space	Equivalent Parking Spaces
Open bus bay stop (far side)		**A**	**B**	**C**	**D**	**E**
	<u>Urban street with on-street parking:</u> typical posted speeds 25-30 mph; Bus enters stop area at 10 mph	10 ft. (3.0m) safety buffer beyond crosswalk	120 ft. (36.5 m) length x 11 ft. (3.4 m) width in bus bay; add 20 ft. (6.1m) for articulated bus	N/A: Uses intersection to decelerate	30 ft. (9.1 m) taper	Up to 8 spaces
	<u>Minor road with no on-street parking:</u> typical posted speeds 25-35 mph; Bus enters stop area at 15 mph		120 ft. (36.5 m) length x 11 ft. (3.4 m) width in bus bay; add 20 ft. (6.1m) for articulated bus		40 ft. (12.2 m) transition plus 30 ft. (9.1 m) taper	N/A
	<u>Major road with no on-street parking:</u> typical posted speeds 35-45 mph; Bus enters stop area at 20 mph		120-ft. (36.5-m) length x 11-ft. (3.4-m) width in bus bay; add 20 ft. (6.1 m) for articulated bus		90 ft. (27.4 m) transition plus 33 ft. (10.1 m) taper	

Source: DVRPC (2012).

Table 13 | Dimensional Specifications for Midblock Open Bus Bay Stop

<table>
<tr><th>Stop Configuration</th><th>Roadway Characteristic</th><th>Minimum Safety buffer</th><th>Primary Bus Zone Length</th><th>Additional Deceleration Space</th><th>Additional Acceleration Space</th><th>Equivalent Parking Spaces</th></tr>
<tr><td>Open bus bay stop (midblock)</td><td></td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td></tr>
<tr><td rowspan="3">
</td><td><u>Urban street with on-street parking:</u> typical posted speeds 25–30 mph; bus enters stop area at 10 mph</td><td rowspan="3">10-ft. (3.0-m) safety buffer from crosswalk</td><td rowspan="2">170-ft. (51.8-m) length x 10-ft. (3.0-m) width in bus bay; add 20 ft. (6.1 m) for articulated bus</td><td>50-ft. (15.2-m) taper</td><td>30-ft. (9.1-m) taper</td><td>Up to 13 spaces</td></tr>
<tr><td><u>Minor road with no on-street parking:</u> typical posted speeds 25–35 mph; bus enters stop area at 15 mph</td><td>50-ft. (15.2-m) transition plus 50-ft. (15.2-m) taper</td><td>70-ft. (21.3-m) transition plus 30-ft. (9.1-m) taper</td><td rowspan="2">N/A</td></tr>
<tr><td><u>Major road with no on-street parking:</u> typical posted speeds 35–45 mph; bus enters stop area at 20 mph</td><td>170-ft. (51.8-m) length x 10-ft. (3.0-m) width in bus bay; add 20 ft. (6.1 m) for articulated bus</td><td>90-ft. (27.4-m) transition plus 55-ft. (16.8-m) taper</td><td>140-ft. (42.7-m) transition plus 33-ft. (10.1-m) taper</td></tr>
</table>

Source: DVRPC (2012).
Note: Open midblock bus bay stops require more acceleration and deceleration space due to the consistent flow of traffic.

Engineering Considerations to Accommodate SEPTA Buses

Knowing standard and articulated vehicle dimensions, clearances, and turning radii are important when designing a new stop in SEPTA's network. In addition, there is value in understanding pedestrian sight lines and sight distances for vehicle operators along corridors and intersections with public transit.

Vehicle dimensions for buses in the United States are commonly 40 feet (12.2 meters) long for a standard bus and 60 feet (18.3 meters) for an articulated bus. SEPTA's fleet currently consists of six types of vehicles that are 40–43 feet in their vehicle length (including body and bumper) and one 60-foot or articulated vehicle, which is 62 feet including the bumper.

Consideration in the bus zone should also be given to the loading and unloading of **bicycles from the front-of-bus rack, which adds an additional six feet (1.8 meters)** to the loading zone vehicle length. **Vehicle height is 11.1 feet (3.4 meters) for both types.**

In-street stop design also requires consideration of **horizontal and vertical clearances** for both passengers and vehicles. The curbside stop area should be free of horizontal obstructions at least two feet (0.6 meter) from the curb face. Vertical obstructions should be clear from the loading area surface to a height of at least nine feet (2.7 meters), and preferably 12 feet (3.7 meters) or more.

Turning radii are important considerations for stop locations where the bus makes a turn or deviates from its primary corridor. The required turning radius must be accommodated so a bus will not halt in the pedestrian way or impede other traffic flow. Figure 8 illustrates the specific radii requirements.

As a general rule to permit comfortable bus movements, corners should be designed for 50 feet (15.24 meters) outside and 30 feet (9.14 meters) inside turning radii. At the time of this report the vehicle types in service and their standard turning radius are listed below.

- New Flyer 40' Hyrbid Bus: Turning Radius 44';
- Proterra 40' Electric Bus: Turning Radius 42';
- Nova 40' Bus: Turning Radius 41';
- New Flyer 40' Hybrid Bus: Turning Radius 44';
- New Flyer 40' Diesel Bus: Turning Radius 44';
- New Flyer Trackless Trolley 40': Turning Radius 44'; and
- Nova Bus 60' Articulated Bus: Turning Radius 44'.

Therefore, Figure 8 recommends using a conservative estimate so that any of the above vehicles can be accommodated.

Bus lane with multiple waiting areas, Metroplex Shopping Center, Plymouth Meeting, Pennsylvania

Source: SEPTA (2012).

PEDESTRIAN SIGHT LINES AND OPERATOR SIGHT DISTANCES FOR BUS STOP DESIGN

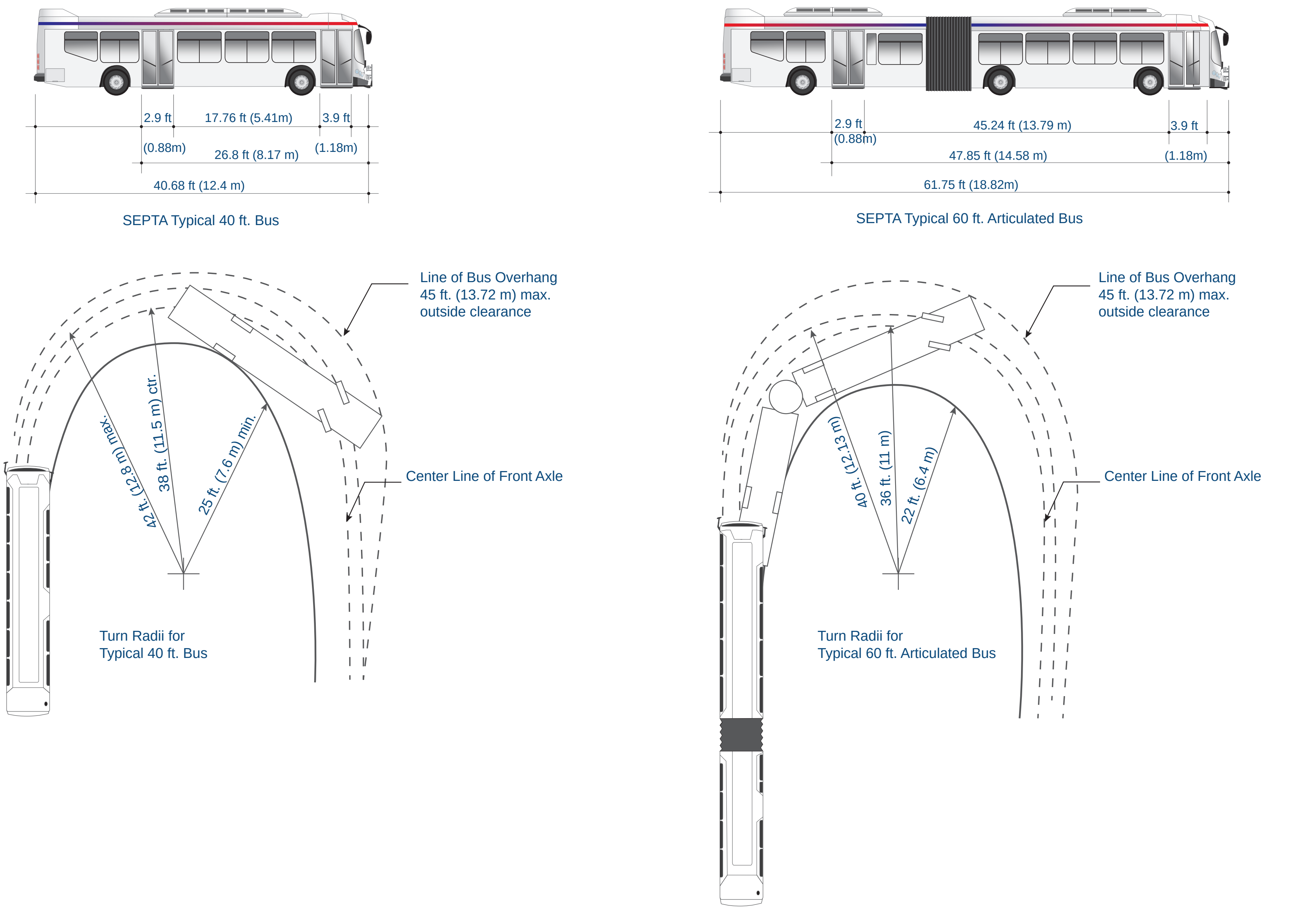
Pedestrians at or near bus stops are often in the visibility impairment zones, or blind spots of bus operators, and therefore the operator may not be able to see pedestrians. This is particularly true for right-turning bus movements, due to a particularly large blind spot on the right side of the bus.

Therefore, when designing for a new bus stop, relocating an existing one, or altering the space around an existing bus stop, sight lines for a pedestrian and sight distances for a bus operator should be designed for and considered. Sight triangles can be used as a tool to determine where building setbacks, parking zones, advertising signs, trees, and landscaping should be removed, located, or relocated. Considering the placement of these elements at a bus stop is important for the safety of a pedestrian, vehicle operator, and passengers.

In practice each intersection varies in geometry, volumes, and cross section making it difficult to generalize how pedestrian sight lines and operator sight distances at a bus stop should be implemented. For more information on how to calculate sight distances at a particular location, please see TransLink's Bus Infrastructure Design Guidelines.[1]

[1] *TransLink's Bus Infrastructure Design Guidelines (Revised September 2018).*

Figure 8 | Turning Radii for SEPTA Standard and Articulated Buses



Sources: DVRPC (2012), AASHTO 2002 (Interim Guide, Geometric Design for Transit Vehicles on Highways and Streets).

Roadway Paving Considerations

Roadway design should accommodate the wear and tear of constant vehicle traffic and passenger loading. A transit stop's road surface should be durable enough to withstand heavier loads than average daily traffic under normal conditions. Traffic flow may be disrupted due to excessively damaged road surfaces, which would also increase vehicle maintenance needs.

In general, roadway pavement design must be evaluated using the American Association of State Highway and Transportation Officials' (AASHTO) *Guide for the Design of Pavement Structures*. Most states and many municipalities have a version of this standard, which would be used to engineer the appropriate design for a particular site and climate condition. Some basic steps used to evaluate an appropriate paving surface required for a bus stop location would include:

- Defining a scope of work: Identify what considerations will be needed for a location. Evaluate the type of paving required (new paving, reconstruction, resurfacing, or reclaiming existing paving). Identify the type of paving treatment desired: flexible Hot Mix Asphalt (HMA), rigid (concrete), composite (combination HMA and concrete), or permeable (porous asphalt or pavers) treatments may be considered.

- Collecting data: Perform field investigation of site, drainage, soils, etc. Determine site design criteria, including the bus loading areas and the bus travel path to determine lane widths and necessary turning radii. If existing paved areas are to be reused, determine the thickness, composition, and sub-base conditions. Test existing conditions to determine suitability to add bus transit to the location.

- Collect traffic data: The Annual Average Daily Traffic along the roadway must be determined using current traffic count data plus estimated traffic counts for the next 20 years. Traffic counts are used to estimate a cumulative traffic load, typically in units of equivalent single axle loads, which then is used in the pavement design process. For more information on this subject please see the Federal Highway Administration's Pavement Design Considerations webpage (https://www.fhwa.dot.gov/pavement/cfr06261.cfm).

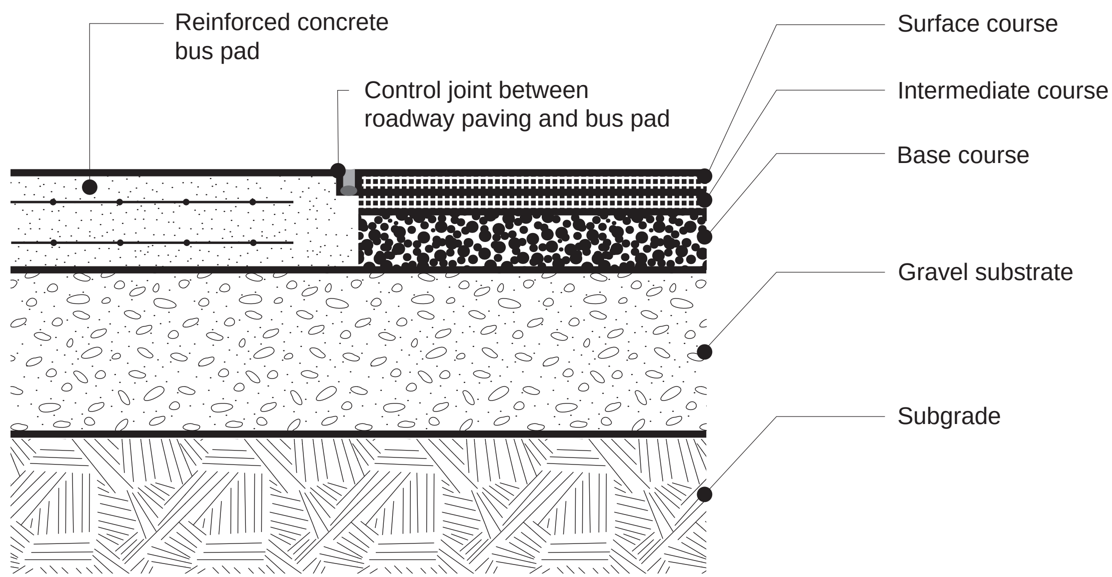
- Determine the final design criteria based upon all the information gathered from previous steps. All roadway or parking area designs where transit service is provided must be reviewed by a qualified engineer to ensure that the roadway can reasonably withstand regular transit use.

Concrete pad in street at bus stop area, Suburban Square, Ardmore, Pennsylvania
Source: SEPTA (2012).

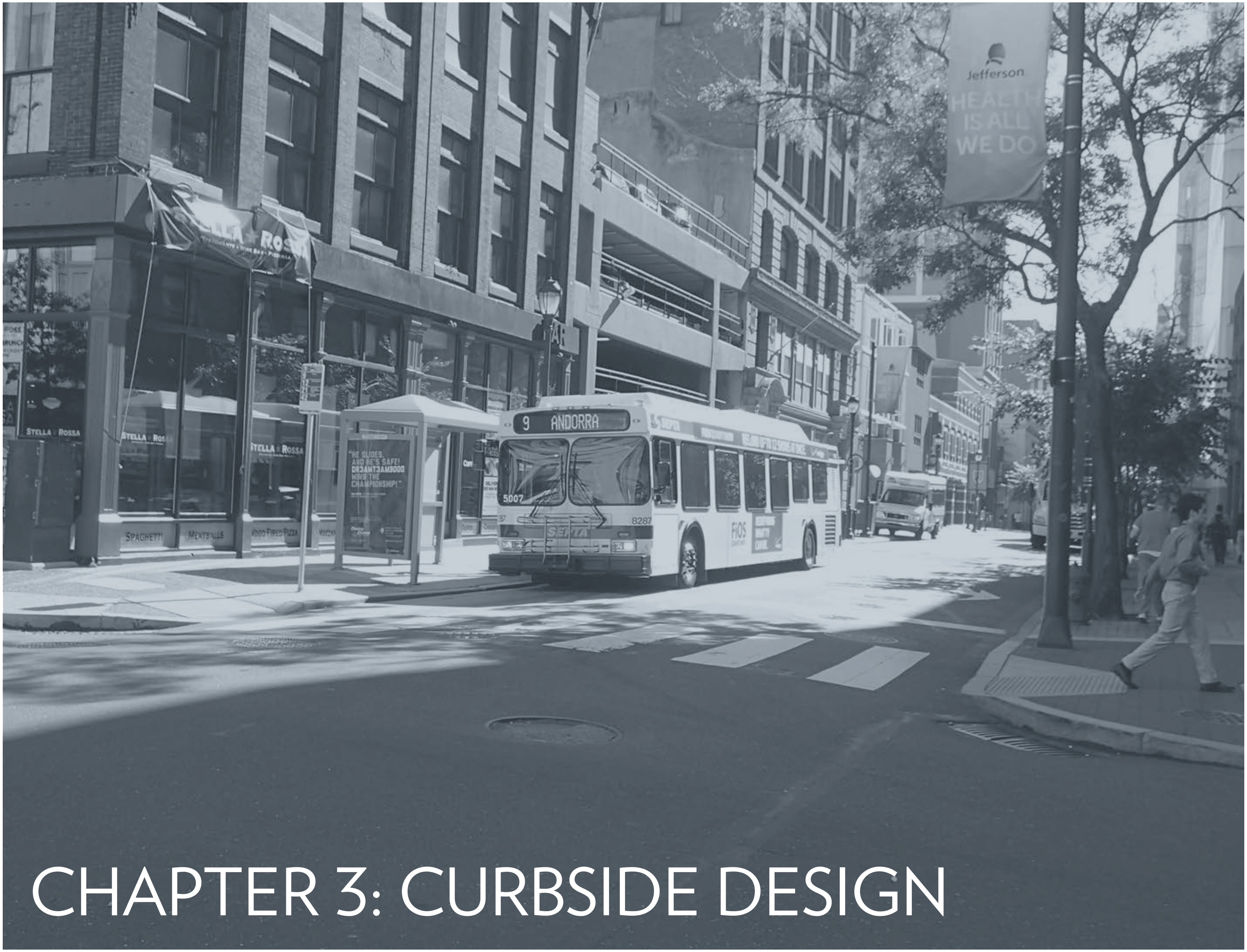
A reinforced concrete pad is recommended for bus stop areas, particularly in park-and-ride, depot, and end-of-line situations, where multiple routes and heavier loads can be expected. A concrete pad can be incorporated or retrofitted into the roadway design to provide a heavy-duty surface that will handle constant heavy vehicle stress; however, local conditions must be evaluated to determine the best design for a particular site.

Figure 9 illustrates typical asphalt and concrete cross-sections to accommodate transit. However, because SEPTA is not the final evaluating authority, all roadway recommendations should be based upon local construction and safety code requirements. Consult with local officials, engineering professionals, and design professionals for specific details.

Figure 9 | Flexible Paving Components for High-Volume Roadway



Source: DVRPC (2012).



CHAPTER 3: CURBSIDE DESIGN

Source: DVRPC (2018).

Source: DVRPC (2016).

Curbside design addresses all aspects of spatial design of a bus stop, including the interaction between the vehicle and operator and the stop and the space reserved for passengers to wait for and board the transit vehicle. Curbside design also deals with the connectivity between the bus stop and nearby development. The Delaware Valley Regional Planning Commission (DVRPC) surveyed stakeholders about bus stop and curbside design; the results can be found in Appendix B.

Universal Design and ADA

Universal design means that facilities for transportation are designed to be used easily not only by those with disabilities, but also by users who may be temporarily encumbered, such as someone carrying a large load of groceries, a parent with a stroller, or someone temporarily using crutches. Special attention is given to the path of travel for pedestrians to the bus stop, the loading area clearances, and any furnishings that may be part of the bus stop. All new or newly renovated facilities must be designed and upgraded to meet current ADA accessibility standards.

FEDERAL REGULATIONS

Section 3.1.3, "Bus Stops," in FTA Circular 4710.1 provides recommendations for connecting bus stops to existing streets, sidewalks, or paths in order to make it possible for someone with a disability or temporarily encumbered to access the bus stop and the surrounding area. These regulations are included in this set of guidelines. The FTA Circular also specifies the size, construction, and slope of the boarding and alighting area (or a loading area, as defined in this document). Page 3A-4 provides a helpful checklist for bus stop design that ensures that the stop and connections are accessible to riders with disabilities.

SEPTA Curbside Passenger Facility Design

As shown in Figure 10, curbside passenger facilities have three primary elements:

- a loading area, which provides ample space for loading and unloading passengers (this includes a **clear area,** defined further below);
- a waiting area; and
- an accessible pedestrian path to reach the stop.

Appropriate stop dimensions and elements are determined using factors such as passenger volume, nearby trip generation, and local needs. When evaluating stops, consideration should be given to persons with disabilities. Design guidelines for the following specific stop types are detailed throughout this chapter.

LOADING AREA

A level loading area should be provided at a minimum where the front doors of the bus open to receive and discharge passengers (shown in the photo on the right). Locating a **clear area** at the front of the bus allows easy deployment of the front door ramp or the kneeling feature of the vehicle for disabled or temporarily incumbered persons.

When possible, a second loading pad should also be installed to provide space for passengers alighting from the bus's rear doors. This space is not recommended for planters, green stormwater infrastructure, tree trenches, or street furniture. Green stormwater infrastructure (GSI) includes a range of soil-water-plant systems that intercept stormwater, infiltrate a portion of it into the ground, evaporate a portion of it into the air, and in some cases release a portion of it slowly back into the sewer system.[1]

[1] *Philadelphia Water Department, www.phila.gov/water/sustainability/protectingwaterways/Pages/default.aspx (2018).*

Figure 10 | Curbside Facility Elements

Source: DVRPC (2019), Delaware County Planning Department (2010).

Loading areas and pads should be a minimum of five feet (1.5 meters) wide along the curb by eight feet (2.4 meters) deep, which is the ADA standard. Loading pads can be configured with a detectable edge to be easily located by drivers and passengers, and should comprise a firm, slip-resistant surface suitable for use in all weather conditions.

WAITING AREA

A bus stop waiting area should be sized to reflect expected passenger volumes and, at a minimum, be wide enough at the curbline to provide a safe place for passengers to wait outside of the loading area. In locations where both pedestrian volumes and the number of transit passengers expected to use a stop are relatively low, the waiting area may overlap with the pedestrian path. Where pedestrian and/or passenger volumes are higher, care should be given to separate the waiting area and pedestrian path to the greatest extent practical. SEPTA ridership information can be accessed using the following web portal: http://septaopendata-septa.opendata.arcgis.com/.

A detectable edge at the curbline that clearly defines the bus stop is desirable and can be comprised of any appropriate material in a contrasting color. Well-defined waiting and loading areas speed up passenger movements. The surface must be durable, slip resistant, and free of horizontal or vertical obstructions or tripping hazards. All clearances must meet ADA Accessibility Guidelines (ADAAG) 2010 criteria and local codes. The relevant criteria is in Section 810. Refer to Tables 14–20 for dimensions and examples.

Space allocation for detailed waiting area calculations: *The Transit Capacity and Quality of Service Manual* (TCQSM; TCRP Report 100, 2nd edition) indicates in Exhibit 7-8 (Levels of Service for Queuing Areas, page 7-14) that a standing waiting area should consist of seven square feet (0.65 m²) per person net area to achieve a level of service between C and D. The net area is defined as the area remaining after subtracting the areas reserved for pedestrian paths and the bus loading pad from the total area. Excluding the ADA-specified clearances for the loading pad and other furnishings, additional clearance space for obstructions by local barriers, such as poles or hydrants, should be evaluated.

IMPACT OF ADDING A TURN LANE AT A BUS STOP

To add capacity to a roadway, turn lanes are often recommended. These lanes often conflict with bus stops and cause signifcant challenges for high-quality transit services. Impacts can include:

› potential conflict points between a bus stopped out of the main travel lane that will be proceeding straight with a turning vehicle;

› the available street frontage for locating a bus stop or possible justification for a relocation that impacts customers;

› situations where bus stop pairs cannot be easily co-located to allow for round-trip travel;

› depending upon design, creating longer crossings of roadways, which is especially important for persons with mobility challenges; and

› when a stop must move away from intersection, bus passengers may cross street outside of crosswalk.

Traffic engineers should be particularly careful, when proposing new turn lanes, to take into account issues related to bus stops. It is strongly suggested that preliminary design plans be shared with SEPTA, which may lead to additional feedback or field inspections to determine the justification and feasibility of relocating a bus stop. Engineers should build these reviews into their plan approval and permit submittal timelines.

The waiting area typically extends outside of a shelter (if present) to connect with the loading area.
Source: Chester County Planning Commission (2019).

Large shelters, such as this one at Montgomery County Community College, can accommodate higher numbers of waiting passengers.
Source: SEPTA (2012).

ACCESSIBLE PEDESTRIAN PATH TO BUS STOP

A minimum four-foot (1.2-meter)-wide clear pedestrian path should be provided for access to the bus stop waiting area and loading area. A sidewalk that connects the bus stop to adjacent development or neighborhoods is the most common solution. However, both a sidewalk or trail can provide a clear pedestrian path to and from the bus stop area, the bus stop loading pad, and the bus shelter or bench, when present.

A stop location adjacent to a trail can be accommodated by providing a short pedestrian link to the bus pad and waiting area. The trail can be used as a loading pad if it is wide enough to provide pedestrian passing space in addition to the loading pad area and is located adjacent to the roadway. Cinder, gravel, or dirt trail surfaces are not suitable to withstand wear from waiting passengers. A hard or impervious surface can be incorporated into the area of the trail used for the bus stop.

The placement of stormwater management facilities, including storm inlets, vegetation, and rain gardens, should be coordinated with SEPTA. This will avoid creating conditions where either door entrance is blocked or there is the potential for ponding.

When a bus stop is required in an area that does not have a formal sidewalk, a portion of the pedestrian path may be located within the shoulder unless pedestrian use of the shoulder is prohibited. For such use, the shoulder should be eight feet (2.4 meters) wide, have slopes not exceeding 5 percent, and cross slopes and running slopes equal to the roadway geometry but not more than 8.3 percent in the direction of roadway travel.

Pedestrian path and multiuse trail connecting to bus stop.
Source: Delaware County Planning Department (2017).

Pedestrian path connecting stop area to surrounding development.
Source: SEPTA (2012).

Safe Access to Bus Stops

Creating consistency in access to bus stops in SEPTA's service area should be a priority for municipalities, developers, and other planning partners. While SEPTA does not have the authority to implement these improvements, the agency can be a partner in pursuing and advocating for them. This section lists four ways to facilitate safer access to bus stops.

ACCESS MANAGEMENT[1]

Consolidating driveways, reducing the total number of access points, and increasing the spacing between driveways are all forms of access management. Implementing these techniques can prevent conflicts between roadway users (e.g., transit vehicles, automobile traffic, and non-motorized users). This is true for any corridor; however, it may have the opportunity to make a bigger impact on a transit corridor, where there are likely more pedestrians.

CONTROLLED INTERSECTIONS

SEPTA encourages stops at controlled intersections, or a location with a form of traffic control (e.g., stop sign, traffic signal, yield sign) because street crossings are generally safer at intersections due to the presence of curb ramps and other benefits of accessibility, and for the following other reasons:

- driver behavior; cars expect to see pedestrians at intersections; and
- crossing and walking distances between origins, destinations, and other stops are likely shorter.

NON-MOTORIZED FACILITIES[2]

When SEPTA passengers are trying to get to or from the bus stop, it is beneficial for their safety and the flow of traffic for them to connect to separate non-motorized facilities, such as sidewalks, crosswalks, trails, or sidepaths, to use to reach their destination.

Municipalities should work to complete the pedestrian network where there are bus stops. SEPTA is an advocate for direct, paved, ADA-compliant pedestrian connections to their stops. DVRPC has developed a sidewalk inventory that can be used to find where sidewalks exist and where they do not. Municipalities can use this tool to plan for and prioritize where new sidewalk facilities should be built.[3]

More information about the design specifics for non-motorized facilities can be found later in this chapter, as well as in the following chapter.

TRAFFIC CALMING

At bus stop locations where there are high pedestrian volumes and vehicle speeds are higher, traffic calming

Pedestrian path connecting stop area to surrounding development in Cheltenham, PA
Source: Google (2019).

[1] Michigan standards call for 115–230 feet between unsignalized intersections and driveways: "Standards for Access, Non-Motorized, and Transit," in Washtenaw County Access Management Plan (Ann Arbor: Michigan Department of Transportation, 2008), 23.
[2] Philadelphia Streets Department, Philadelphia Complete Streets Handbook (2017).

[3] DVRPC, www.dvrpc.org/Walk/ (2019).

may be warranted. The purpose of traffic calming is to create a more comfortable pedestrian environment by putting in interventions that lower vehicle speeds on local or neighborhood streets without restricting vehicle volumes.

In conjunction with bus stops, this could include but is not limited to no right-turn-on-red at intersections; traffic channelizers (chicanes), visual cues such as pedestrian signage and rapid flashing beacons, median landscaping, pedestrian refuge islands, bulbs, speed tables, bumpouts and GSI[4], wider sidewalks, defined parking bays or diagonal parking, raised medians, bike lanes, rumble strips, and lighting.

If a municipality is interested in introducing traffic calming techniques along a corridor or at an intersection that is served by transit, there should be coordination to ensure improvements will enhance safe connections rather than inhibiting service.

Detailed Dimensions for Curbside Passenger Facilities

Figures 11-16 and the associated Tables 14-20 illustrate detailed dimensions and specifications for common curbside stop types and operating contexts. **Each stop type includes the basic building block of a five-foot (1.5-meter)-long parallel to the curb by eight-foot (2.4-meter)-deep loading pad connected to a pedestrian path that is four feet (1.2 meters) wide or wider, as called for by local sidewalk standards.**

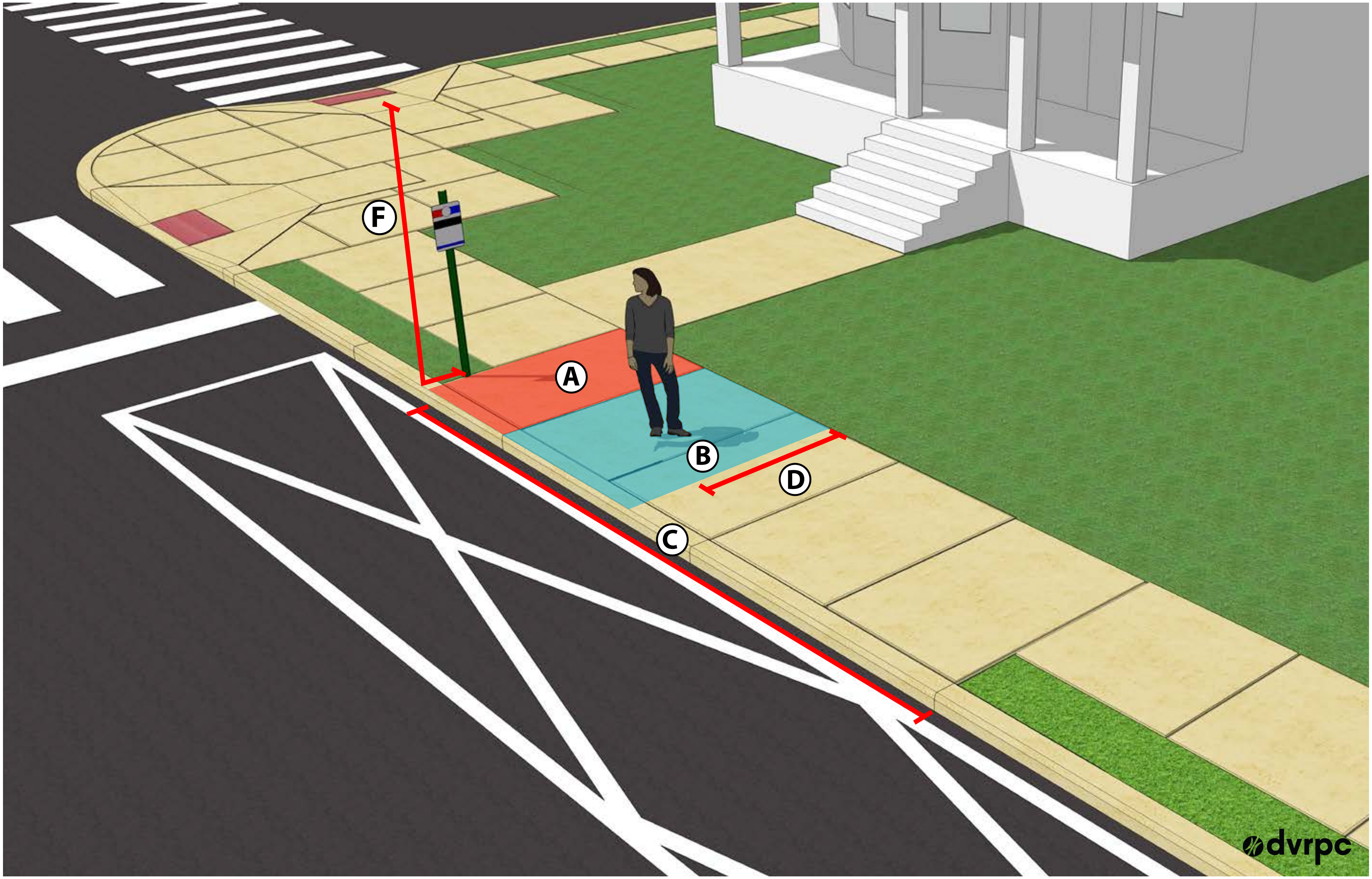
Waiting areas are separate from the loading pad. Bus stops can be sized to meet community-specific needs; however, the minimum bus loading pad should be maintained.

The reference figures and tables are not intended to be exhaustive since every situation has unique characteristics. Rather, they should be used as guidance to inform design decisions based on local needs.

[4] *Philadelphia Water Department, www.phila.gov/water/ (2018).*

A bus stop near a signed pedestrian crossing in Bryn Mawr, Pennsylvania
Source: Google (2018).

Figure 11 | Type 1: Minimum Stop with Recessed Pedestrian Path



Source: DVRPC (2019).

Table 14 | Dimensional Specifications Type 1: Minimum Stop with Recessed Pedestrian Path

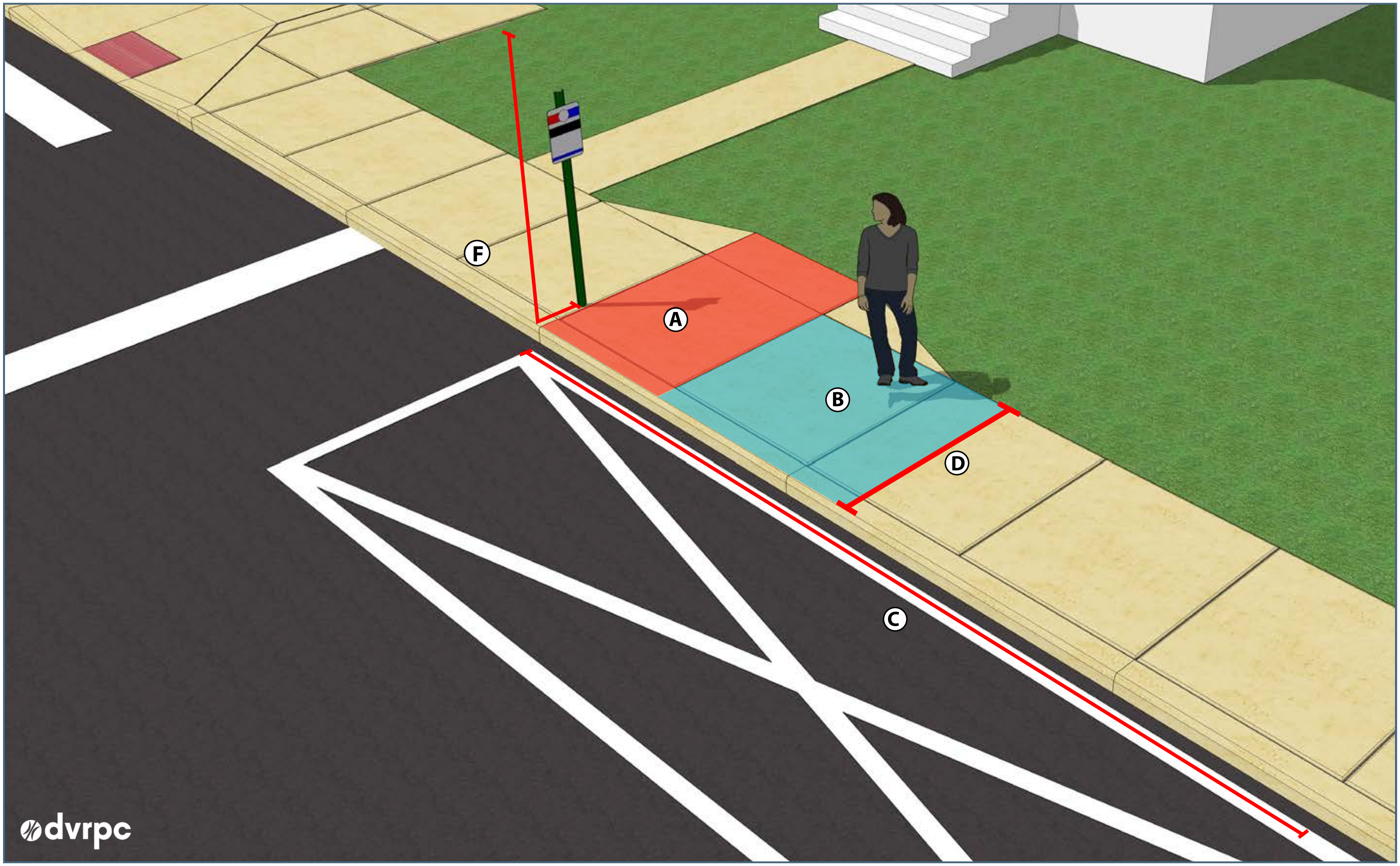
Element		Details
A	Loading Pad	5 ft. (1.5 m) long x 8 ft. (2.4 m) deep; pad must be firm, stable, and slip resistant, and connected to the pedestrian path. Provides a 5-ft. (1.5-m) diameter clear turning radius for wheelchair users. Sign should be located adjacent to the loading pad to clearly indicate bus stop.
B	Waiting Area	7 ft. (2.1 m) long x 4 ft. (1.2 m) deep (minimum); waiting area can be accommodated in the pedestrian path if pedestrian volumes are low. Provides enough area for 4 passengers at 7 sq. ft (0.65 m²) per person, 28 sq. ft (2.6 m²) total.
C	Stop Area	A 26-ft. (7.9-m) area along the curbline should be kept free from obstructions. The length should provide free access to the vehicle's front door.
D	Pedestrian Path	Minimum 4 ft. (1.2m) deep pedestrian path, or wider, as called for by local sidewalk standards, along a sidewalk or similar walkway. Should be a firm, stable, and slip-resistant surface connected to the loading pad. Wider path is desirable to provide space for passing.
E	Furniture	N/A
F	Clear Area	Clear space is required for the bus to pull over to allow passengers to board from the curb. The clear area should be 2 ft. (0.6 m) from the curb edge, 9 ft. (2.7 m) in minimum height.

Source: DVRPC (2019).

A minimum stop example in Media, Pennsylvania

Source: Google (2018).

Figure 12 | Type 2: Minimum Stop with Curbside Pedestrian Path



Source: DVRPC (2019).

Table 15 | Dimensional Specifications Type 2: Minimum Stop with Curbside Pedestrian Path

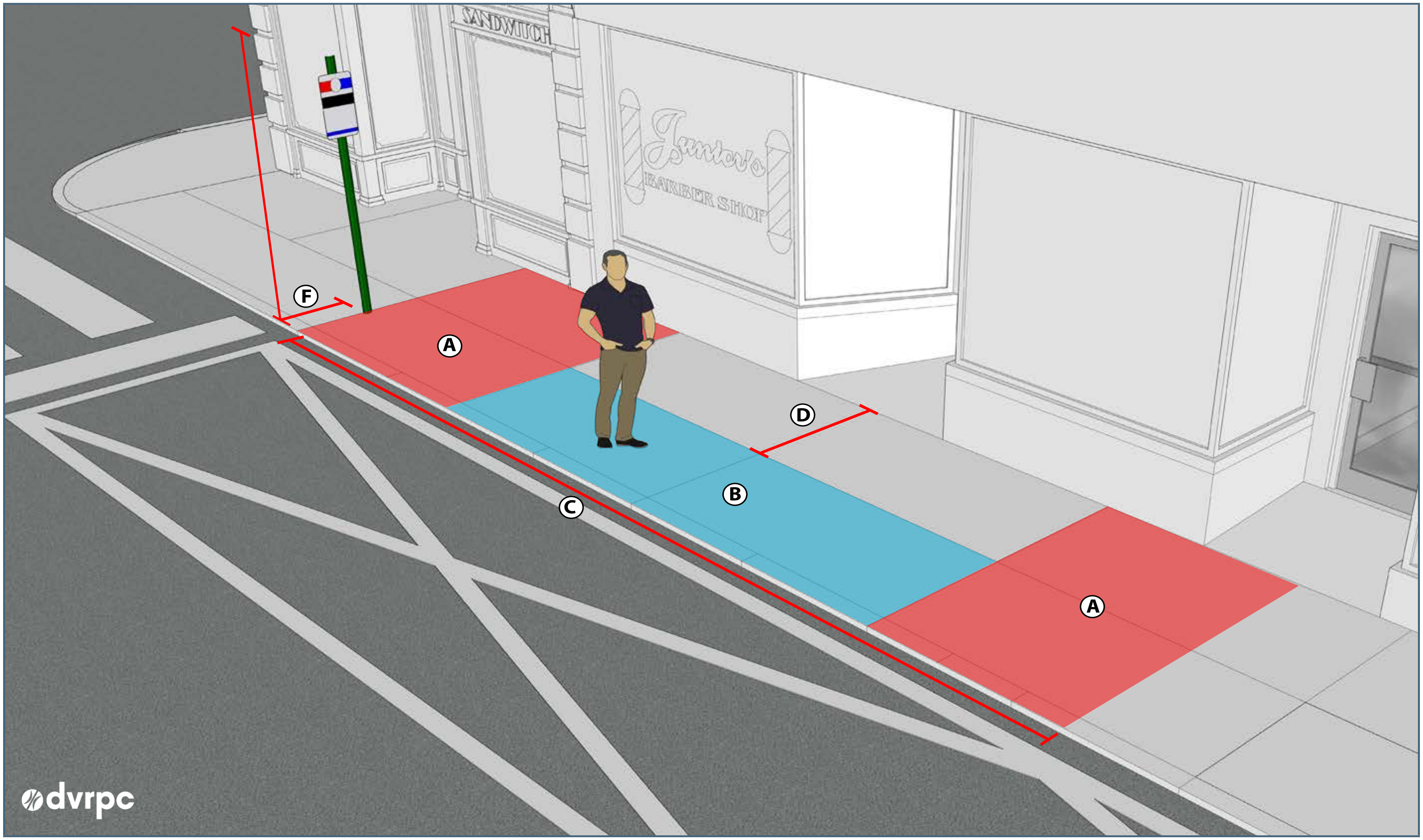
Element		Details
A	Loading Pad	5 ft. (1.5 m) long x 8 ft. (2.4 m) deep; pad must be firm, stable, and slip resistant, and connected to the pedestrian path. Provides a 5-ft. (1.5-m) diameter clear turning radius for wheelchair users. If sidewalk is less than 5 ft. in width, the creation of flaired sidewalk segment should be included when possible. Sign should be located adjacent to the loading pad to clearly indicate bus stop.
B	Waiting Area	7 ft. (2.1 m) long x 4 ft. (1.2 m) deep; waiting area can be accommodated in the pedestrian path if pedestrian volumes are low. Provides enough area for 4 passengers at 7 sq. ft. (0.65 m²) per person, 28 sq. ft. (2.6 m²) total.
C	Stop Area	A 26-ft. (7.9-m) area along the curbline should be kept free from obstructions. The length should provide free access to the vehicle's front doors.
D	Pedestrian Path	Minimum 4-ft. (1.2-m)-deep pedestrian path, or wider, as called for by local sidewalk standards, along a sidewalk or similar walkway. Should be a firm, stable, and slip-resistant surface connected to the loading pad. Wider path is desirable to provide space for passing.
E	Furniture	N/A
F	Clear Area	2 ft. (0.6 m) from the curb edge, 9 ft. (2.7 m) minimum height.

Source: DVRPC (2019).

A minimum stop example in Media, Pennsylvania

Source: Google (2018).

Figure 13 | Type 3: Narrow Urban Stop with Curbside Pedestrian Path



Source: DVRPC (2019).

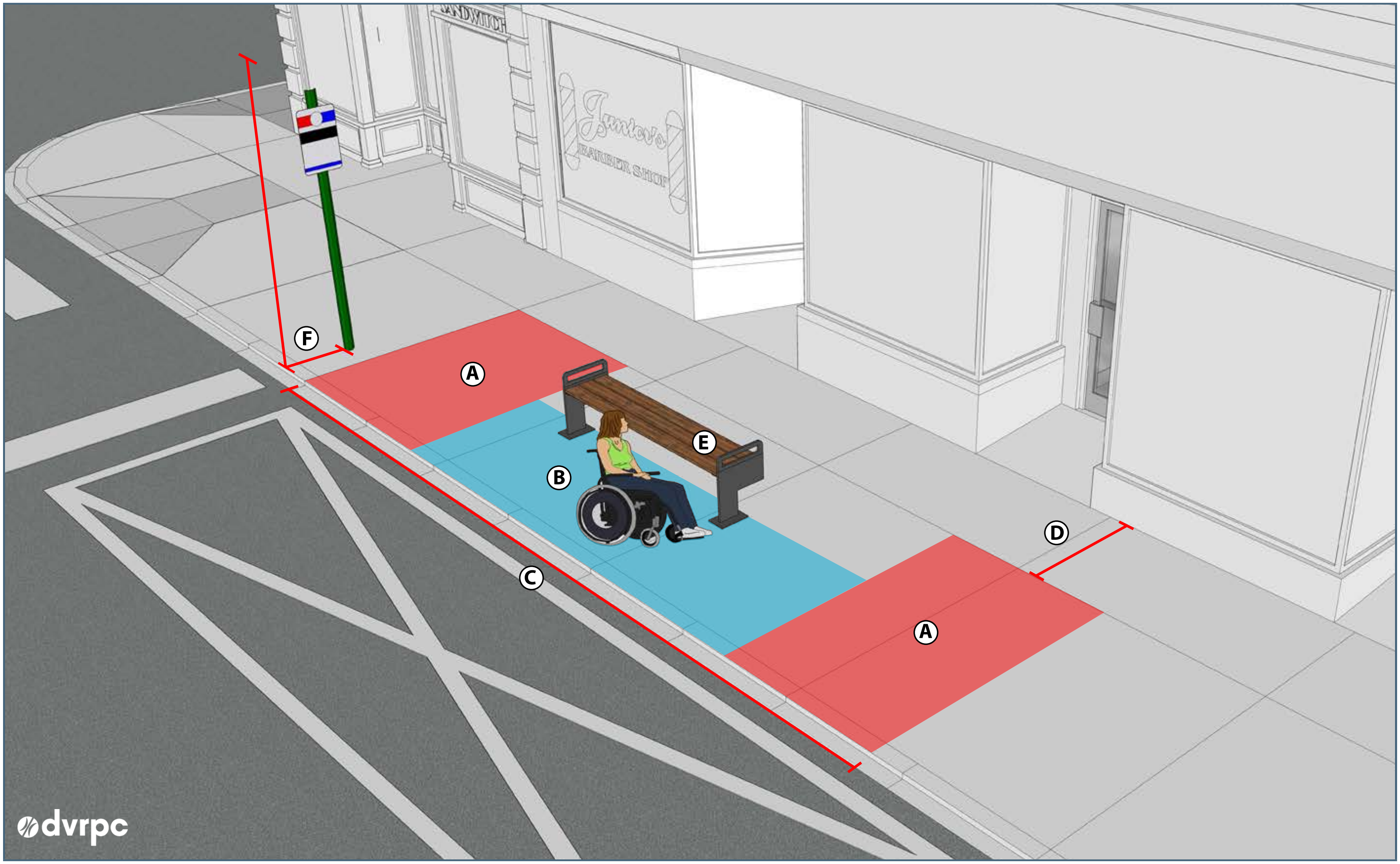
Table 16 | Dimensional Specifications Type 3: Narrow Urban Stop Design Elements

Element		Details
A	Loading Pad	5 ft. (1.5 m) long x 8 ft. (2.4 m) deep; pad must be firm, stable, and slip resistant, and connected to the pedestrian path. Provides a 5-ft. (1.5-m) diameter clear turning radius for wheelchair users. Where possible, loading pads should be provided for both front and rear doors to accommodate more passengers boarding and alighting. Sign should be located adjacent to the front loading pad to clearly indicate bus stop.
B	Waiting Area	16 ft. (4.6 m) long x 4 ft. (1.2 m) deep between bus doors; waiting area can be accommodated in the pedestrian path if pedestrian volumes are low. Provides enough area for 9 passengers at 7 sq. ft. (0.65 m²) per person, 64 sq. ft. (6.0 m²) total.
C	Stop Area	26-ft. (7.9-m)-long area should be kept free from obstructions along the curb edge. The length should provide free access to vehicle's front and rear doors.
D	Pedestrian Path	Minimum 4-ft. (1.2-m)-deep pedestrian path, or wider, as called for by local sidewalk standards, along a sidewalk or walkway. Should be a firm, stable, and slip-resistant surface connected to the loading pad.
E	Furniture	N/A
F	Clear Area	2 ft. (0.6 m) from the curb edge, 9 ft. (2.7 m) minimum height.

Source: DVRPC (2019).

A narrow urban stop example in Philadelphia, Pennsylvania
Source: Google (2018).

Figure 14 | Type 4: Urban Stop with Seating



Source: DVRPC (2019).

Table 17 | Dimensional Specifications Type 4: Urban Stop with Seating

Element		Details
A	Loading Pad	5 ft. (1.5 m) long x 8 ft. (2.4 m) deep; pad must be firm, stable, and slip resistant, and connected to the pedestrian path. Provides a 5-ft. (1.5-m) diameter clear turning radius for wheelchair users. Where possible, loading pads should be provided for both front and rear doors to accommodate more passengers boarding and alighting. Sign should be located adjacent to the front loading pad to clearly indicate bus stop.
B	Waiting Area	16 ft. (4.6 m) long x 6 ft. (1.8 m) deep between bus doors; waiting area can be accommodated in the pedestrian path if pedestrian volumes are low. After subtracting the bench dimension, waiting area provides enough space (86 sq. ft.; 8.0 m²) for 12 standing passengers at 7 sq. ft. (0.65 m²) per person, plus seating space for 3.
C	Stop Area	26-ft. (7.9-m)-long area should be kept free from obstructions along the curb edge. The length should provide free access to vehicle's front and rear doors.
D	Pedestrian Path	Minimum 4-ft. (1.2-m)-deep pedestrian path, or wider, as called for by local sidewalk standards, along a sidewalk or walkway. Should be a firm, stable, and slip-resistant surface connected to the loading pad. Wider path is desirable to provide space for passing.
E	Furniture	6.5-ft. (2-m)-long bench, 3 seats with hand rails for seniors and those with disabilities. Made of a durable material, with or without a back. Keep at least 3 ft. (0.9 m) clear around all furniture, which should be located close to the street or adjacent to buildings rather than in the middle of the primary pedestrian path. See the next chapter for more details.
F	Clear Area	2 ft. (0.6 m) from the curb edge, 9 ft. (2.7 m) minimum height.

Source: DVRPC (2019).

An urban stop with seating in West Chester, Pennsylvania

Source: Google (2018).

An urban stop with seating in Lansdowne, Pennsylvania

Source: Google (2018).

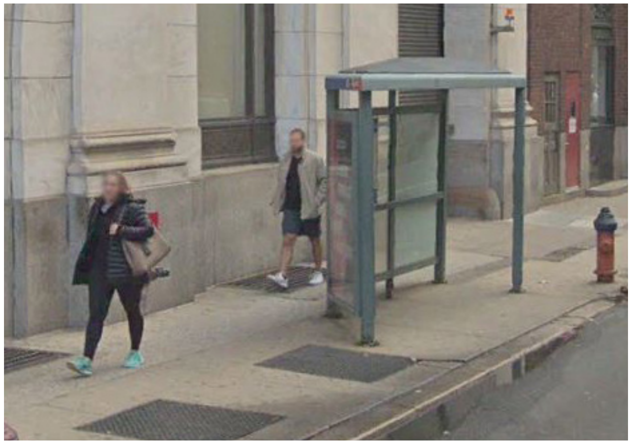
Figure 15 | Type 5: Stop with Narrow Shelter

Source: DVRPC (2019).

Table 18 | Dimensional Specifications Type 5: Urban Stop with Narrow Shelter Design Elements

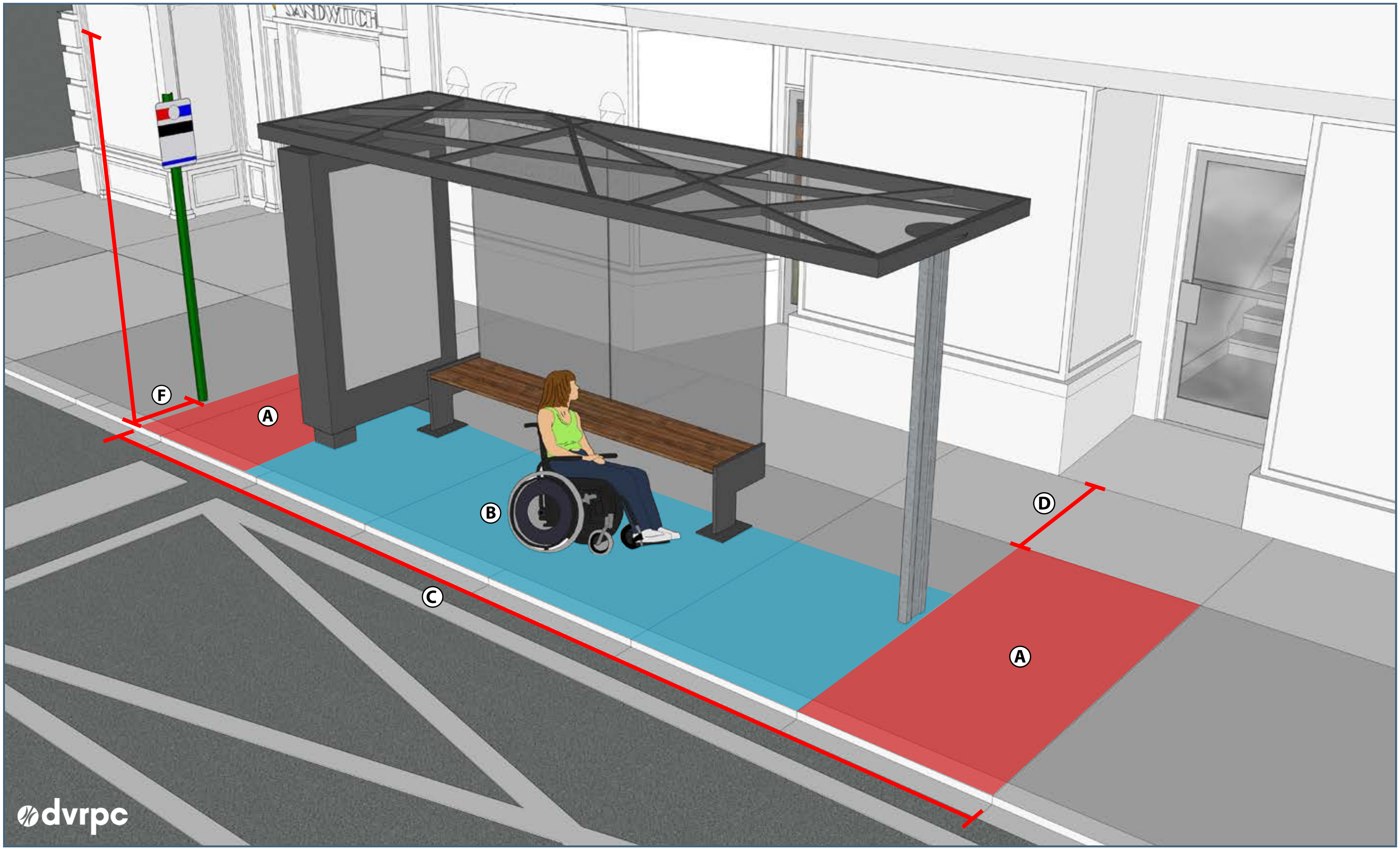
Element		Details
A	Loading Pad	5 ft. (1.5 m) long x 8 ft. (2.4 m) deep; pad must be firm, stable, and slip resistant, and connected to the pedestrian path. Provides a 5-ft. (1.5-m) diameter clear turning radius for wheelchair users. Where possible, loading pads should be provided for both front and rear doors to accommodate more passengers boarding and alighting. Sign should be located adjacent to the loading pad to clearly indicate bus stop.
B	Waiting Area	16 ft. (4.6 m) long x 4 ft. (1.2 m) deep between doors; waiting area can be partially accommodated in the pedestrian path if pedestrian volumes are low. Provides enough net area for 9 passengers, including 6 within the shelter at 7 sq. ft. (0.65m ^{2}) per person, 64 sq. ft. (6.0 m^2) total. Shelter design and configuration may vary.
C	Stop Area	26-ft. (7.9-m)-long area should be kept free from obstructions along the curb edge. The length should provide free access to vehicle's front and rear doors.
D	Pedestrian Path	Minimum 4-ft. (1.2-m)-deep pedestrian path, or wider, as called for by local sidewalk standards, along a sidewalk or walkway. Should be a firm, stable, and slip-resistant surface connected to the loading pad. Keep 3 ft. (.9m) clear around all street furniture and building elements.
E	Furniture	15-ft. (4.6-m)-long x 3-ft. (0.9-m)-wide x 9-ft. (2.7-m)-high shelter with lean rail, stop information, and advertising panel. Glass panels allow view of arriving bus and weather protection. 45 interior sq. ft. (4.2 m^2) can accommodate 6 passengers.
F	Clear Area	2 ft. (0.6 m) from the curb edge, 9 ft. (2.7 m) minimum height.

Source: DVRPC (2019).



A narrow shelter in Philadelphia, Pennsylvania
Source: Google (2018).

Figure 16 | Type 6: Stop with Standard Shelter



Source: DVRPC (2012).

Table 19 | Dimensional Specifications Type 6: Stop with Standard Shelter Design Elements

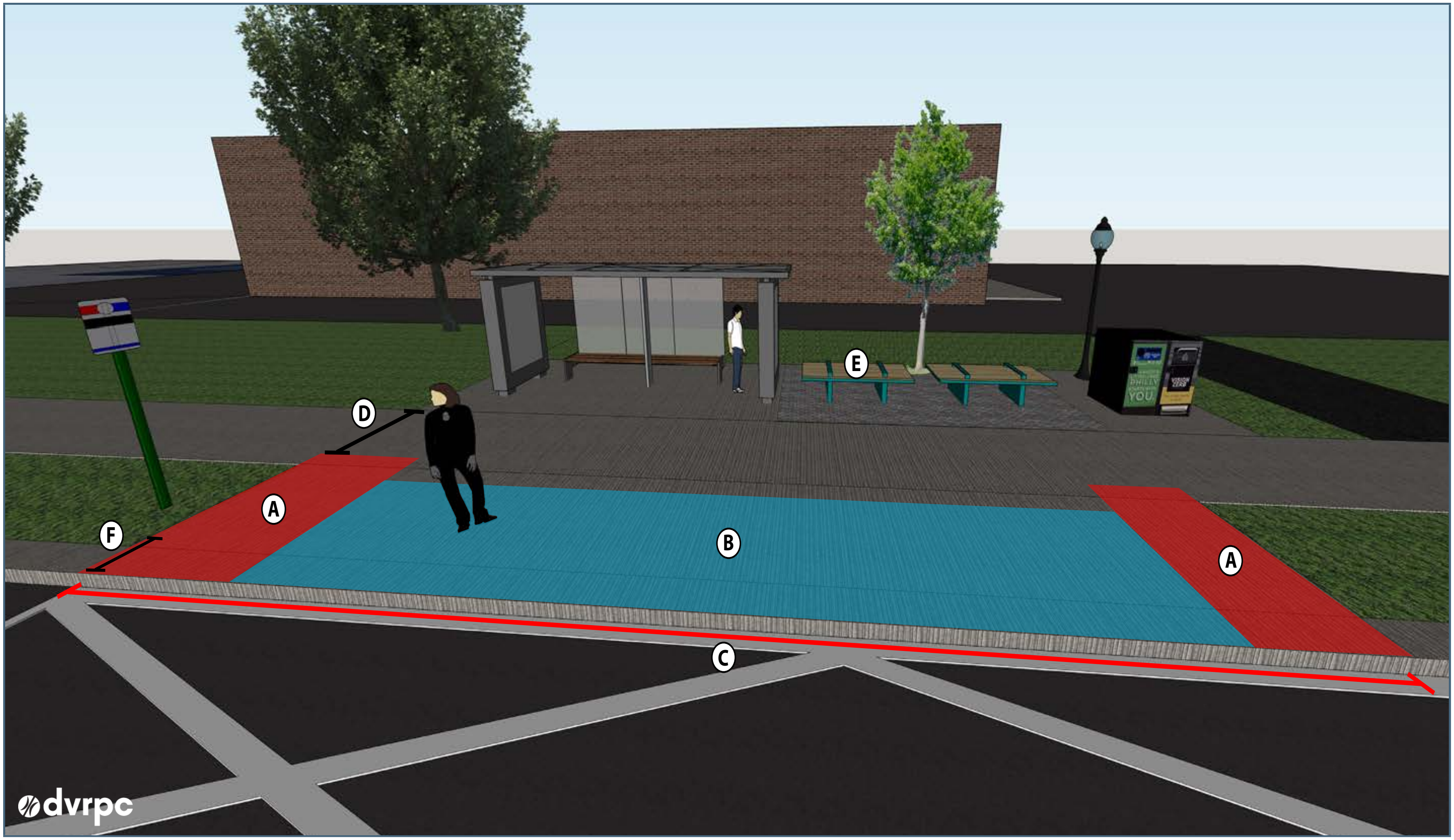
Element		Details
A	Loading Pad	5 ft. (1.5m) long x 8 ft. (2.4m) deep; pad must be firm, stable, and slip resistant, and connected to the pedestrian path. Provides a 5 ft. (1.5m) diameter clear turning radius for wheelchair users. Where possible, loading pads should be provided for both front and rear doors to accomodate more passengers boarding and alighting. Sign should be located adjacent to the loading pad to clearly indicate bus stop.
B	Waiting Area	16 ft. (6.1m) long x 6 ft. (1.8m) deep between doors. After subtracting bench dimension, provides enough net area for 12 standing passengers at 7 sq. ft. (0.65m ^{2}) per person (86.3 sq. ft. or 8.01m^2 total), plus seating space for 3. Shelter design and configuration may vary.
C	Stop Area	26 ft. (7.9m) long area should be kept free from obstructions along the curb edge. The length should provide free access to vehicle's front and rear doors.
D	Pedestrian Path	Minimum 4 ft. (1.2m) deep pedestrian path, or wider, as called for by local sidewalk standards, along a sidewalk or walkway. Should be a firm, stable, and slip resistant surface connected to the loading pad and separate from waiting area. Keep 3 ft. (0.9m) clear around all street furniture and building elements.
E	Furniture	15 ft. (4.6m) long x 6 ft. (1.8m) wide x 9 ft. (2.7m) high shelter with lean rail, 3-seat bench, information, & ad panel. Glass panels allow view of arriving bus and weather protection. 78 net interior sq. ft. (7.2 m^2) can accommodate 10-11 standing passengers plus seating for 3. Existing shelters may vary in size based on their location.
F	Clear Area	2 ft. (0.6 m) from the curb edge, 9 ft. (2.7 m) minimum height.

Source: DVRPC (2012).

A stop with a standard shelter in Media, Pennsylvania
Source: Google (2018).

A stop with a standard shelter in Conshohocken, Pennsylvania
Source: Google (2018).

Figure 17 | Type 7: Enhanced Stop



Source: DVRPC (2019).

Table 20 | Dimensional Specifications Type 7: Enhanced Stop Design Elements

Element		Details
A	Loading Pad	5 ft. (1.5m) long x 8 ft. (2.4m) deep; pad must be firm, stable, and slip resistant, and connected to the pedestrian path. Provides a 5 ft. (1.5m) diameter clear turning radius for wheelchair users. Where possible, loading pads should be provided for both front and rear doors to accommodate more passengers boarding and alighting. Sign should be located adjacent to the loading pad to clearly indicate bus stop.
B	Waiting Area	38 ft. (4.6m) long x 4 ft. (1.2m) deep between doors; waiting area can be partially accommodated in the pedestrian path if pedestrian volumes are low. Provides enough net area for 9 passengers, including 6 within the shelter at 7 SF (0.65m²) per person, 64 SF (6.0 m²) total. Shelter design and configuration may vary.
C	Stop Area	48 ft. (7.9m) long area should be kept free from obstructions along the curb edge. The length should provide free access to vehicle's front and rear doors.
D	Pedestrian Path	Minimum 4 ft. (1.2m) deep pedestrian path, or wider, as called for by local sidewalk standards, along a sidewalk or walkway. Should be a firm, stable, and slip resistant surface connected to the loading pad. Keep 3 ft. (.9m) clear around all street furniture and building elements.
E	Furniture	24 ft. (4.6m) long x 5 ft. (0.9m) wide x 9 ft. high shelter with stop information and advertising panel. Glass panels allow view of arriving bus and weather protection. 120 interior sq. ft. (11.1 m²) can accommodate 16 passengers with seating for 4. Station area can also included 2 benches, a trash receptacle, and lighting.
F	Clear Area	2 ft. (0.6 m) from the curb edge, 9 ft. (2.7 m) minimum height.

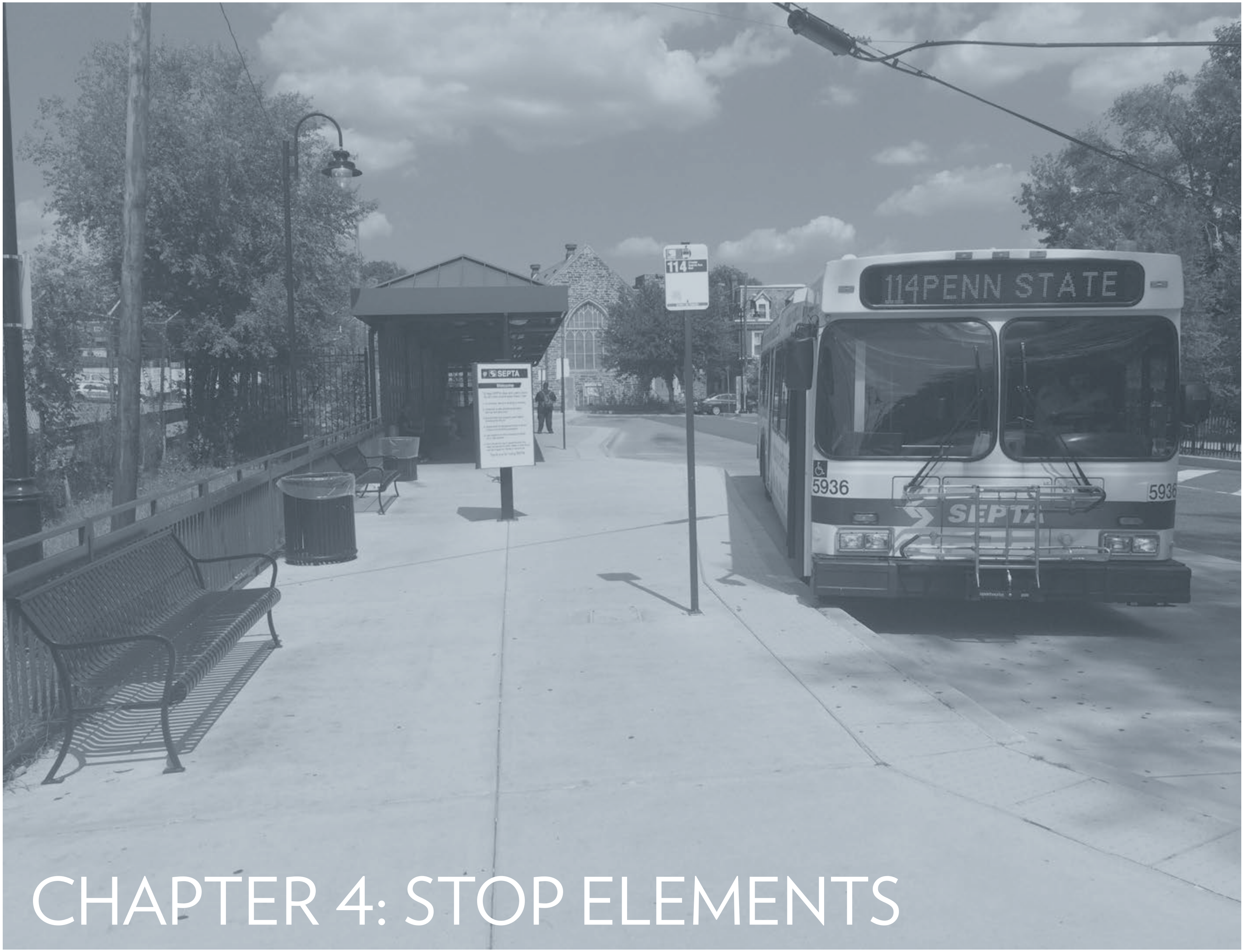
Source: DVRPC (2019)

Figure 17 illustrates what an enhanced stop could look like in SEPTA's network. The elements included would be ideal for a high-ridership, high-transfer location at a major trip generator, such as a shopping center, major employment center, office park, or large institution (medical facilities and schools).

The City of Philadelphia has built a number of Direct Bus stations or plazas to accommodate high-ridership and transfer locations along Roosevelt Boulevard in coordination with its Boulevard Direct limited stop service. New bus shelter designs were also completed and placed at the stop locations (shown in Figure 18). The stop elements create a more spacious environment for passengers waiting for the bus and have information about SEPTA's network. The dimensions of Welsh and Rhawn streets' stops on Roosevelt Boulevard were used as examples to create the dimensions and guidelines for Figure 17. Note: additions and amenities as suggested in this section would not necessarily warrant Direct Bus Service.

Figure 18 | Direct Bus Shelter Design

Sources: City of Philadelphia, oTIS, and DIGSAU (2018).



CHAPTER 4: STOP ELEMENTS

Source: DVRPC (2018).

Introduction

Stop elements are features that provide added convenience and comfort to a passenger's wait for the bus. Bus stop elements can be provided by a sponsor other than SEPTA. Just as the bus itself needs to be comfortable, easy to use, clean, and safe, so too does the stop.

Collectively, stop elements can help enhance the visibility of transit in a corridor and raise general awareness of transit as a mobility option. Bus stop elements are a way for communities to welcome visitors and for residents to take pride in their area. In some cases, they may reflect a visual identity treatment for a locality and be viewed as a community asset.

Ideally stops should be connected to the surrounding area by sidewalks, signalized crossings, and crosswalks. A person in a wheelchair, on crutches, with a stroller, or carrying heavy packages should be able to navigate to a stop. Information on safe access to stops is in Chapter 3, with detailed dimensions. Examples of each are also shown in Figure 19 on the following page.

Once at the stop, riders should have a pleasant experience while they wait for the bus. Street furniture providing cover, seating, lighting, and other elements can make waiting time for passengers more comfortable and safe. Examples could include custom wayfinding signage and real-time information that helps guide customers to and from the stop, local destinations, and other transportation modes. Based on research from the University of Minnesota[1], station and stop elements, such as a bench or basic shelter, reduce the perceived wait time.

In addition, considering how to add complementary infrastructure may be valuable. With coordination, a stop could facilitate connections between two modes, such as bicycle parking and bike share at a bus stop, so that someone could use both modes seamlessly to reach their final destination. Providing customers with information to help them get to their next, final, or future destination also has the ability to create a better passenger experience.

SEPTA Wayfinding Signage at Norristown Transportation Center
Source: DVRPC (2011).

[1] *Yingling; Guthrie; Levinson, Perception of Waiting Time at Transit Stops and Stations (2018).*

Figure 19 | Stop Elements Overview Design

Element		Pg.
A	Public Art	49
B	Transit Shelter	50
C	Stop Area Seating	50
D	Trash Receptacle	50
E	Lighting	51
F	Signage	51
G	Real Time Info	51
H	Bicycle Parking	52
I	On Road Bicycle Facilities	52
J	Bike Share	53

Source: DVRPC (2019).

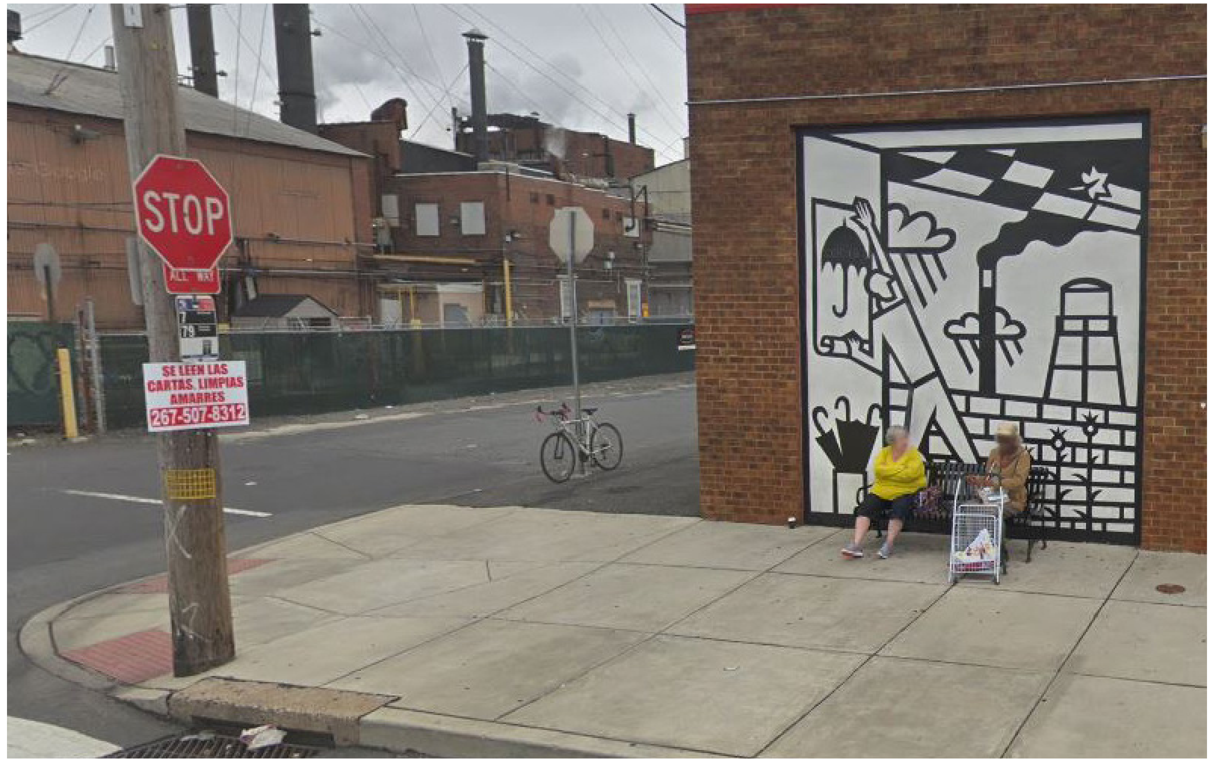
STOP ELEMENTS OVERVIEW DESIGN

SEPTA's network serves many different types of land contexts: urban, suburban, and rural. Therefore, what works in one situation may not work in another because of the conditions around a bus stop. The overview design shown in Figure 19 illustrates how multiple modes can intersect and be accommodated at a bus stop. Components from each chapter are shown with urban and suburban roadway characteristics, including: far-side curbside stops, minimum safety buffers, in-street primary bus zone length, additional space for acceleration, loading pad, waiting area, stop area, pedestrian path, furniture, and clear area. This chapter also describes the encouraged bus stop elements in further detail.

Public Art at Bus Stops

Studies increasingly demonstrate the positive health benefits of public art. Bus stops can be further improved by including the local community to help design and create murals and street furniture, as well as overall placemaking.

Showcasing creativity in these amenities can give people a sense of pride in their community. Bus stop infrastructure can be a form of public art.



Public Art at a bus stop near Snyder Plaza in South Philadelphia, Pennsylvania

Source: Google (2019).

Street Furniture

Bus-stop-related street furniture can include shelters, benches, lean rails, trash receptacles, and lighting. This section contains some basic guidance for desirable elements to be considered when choosing appropriate stop elements.

TRANSIT SHELTERS

Shelters provide important protection for passengers from all weather conditions. Shelters must not block motorists' or pedestrians' line of sight.[2] A quality shelter should have the following features:

- The shelter should be constructed of durable, architecturally sound materials to withstand heavy use and continual exposure to the elements. It should have a roof and be enclosed on at least two sides to provide a screen from prevailing winds. A clear view of the approaching bus and bus loading pad is necessary and can be accomplished using tempered, clear glass panels. Films or clear-view materials can add design elements to the shelter exterior.
- Sun and rain or snow protection are equally important. The shelter should be oriented and enclosed to protect against exposure. A site-specific design for the protective sides or solar shading material may be necessary depending on local weather conditions.
- The shelter opening should be oriented toward the path that leads to the bus loading pad. Refer to Chapter 3 for shelter dimensional guidelines.

Custom shelter serving a community, Glen Mills, Pennsylvania
Source: SEPTA (2012).

STOP AREA SEATING

When present, a bench should be made of a durable material, resistant to vandalism and wear from exposure to weather. The bench should be ADA-compliant in dimension, with a recommended minimum length of 6.5 feet (2.0 meters), or the equivalent of three seats. Arms are an important feature to assist seniors and the disabled.

Other forms of seating, such as a resting or leaning rail, can also be used as an alternative to benches. Options include a large-diameter tube or ledge slightly higher than seat height, or about 2.5 feet (0.8 meter) high above the stop location surface. A low masonry wall also makes a convenient resting spot and can provide an opportunity for landscape integration of the bus stop area.

TRASH RECEPTACLES

Trash receptacles should be placed at high-ridership stops, transfer locations, and places where the potential for accumulating trash is apparent. Adding trash

Stop area benches and trash receptacles, Darby, Pennsylvania
Source: Delaware County (2017).

Lean rail, Philadelphia, Pennsylvania
Source: DVRPC (2019).

receptacles requires additional maintenance. Therefore, before adding them, a municipality or private entity needs to have a maintenance plan and budget in place. Placement must not infringe upon the ADA pad, pedestrian pathway, direct access between the ADA waiting area and the ADA landing pad, or access between either the ADA area and the sidewalk.

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[2] Note: In the City of Philadelphia shelters need to go through right-of-way permitting and review, and no other entities can install a shelter with advertising. If you would like to build a shelter that is or could be in a public ROW, consult your local municipality to ensure it is built legally.

LIGHTING

Lighting within the bus stop area enhances safety by improving both SEPTA driver and passenger visibility. It also provides a sense of security and helps define the waiting area. Lighting may take several forms in any combination to provide an average level of 1.3 to 2.6 horizontal foot candles or 13 to 26 lux, which is roughly the typical light level around a building entrance.

A nearby street light can also be used for stop area lighting; this can be cost-effective coordination. The bus stop signage should be illuminated and, if present, shelter fixtures can provide added light levels. LEDs are encouraged and recommended.

On-Street Customer Information

Customers want to know more information about when and where their bus or train is coming, and if there are any delays or disruptions in service. Many people are deterred from public transit because they do not have the information they may want to make them feel safe and confident to easily use transit services.

SEPTA, municipalities, and private entities can facilitate this information with clearly marked, visible information at stops. The type of passenger information that can be displayed at a stop includes both static and real-time information in the same location; the following are options of what could potentially be displayed now and in the future.

- bus route information (including URLs and QR codes for the SEPTA App) and stop location;
- fares, maps, local wayfinding information, and available transfers with travel times for common ultimate destinations;
- estimated arrival, departure, or countdown times for the approaching vehicle;
- transit vehicle locations;
- service disruptions and delays; and
- other valuable information, such as the date, time, weather, and current news, often with advertisements.

SIGNAGE

At a bus stop, the bus pad should be well marked with a double-sided sign, preferably on its own pole. Stop signage will be provided by SEPTA. Clear and distinct signage differentiates the stop area from other roadside information and indicates locations to connect with other SEPTA service. The sign location assists passengers in visually gauging the stopping point for the vehicle, and for those who are visually impaired, the sign post can provide a landmark in locating the bus loading pad with the aid of a cane. Clear signage helps passengers confirm that they are at the right location and ready to board the right vehicle.

Current SEPTA signage standards (detailed in Appendix A) include a standard sign 18 inches (457 millimeters) tall and 12 inches (305 millimeters) wide, with lettering indicating the bus route number, unique stop identifier number, and route destination points. All basic information contained on the sign is designed to be ADA compliant, including graphic symbols and type sizes per section 703-Signs, ADAAG 2010. Standard signage also contains phone numbers for SEPTA customer service and Telecommunications Device for the Deaf/Teletypewriter messaging for the hearing impaired and those with disabilities.

Transit stop signs should be displayed along the roadway in a way that does not interfere with traffic signage. The preferred sign location is set back from the curb edge two feet (0.6 meter) and with two-foot (0.6 meter) clearance from the bus loading pad.

Additional static information, such as fare zones; fare pricing; wayfinding maps; signage to major local shopping and institutional destinations; as well as transfer information to or between SEPTA services and other modes, such as bike parking, bike share, car parking, or local trails should be considered when applicable.

REAL-TIME INFORMATION

Passenger real-time information refers to sharing with passengers up-to-date bus location, operational, and schedule information collected for viewing at stations or on passengers' personal devices. Through customer satisfaction surveys and academic research it has been determined that the public places a dollar value on real-time information, and that this feature alone has the potential to increase ridership by 1–3 percent.[3]

Currently SEPTA provides customers with various electronic passenger information. The official SEPTA App is a way passengers can stay connected with real-time information. When downloaded, the app allows passengers to view a map that shows the current vehicle location of a particular route one has selected. In addition, there are schedule, detour, and delay updates. Displaying this type of information at stops could be warranted in the future. However, getting this kind of information to display electronically at stops would require that utilities be connected, and provisions made for continued maintenance.

[3] *FTA, "Real-Time Transit Information Assessment, White Paper Literature Search and Review of Current Practices in Providing Real-Time Transit Information" (Washington, DC, 2002).*

Making the Bus-Bike Connection More Fluid

People do not commonly bike to bus stops because they may feel unsafe on the roads they need to use to get to their stop, or they do not have a secure place to store their bike during the day. The more connected the bike network is to the bus network, and vice versa, the more likely people will be to bike to and from the bus stop.

To encourage riders to make a transfer or connection between the bus to a bike, municipalities and private entities can create bus stops that better accommodate cyclists. Figure 19 displays how some of these elements could work in coordination with bus stops.

- Build secure and weather-protected bicycle parking for personal bicycles, where appropriate and space permits.
- Create safe and clearly defined access from a bus stop to a bicycle trail, lane, or low-stress roadway. Creating trails, bike lanes, and bike paths that are connected and closer to bus stops will help make these connections more fluid.
- Locate bike share facilities close to bus stops; or
- In suburban or rural areas provide wide shoulders for cyclists to use when they are sharing the road with other modes.

It is advantageous to coordinate bicycle infrastructure at bus stops because:

- It has the potential to increase the number of bus riders and extend the reach of the fixed route system;
- At park-and-ride facilities or at bus terminals, it reduces the need for parking; and
- It has the potential to reduce congestion on local streets, thus helping bus transit to function more effectively and efficiently.
- Additional signage guiding users making a connection between bike facilities and the bus is encouraged. This breaks down a perceived barrier that may exist to making this connection.

BICYCLE PARKING AT BUS STOPS

Bicycle racks and storage shelters are increasingly used to accommodate commuters who use a bicycle to access transit but prefer not to use on-board bus bike racks. For specific design guidance see the National Association of City Transportation Officials' (NATCO's) *Transit Street Design Guide.* Supplying bicycle parking in a well-lit, secure area will help to deter theft. Providing secure bike parking at bus stops creates an intermodal link for cyclists to the bus stop, and allows riders more flexibility. Ideally, bike parking and storage has the following features and specifications.

- Bike parking should not impede pedestrians or passengers that are boarding or alighting.
- The parking should be located near a stop in order to make it convenient and to make it obvious to cyclists that it exists.
- Bike racks should be located where they are easy to use, and there is enough room between each rack and around the racks in order for cyclists to safely and comfortably maneuver bikes in and out.
- Bike racks should provide durability and vandal-resistant anchoring to attract users and provide long-term utility. The rack should hold bikes upright by providing two points of contact along the horizontal plane, allowing for both frame and wheels to be locked. The "U" design

Bicycle parking at tourist bus stop, Philadelphia, Pennsylvania
Source: DVRPC (2012).

  is recommended for these reasons. In restricted spaces, consider rotating the U racks 45 degrees.[4]
- Bike racks, where possible, should have signage so that riders know where to park their bikes.
- Bike storage is most effective at "end-of-line" stations or at bus terminals or transportation centers.

SAFE ACCESS FOR BIKE RIDERS TO BUS STOPS

Creating bike facilities that are "protected" on key routes connecting to bus stops increases the efficiency of biking and bus riding, as well as the safety of bikers and bus riders. Protecting bike facilities means having a buffer between bicycle traffic and vehicular traffic. Buffers may be in the form of on-street parking, a sidewalk paired with a planter (to also ensure the safety of pedestrians), a striped buffer with bollards, a plain planter acting as a median, or a combination of any of these. The presence of buffers helps prevent buses and other vehicles from pulling into bike lanes

[4] *Philadelphia OTIS, "Bike Parking Guidelines and Application" (December 2017).*

and trails to pick up passengers. If it is not possible to create a protected bike lane the full length of a corridor, to separate bikes from buses, one option is to create a “floating bus stop" for passengers to wait on.
Floating bus stops are built to separate the existing bike lane from bus traffic to allow bikers an uninterrupted lane of travel. An example of this is a bus stop in Philadelphia along the 58th Street Greenway, which is used to separate the Greenway from the bus. Another example from Seattle, shown on this page, is a floating island with a one-way cycle track along the curb.
In the case of a one-way street, it is preferable to avoid having the bike facility on the same side of the street as the bus stops. Place the bike lane or trail on the opposite side to prevent pedestrians from having to cross a bike facility to get to their bus stop, as well as, again, preventing buses from pulling into the bike lane to pick up passengers. An example of this exists as a left-side lane pilot in Philadelphia on Market and JFK streets.

If there is a location that is at the intersection of a trail and surface transit facility, partner with SEPTA as they are looking to connect transit to DVRPC's Circuit Trails. Connecting to the Circuit Trails will increase the potential for bike and bus interaction in a comfortable way.

BIKE SHARE AT BUS STOPS

Siting bike share by adding bike docks around bus stops allows for flexibility in mode choice. Depending on variables, such as weather, time of day, time available, and fatigue, people may desire to walk, bike, or take a bus. Giving them all three options from the same point allows for this flexibility of choice.

Placing bike share docks by bus stops also allows for passengers to have the option of completing the “last mile” or the distance a person needs to go to get from the nearest stop to their destination. When there are no options for completing the last mile other than walking a long distance, people may opt to drive or use ride share platforms over taking transit. Coordinating bike share facilities with bus stops provides passengers with additional options and benefits, such as access to bus stops for passengers who are beyond walking distance or who do not own or care to own a bike.
The coordination between bus stops and bicycle infrastructure can be strengthened by having compatible or complementary wayfinding signage and messaging.

Left-side protected bike lanes on JFK Boulevard, Philadelphia, Pennsylvania
Source: Google (2018).

Floating island with bike lane, Seattle, Washington
Source: NACTO Urban Street Design Guide (2018).

58th Street Greenway, Philadelphia, Pennsylvania
Source: Google (2018).

Indego Bike Share with SEPTA bus stop, Philadelphia, Pennsylvania
Source: Google (2018).

WIDE PAVED SHOULDERS

On rural, low-volume roadways, wide paved shoulders should be built to better accommodate customers when other facilities are not feasible. Paved shoulders also have safety benefits for pedestrians and bicyclists. Wide paved shoulders can improve safety for drivers and create a space for bicyclists and pedestrians near bus stops and trails.

Improving Bus Stops Through Community Coordination

Chapters 3 and 4 show elements and amenities that create comforts and safe connections for bus riders. However, planning for, building, and maintaining these can be challenging due to cost in staff or consultant time and dollars.

Working with or creating a group that has shared interests along a corridor, within a business park, or other type of development could aid in enhancing bus stops and applying for grants and local funds to design a better built environment for those bus passengers.

WEST CHESTER PIKE COALITION

West Chester Pike is a transit corridor with varying levels of bus service, as well as a mix of land uses, high traffic volumes, and densities throughout Delaware and Chester counties, and 10 different communities. In 2016, following a series of feasibility reports about enhancing bus service on the corridor, the West Chester Pike Coalition[5] was formed.

The West Chester Pike Coalition includes staff from both Chester and Delaware counties who organize and lead the group, which includes representatives from SEPTA, Pennsylvania Department of Transportation, Transportation Management Association of Chester County, Delaware County Transportation Management Association, DVRPC, corridor municipalities, and local economic development agencies. Meetings are held three times per year and give these stakeholders an opportunity to hear what else is going on along the corridor and see how they can come together and advocate or apply for grants or other funding to improve transit on the corridor together. The vision for this group is improved transportation opportunities, operations, and safety along West Chester Pike.

GREEN STORMWATER INFRASTRUCTURE (GSI) AND BUS STOP DESIGN

SEPTA has over 8,200 surface transit stops in the City of Philadelphia.[6] In November 2016, DVRPC hosted a charrette to set standards for Philadelphia Water Department's (PWD) GSI at surface transit stops. The charrette was developed in response to PWD's utilization of DVRPC's 2012 SEPTA Bus Stop Design Guidelines that led to design conflicts for GSI at SEPTA surface transit stops.

The purpose of the gathering was to work together to come up with a design that would minimize delay associated with curbing a bus and facilitating boarding and alighting by all passengers (inclusive of those in wheelchairs) in different operating environments. Standards were developed to address locations where bus stops coincide with sites targeted for the development of green stormwater planters, tree trenches, and green bumpouts. Such interventions can be used proactively to direct passengers toward crosswalks and footways.

Participants in the charrette developed and agreed upon guideline designs for standard and articulated bus bumpouts where appropriate. The designs are shown in Appendix C. The designs were prepared by PWD and reviewed by SEPTA's Engineering, Maintenance, and Construction Division and other SEPTA staff. Although these two designs are agreed upon by both agencies, third parties are required to get approval from both the Green Infrastructure Unit at PWD and EMC at SEPTA. There are additional standards across different bus stop conditions that PWD has developed and can be requested from them.

This is another example of how working together to develop design for bus stops can create a better outcome or standard for all to use.

[5] *West Chester Pike Coalition, www.chescoplanning.org/transportation/WestChesterPike.cfm (2019).*

[6] *For the purposes of this conversation surface transit stops exclude trolley systems. PWD's GSI Unit will work collaboratively SEPTA to develop GSI.*

CHAPTER 5: DEVELOPMENT CONTEXT AND CASE STUDIES

Source: DVRPC (2018).

Introduction

This chapter includes a series of visual case studies (Figures 20-23) that illustrate the ways in which this document's design standards can be applied in various typical development contexts, both urban and suburban.

Table 21 is a checklist broken into three categories to consider when creating or relocating a bus stop in a development. This table considers transit operating and passenger needs as part of development design and review. The language can be adopted into development regulations for municipalities interested in promoting better transit with development projects.

For more specific questions please email serviceplanning@septa.org.

Table 21 | Checklist for New or Relocated SEPTA Bus Stops

Stop Placement	
	Has SEPTA been contacted to verify that transit service currently exists adjacent to a proposed development, or may be feasible to provide in the future?
	Are large developments being designed to permit safe routing of buses throughout?
	Has SEPTA been contacted to explore whether new or relocated transit stops can be provided on or adjacent to the proposed development?
	If new or relocated transit stops are proposed, are they located in a reasonable proximity to major destinations, as well as in a pair of stops serving the opposite direction?
Transit Circulation	
	For all intersections and driveways that will accommodate buses, are corners designed for a 50-ft. (15.2-m)-outside and 30-ft. (9.1-m)-inside turning radius?
	For all roadways and driveways that will accommodate buses, are grades 6 percent or less?
	For all roadways and driveways that will accommodate buses, are lane widths 10–12 ft. (3.0–3.6 m)?
	For all roadways, driveways, and stop areas that will accommodate buses, have pavement cross-sections been designed to withstand the wear and tear that will be generated by heavier vehicles (ideally concrete pads at bus stop areas)?
	Will structures and landscaping outside the cartway permit sufficient vertical and horizontal clearance for buses, with all areas within 2 ft. (0.6m) of curbs kept clear of obstructions to a height of at least 9 ft. (2.7m)?
	Are proposed stops connected to primary destinations with an ADA-compliant pedestrian access path free of obstacles?
Stop Design Elements	
	If the developer is to provide stop improvements, have the proposed stop elements been designed to be consistent with the guidelines in this document and approved by SEPTA?
	If new or relocated transit stops are proposed, are they located in a safe, visible, and well-lit location?

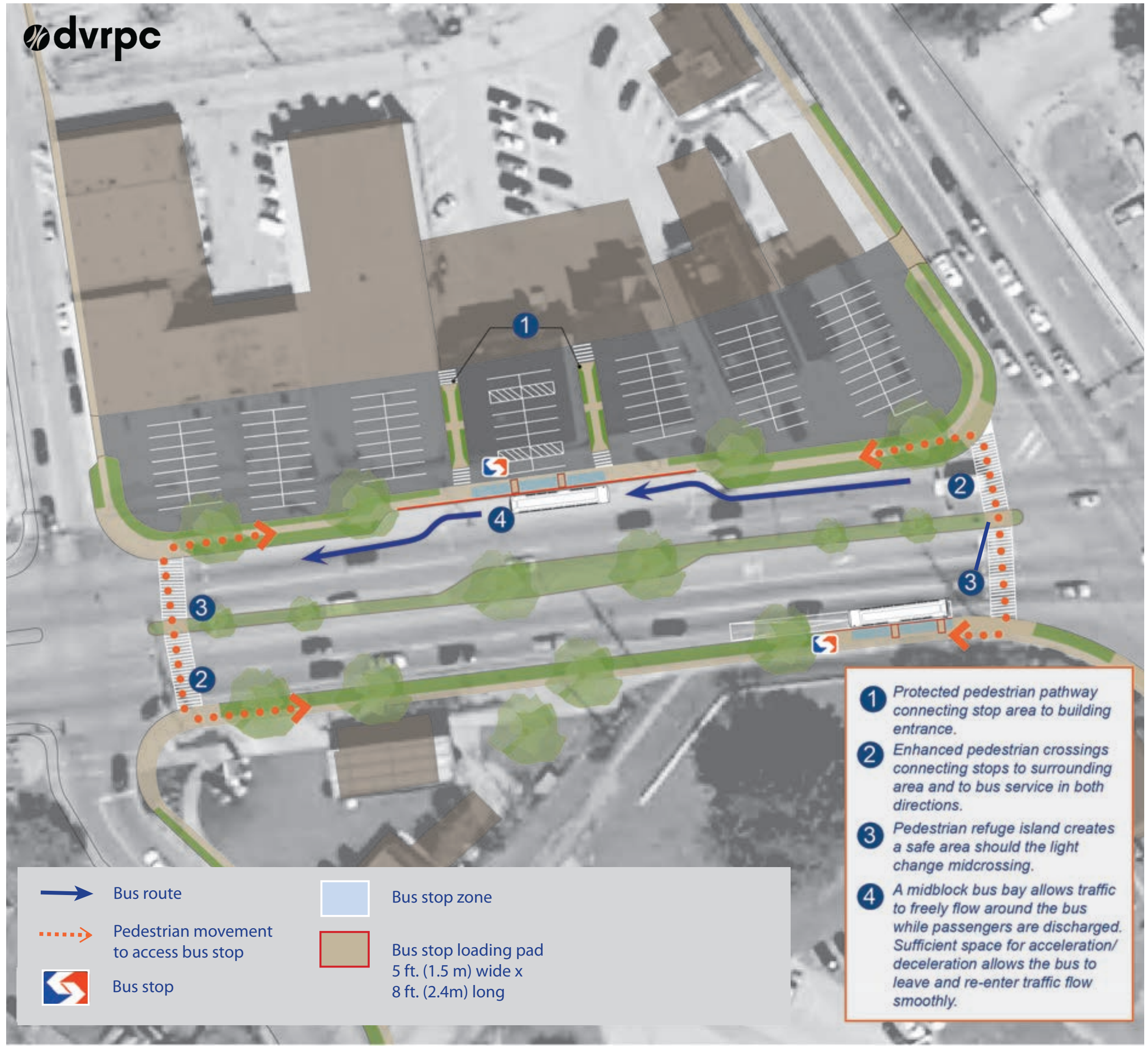
Case Study 1: Serving "Strip" Commercial Development with a Curbside Stop

A highway commercial or "strip" shopping center typically has off-street parking located between building entrances and the primary frontage street. If the bus does not deviate from its primary route onto the site, the challenge is in connecting passengers from the curbside (in-line) stop location to the buildings that the stop is intended to serve.

This case study (Figure 20) illustrates the use of a high-quality pedestrian network to close this gap, including the provision of landscaped pedestrian walkways connecting the stop area to building entrances across the parking lot.

This example also illustrates the use of a midblock bus bay. A bus bay that brings the bus out of the flow of traffic may be particularly appropriate for suburban stops where dwell times (the amount of time spent by the bus at the stop) are likely to be higher, such as at a supermarket where passengers may be carrying grocery bags or parcels. A midblock stop should only be used where there is a major destination and passengers will not want to walk as far with bags or parcels. If a bus bay is used, it should be of sufficient length for the bus to decelerate and accelerate appropriately. If sufficient space is not available, a bus bay should not be used (bus bays that are too short can lead to significant time delay for buses).

Figure 20 | Case Study 1



Source: DVRPC (2012).

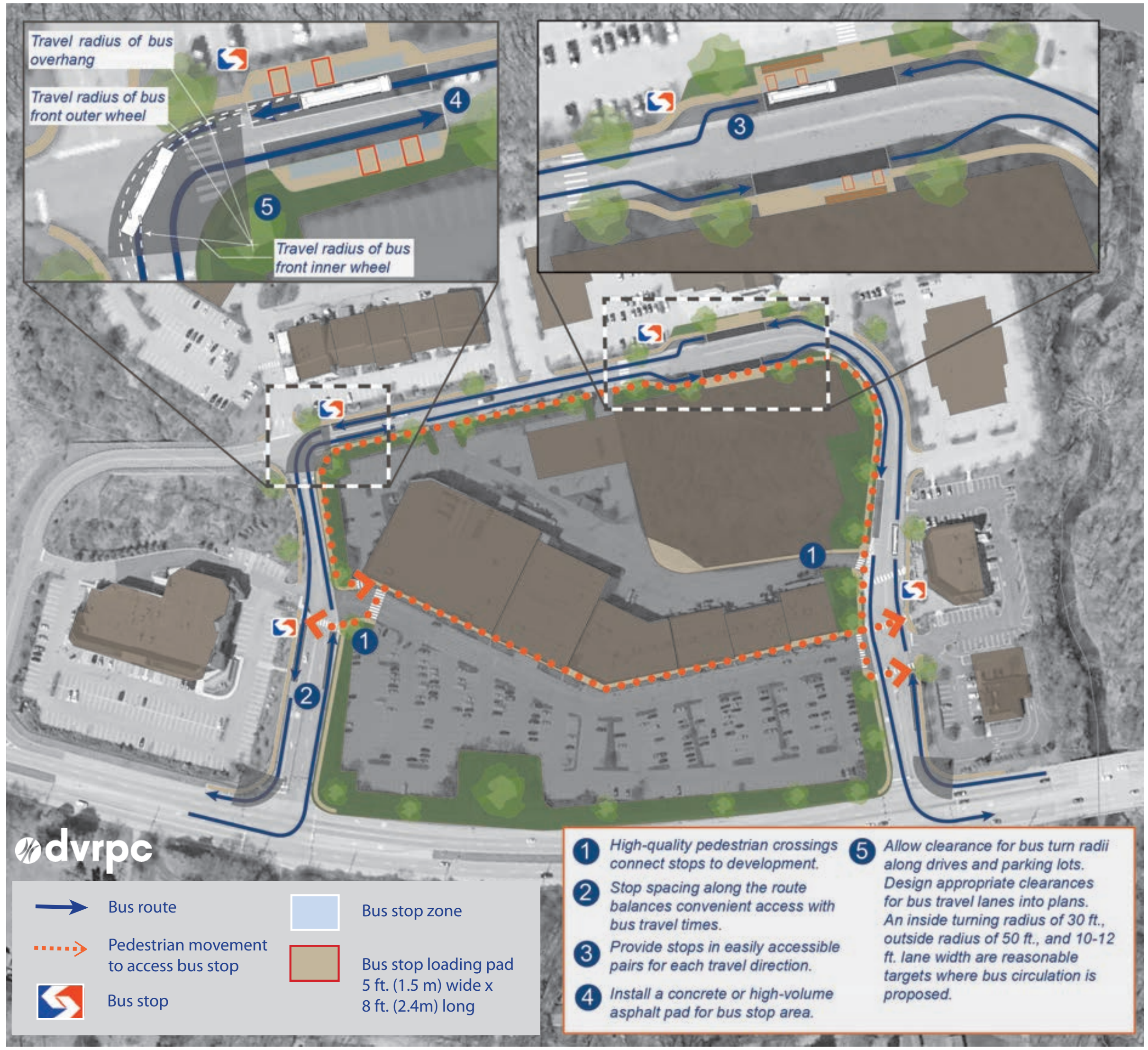
Case Study 2: Deviating from the Primary Route to Serve a Large Commercial Center

For large developments with multiple interior destinations, it may be appropriate for the bus route to deviate from the frontage street and operate through the development. SEPTA's decision to enter a development is based on a variety of factors, **including potential demand, consideration of delay to existing customers, and additional operating expense. In addition, the deviation cannot exceed three passenger-minutes per each rider boarding or alighting along the proposed deviation per SEPTA's *Service Standards and Process* (2019)**. SEPTA may also seek to have a legal agreement outlining the terms of the property access.

Where this kind of transit service is appropriate, it is important that the development be designed from the outset with transit operations in mind. Buses are heavy vehicles that can generate significant wear and tear, increasing pavement maintenance and upkeep costs over time if inappropriate design choices are made. Stops should be well connected with quality pedestrian paths to the individual buildings that they are intended to serve, and should be placed in visible, well-lit locations. See Figure 21 for ideas on how to accommodate a bus stop in this situation.

Bus stop area within a commercial shopping area along Wynnewood Road in Lower Merion, Pennsylvania
Source: DVRPC (2018).

Figure 21 | Case Study 2



Source: DVRPC (2012).

Case Study 3: Elements of a Successful Transit Center at a Suburban Mall

Suburban malls can be good locations for transit centers or hubs, since they are often served by multiple bus routes and can generate high ridership among both mall customers and employees.

This case study (Figure 22) highlights the transit center at a suburban mall, which serves multiple bus routes and includes desirable elements, such as a short bus-only right-of-way and both indoor and outdoor passenger waiting areas.

Mall transit hubs should be well connected with quality pedestrian paths to mall entrances, and should be placed in visible, well-lit locations. As detailed for Case Study 2, pavement intended to carry high volumes of buses should be designed to withstand the wear and tear that they will generate.

Figure 22 | Case Study 3

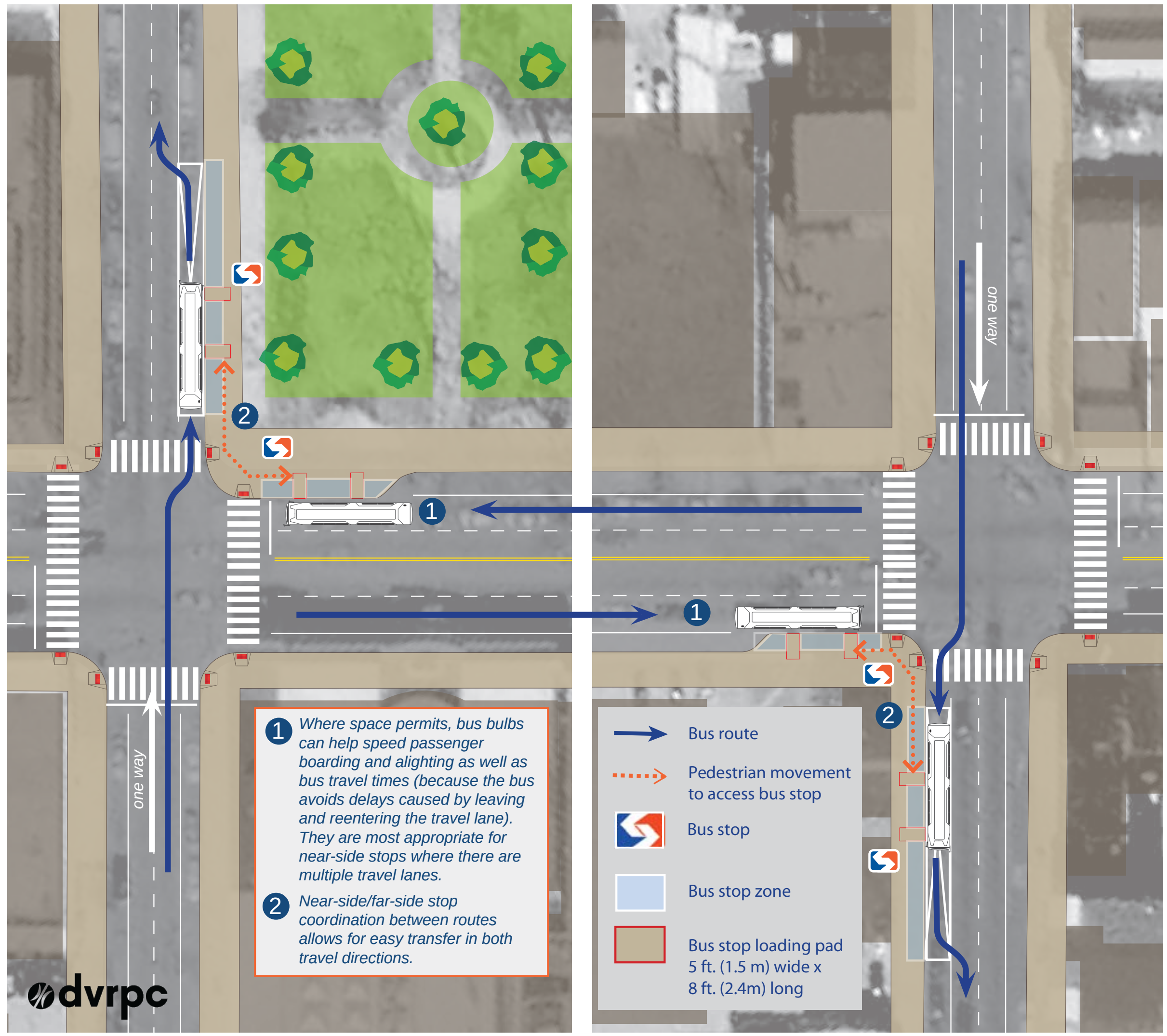
Source: DVRPC (2012).

Case Study 4: Coordinating Stop Design/ Location to Enhance Customer Mobility

SEPTA provides an interconnected network of surface transit routes with frequent service in Philadelphia and many other walkable town centers in the region. This dense "grid" of routes provides good mobility for passengers between many different sets of trip origins and destinations, and this mobility is enhanced where transfers are fast, comfortable, and convenient for passengers.

This example (Figure 23) illustrates how stop location and design can be coordinated to minimize transfer walking distance and enhance safety. Pairing a near-side stop for one route with a far-side stop for a crossing route can allow a passenger to make a transfer without crossing the intersection.

Figure 23 | Case Study 4



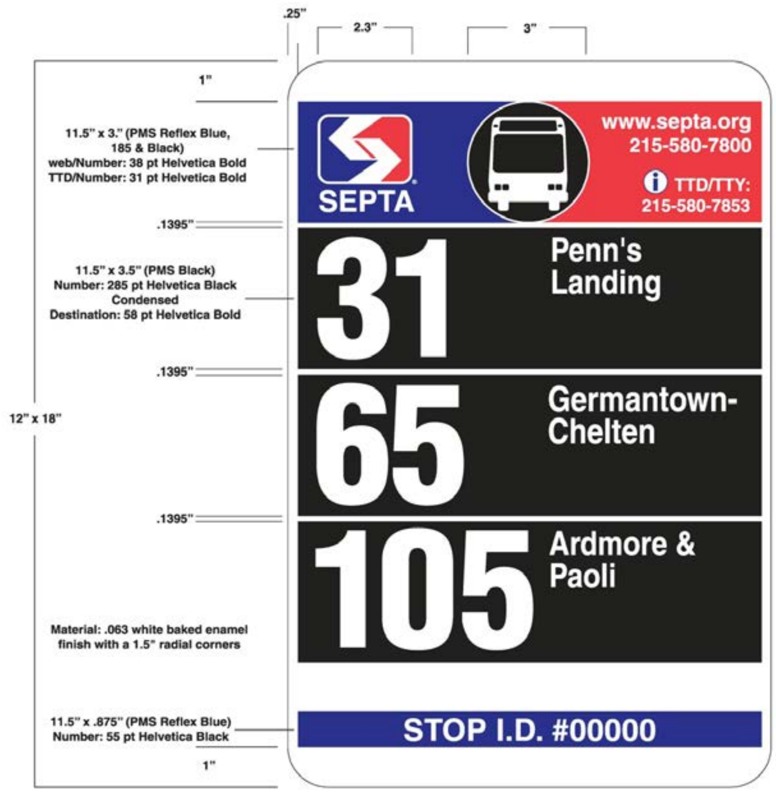
Source: DVRPC (2012).

APPENDIX A: SEPTA BUS STOP SIGNAGE

SEPTA Bus Stop Signage

A requirement for a SEPTA bus stop is that it must have a sign. Figure 24 is an example that shows the specifications of these signs. These are provided by SEPTA Operations once a new or relocated stop has been approved.

Figure 24 | Example of SEPTA Bus Stop Signage



Source: SEPTA and DVRPC (2012).

APPENDIX B: SEPTA SURVEY RESULTS

SEPTA Bus Design Guideline Survey Results

DVRPC assisted SEPTA in updating the standards throughout this document. During the process of updating this document, DVRPC reached out to stakeholders to gauge their personal experiences with the guidelines, their design priorities within their municipalities, and field suggestions that would inform this new version of the document. Municipalities were encouraged to reach out to partner organizations, interested agencies, individuals, institutions, non-profits, and advocacy organizations and forward them the survey. There were 30 responses, which are summarized in this section and in Figure 25.

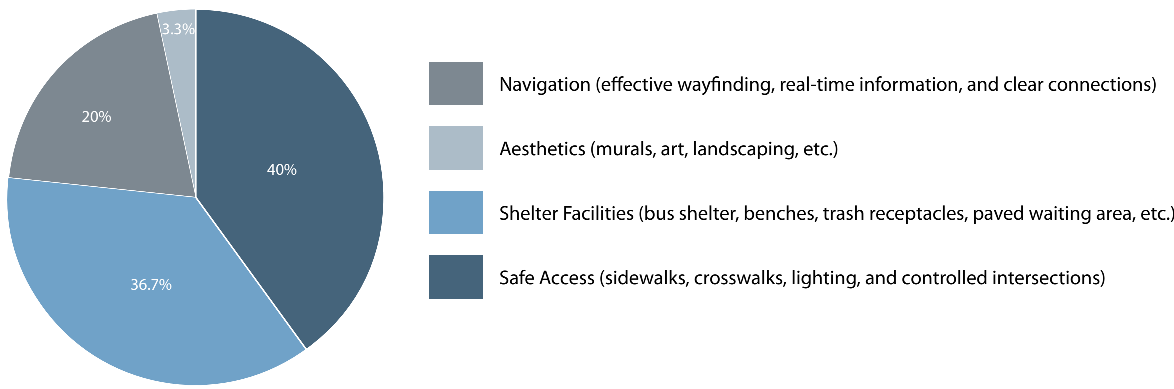
SURVEY TAKEAWAYS

The 2018 survey revealed that respondents leaned on the document for specific examples of bus stop types and bus shelter types, as well as using it as a resource to reference in grant applications and planning documents.

To better play this role, diagrams throughout the documents were edited to better convey technical information, as well as reworked for added clarity and illustrative usefulness. Additionally, graphics were converted from two-dimensional plan views to three-dimensional representations to better communicate design options and dimension requirements. Diagrams in the document were interpreted as too urban, making it difficult for suburban respondents to measure their appropriateness to their communities. Therefore, in the update the designs were altered to reflect all types of land uses served by SEPTA's bus network.

Figure 25 | Survey Response Chart

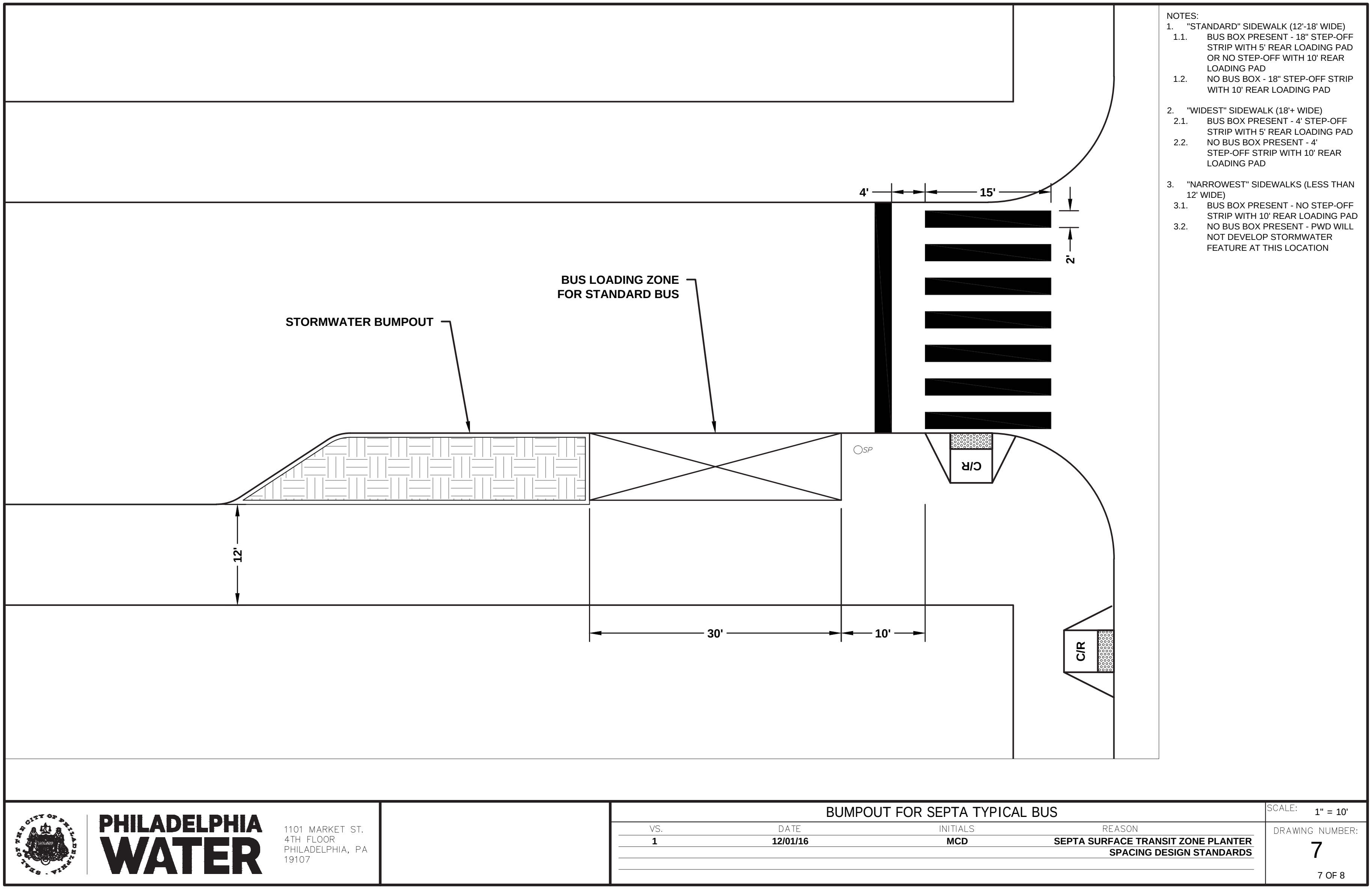
Of the four types of amenities below: which one would be most helpful to you or your community to have additional design guidance on? (30 responses)



Respondents with experience working with SEPTA reported that they enjoyed their work with the agency. Those with little experience working with SEPTA and bus stop installation used this document in the absence of direct collaboration with the agency. Respondents generally expressed an interest in improving their relationship with SEPTA. In response to this feedback, a new section was added to the stop placement chapter that is more transparent about how and when to contact SEPTA during the process of adding or relocating a bus stop.

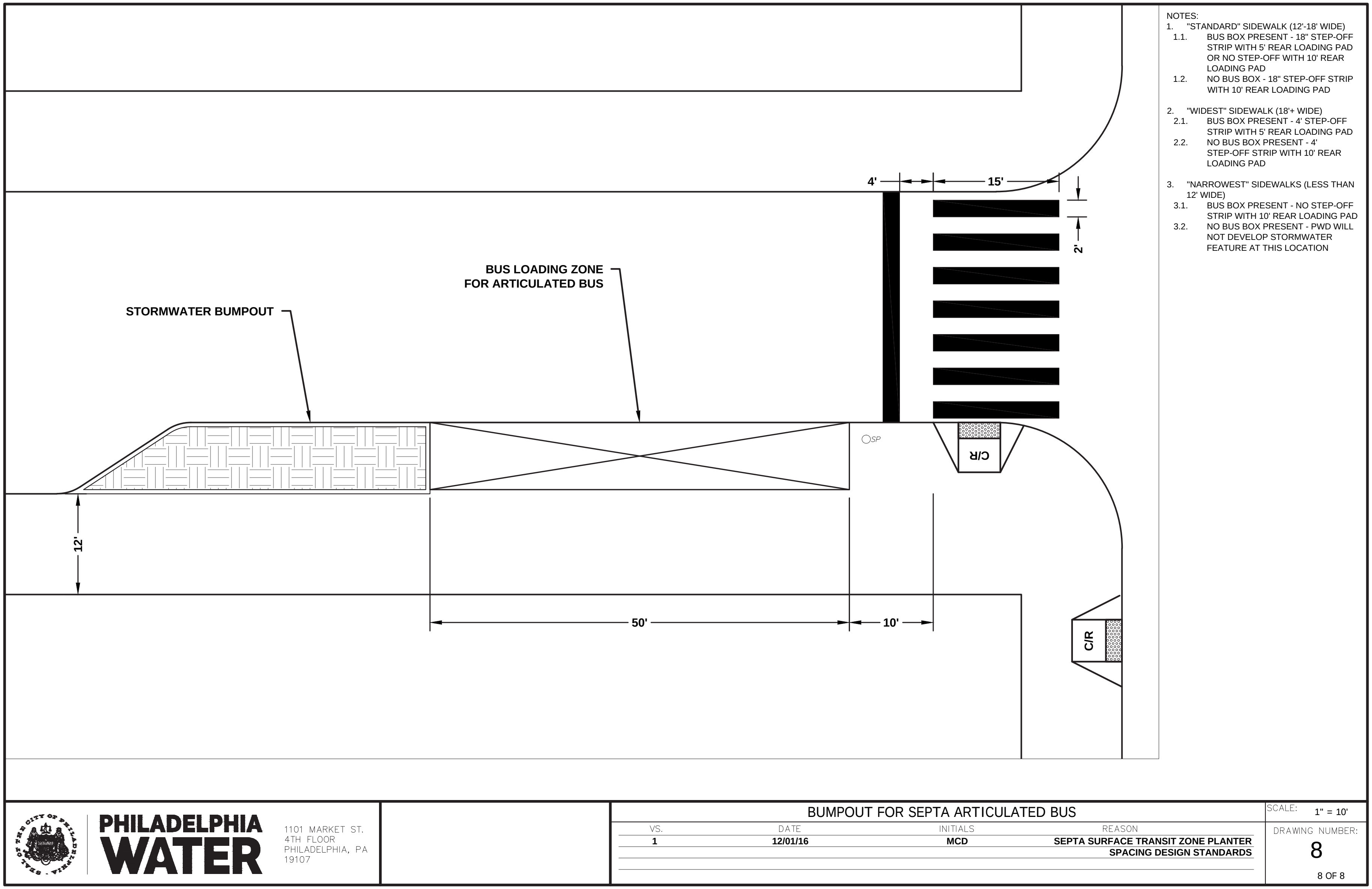
APPENDIX C: PWD BUMPOUT BUS STOP DESIGNS

Figure 26 | Design for Standard Bus Bumpout with GSI



Source: City of Philadelphia Water Department (2016).

Figure 27 | Design for Articulated Bus Bumpout with GSI



Source: City of Philadelphia Water Department (2016).

APPENDIX D: EXAMPLES OF EXISTING BUS BAYS

Bus Bay Examples in SEPTA's Network This section highlights bus bay zones in SEPTA's network, as well as how well each one functions operationally. This supplemental information is incorporated in this document due to the long bus zone length cited in the guidelines. The suggested allotment of space ranges from a maximum of 220 feet for the near-side and far-side bus bays and 410 feet maximum for a midblock bus bay. Ideally a bus bay should be built to comply with the maximum standards; however, the following examples illustrate locations where the length varies from the set standard.

The preferred design for a bus bay is on the far-side of an intersection where there is a traffic light. This setup can create a break in the flow of traffic, allowing the bus to exit more freely and merge back into traffic. This environment is shown in the Greene Street and Chelten Avenue and Broad Street and Olney Avenue locations (Figures 28 and 29).

However, there are still some challenges presented in these situations: for example, if cars are parked in the bus zone, as shown in the street view picture of Broad Street and Olney Avenue.

Figure 28 | Greene Street and Chelten Avenue, Philadelphia Far-Side Open Bus Bay

Length of Bus Bay: approximately 125 feet

Source: Google (2019).

Figure 29 | Broad Street and Olney Avenue Far-Side Bus Bay

Length of Bus Bay: approximately 120 feet

Source: Google (2019).

There is a midblock bus bay on City Avenue near the intersection with Kings Grant Drive (Figure 30). This location does not work well: the acceleration and deceleration area/lane is too short, and buses are challenged pulling into the bay and sometimes get stuck trying to merge back into traffic.

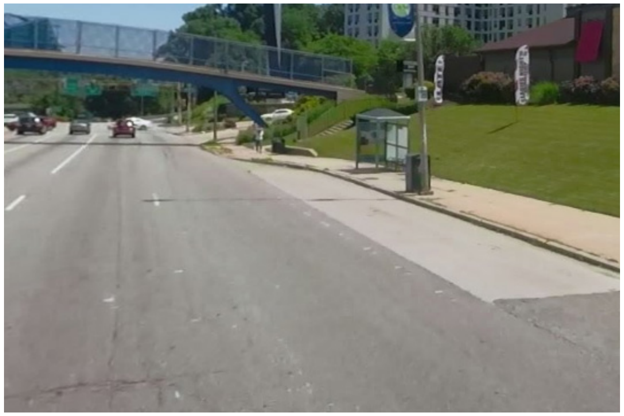
Figure 31 is an example of an open bus bay at Presidential Boulevard and City Avenue. This works better operationally because the lane the bus is using is longer on either end of the bus bay, compared to the example at City Avenue and Kings Grant Drive. This allows the bus to pull off and merge into traffic more easily.

Figure 30 | City Avenue and Kings Grant Drive, Functions as a Midblock Bus Bay

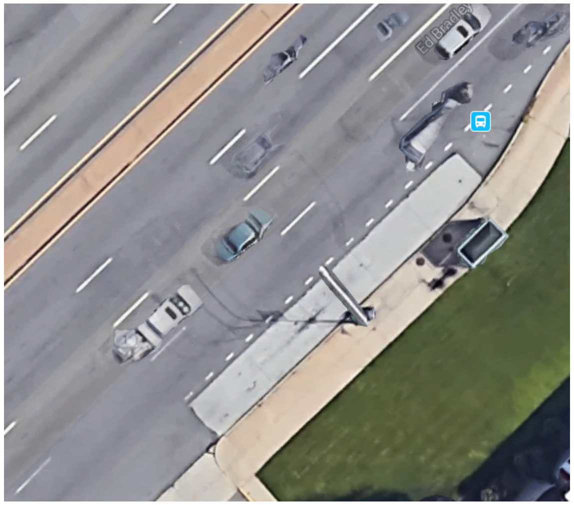
Length of Bus Bay: approximately 140 feet

Source: Google (2019).

Figure 31 | City Avenue and Presidential Boulevard, Open Bus Bay



Length of Bus Bay: approximately 105 feet



Source: Google (2019).

Figure 32 shows a new bus bay constructed for Route 49, located at 33rd & Dauphin streets in Philadelphia. This example is optimal because of the length of the bus bay, which is totals 210 feet; 146 feet of that is straight curbline. This distance allows for buses to pull out of traffic and re-enter traffic easily. In addition, the space can fit up to three vehicles. The location also serves as a layover location for Route 49.

Figure 32 | 33rd and Dauphin Streets, Near-Side Bus Bay

Length of Bus Bay: approximately 210 feet

Source: SEPTA (2019).
Note: At the time of this study, this could not be seen on aerial imagery.

Figure 33 is an example of a midblock bus bay along First Avenue in King of Prussia. The bus bay works for the following reasons.

- It is in proximity to turning traffic off Gulph Road, a high-speed and high-volume roadway. However, because of the bus bay, buses are protected from vehicles accelerating from that turn onto First Avenue. Also, it is far enough from the turn so operators have enough sight distance to pull back into traffic flow without too much difficulty.
- There is an opportunity to short turn trips at this location as needed to manage passenger loads due to the width and length.
- It serves the Valley Forge Casino and Hotel, where persons may be traveling with luggage and may need some extra time to board.
- It allows disabled passengers to load at their pace without blocking a travel lane.
- At most times, traffic volumes do not preclude buses from pulling back into traffic in a timely fashion.

Figure 33 | First Avenue, King of Prussia, Midblock Bus Bay

Length of Bus Bay: approximately 140 feet

Sources: SEPTA and Google (2019).

SEPTA Bus Stop Design Guidelines

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ABSTRACT:
The purpose of this report is to provide municipalities in the SEPTA service area, local developers, and other local partners a consistent set of guidelines for designing surface transit stops.

GEOGRAPHIC AREA COVERED:
SEPTA Bus Network, including: Bucks County, Chester County, Delaware County, Montgomery County, and Philadelphia

KEY WORDS:
Bus, Bus Facilities, Bus Stop, Design, Operator, Passenger, SEPTA, Southeastern Pennsylvania

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