Bus Stop Master Plan

SORTA Bus Stop Evaluation and Design Project

August 2023

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CONTENTS

1. INTRODUCTION

What is the Purpose of This Plan?

SORTA's system includes more than 3,700 active bus stops. These bus stops are the first impression that most passengers have of SORTA's bus services. A bus stop's safety, accessibility, cleanliness, and comfort play an important role in the overall passenger experience. SORTA therefore strives to create bus stops that improve the passenger experience and make a positive contribution to a neighborhood's streetscape while providing useful information to passengers, bus operators, and other street users about the agency's bus services. This plan's purpose is to provide guidance for locating and designing bus stops to help improve the passenger experience.

Bus stop designs and locations must be consistent with state and federal laws, regulations, and industry best practices. Local policies and accepted national best practices have changed since SORTA's previous *Bus Stop Design Guidelines* were published in 2019, including the planned introduction of a new BRT service type. This plan supersedes recommendations from previous iterations of SORTA's *Bus Stop Design Guidelines*.

This *Bus Stop Master Plan* incorporates best practices from across the United States and around the world but draws substantially from the *Transit Street Design Guide* published by the National Association of City Transportation Officials (NACTO). As stated in the *Transit Street Design Guide*, "Reliable public transportation depends on a commitment to transit at every level of design." Using this statement as inspiration and applying the guidance in this plan, SORTA will work toward the continued improvement of the agency's bus stops.

This *Bus Stop Master Plan* will be reviewed and revised as needed.

Who is This Plan For?

This plan is intended to serve both as an internal resource for SORTA as well as a resource for many different audiences with a stake in bus stop design and location, including passengers, neighborhood associations, elected officials, transit advocates, real estate developers, transportation planners, bus operators, and anyone else who has questions about how and why decisions are made about the design and location of SORTA bus stops.

How is This Plan Organized?

This plan contains six chapters that address the following bus stop topics, as well as an appendix with more detailed technical information.

Chapter 2: Bus Stop Amenities provides descriptions and specifications for amenities at bus stops within the SORTA system, such as shelters, benches, trash cans, signage, and more.

Chapter 3: Amenity Tiers describes the framework used to determine which amenities should be placed at bus stops based on ridership and demographic data about the bus stops' surrounding neighborhoods.

Chapter 4: Bus Stop Typologies defines optimal configurations for bus stops based on their relationship to the curbside and nearby intersections.

Chapter 5: Bus Stop Placement provides guidance on bus stop spacing according to context and describes SORTA processes and procedures for adding, relocating, and removing bus stops. This section also explains operational factors to consider when selecting bus stop locations.

Chapter 6: Bus Stop Signs defines specifications for signage at bus stops, including bus stop signs, regulatory signs, and wayfinding.

Chapter 7: Public Communication About Bus Stops describes the process for submitting bus stop feedback, including information on who to contact regarding common bus stop placement and maintenance issues.

> **"Reliable public transportation depends on a commitment to transit at every level of design."**
>
> *Transit Street Design Guide, NACTO*

2. BUS STOP AMENITIES

A bus stop amenity is anything that improves the waiting experience for passengers, the stopping experience for bus operators, or both. Typical bus stop amenities for passengers can include benches, shelters, trash cans and lighting. These amenities make waiting for the bus easier, safer, and more comfortable. Typical bus stop amenities for bus operators can include signage, space for accessible boarding and alighting, and restrooms. These amenities make it easier, safer, and more comfortable for bus operators to stop and serve bus stops.

Together, bus stop amenities for passengers and bus operators make SORTA's bus routes more productive. Improving the waiting experience for passengers with bus stop amenities can help increase bus ridership, while improving the stopping experience for bus operators with bus stop amenities can improve efficiency and reduce operators' day-to-day stress.

In the following section, SORTA has identified 30 potential bus stop amenities for passengers and bus operators.

Amenity Specifications

In an ideal world, the potential bus stop amenities below could be introduced to all bus stops in the SORTA system. However, multiple considerations – such as available space, ridership, and funding resources – affect what can realistically be provided. As discussed later in this chapter, bus stop improvements inevitably need to be prioritized, so the potential bus stop amenities below have been classified into six color-coded amenity categories:

SIGNAGE AND WAYFINDING

Signage and wayfinding amenities clarify route information for passengers, such as a route's name, destination, and other characteristics, and contain important operational information, such as instructing other vehicles not to park in a bus stop. In addition to **Table 1** below, these amenities are discussed in more detail in **Chapter 6.**

ACCESSIBILITY

Accessibility amenities allow passengers with mobility aids, such as wheelchairs, canes, and walkers, to safely access bus stops. They also allow the *broadest possible swath* of the public to safely access bus stops. For example, if a bus stop lacks a connecting crosswalk or sidewalk, it is difficult for *everyone* to reach that bus stop.

SAFETY

Safety amenities improve public safety at bus stops. Street lighting is an essential safety amenity because it ensures adequate nighttime visibility, but other amenities can include video surveillance and emergency call boxes.

COMFORT

Comfort amenities improve the waiting experience for passengers. The waiting experience affects bus ridership: a comfortable experience (for example, waiting inside a shelter with some protection from unpleasant weather) can turn first-time passengers into regular passengers, while an uncomfortable or unpleasant experience (for example, waiting out in the rain) can discourage ridership and lead passengers to seek alternative means of travel.

CONNECTIVITY

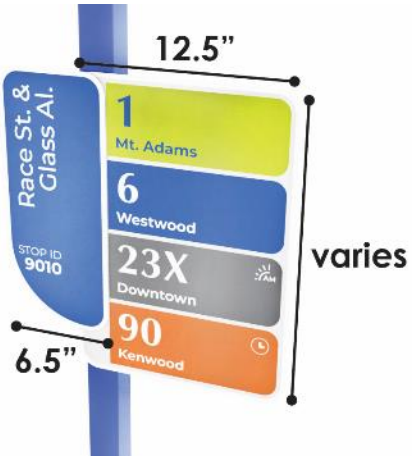
Connectivity amenities provide racks, corrals, lots, and other accommodations for connecting travel modes. Bus stops increasingly serve as connection points to other modes of travel: bikes, e-bikes, scooters, and microtransit (e.g., Uber, Lyft, and taxis) often function as "first mile/last mile" connections between bus stops, passengers' starting points, and/or their destinations.

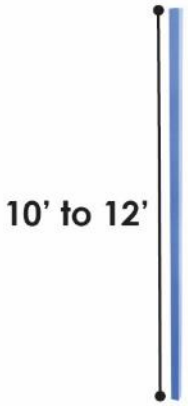
OPERATIONAL

Operational amenities make it easier for bus operators to serve bus stops and provide space for bus operations to happen smoothly and safely. These amenities include dedicated space for stopping and parking buses to improve bus routes' operational efficiency and operator restrooms to improve bus operators' quality of life.

Table 1 through Table 6 list the 30 potential amenities recommended for SORTA bus stops. Each amenity includes a thumbnail image that is not necessarily intended to be a literal representation. Dimensional needs, material and model considerations, placement and siting considerations, and maintenance responsibilities are also provided.

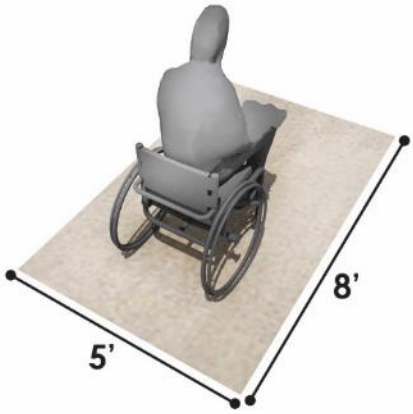
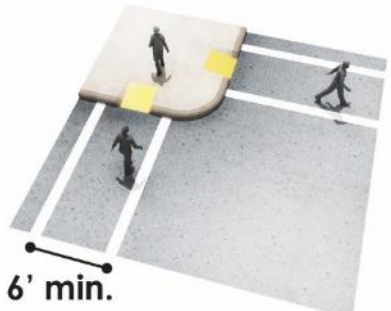
TABLE 1: RECOMMENDED SIGNAGE AND WAYFINDING AMENITIES

	Amenity Name, Number, and Description	Dimensional Needs	Materials and Model	Placement and Siting	Maintenance Responsibilities
Signage and Wayfinding	**1. Bus Stop Sign:** Lists the bus routes serving the bus stop. 	The sign is composed of two panels: the *stop location panel* and the *route information panel.* The first panel is 6.5" wide and the second panel is 12.5" wide. Their lengths vary; see **Chapter 6** for more detailed specifications.	Reflective decals and/or screenprints applied to both sides of aluminum (double-sided).	Place on signpost at the head of the bus stop (where the accessible boarding/ alighting pad is). Ensure the sign is at least 7' above the ground, but no more than 10' above the ground. See **Figure 1** for placement and siting details.	Provided and maintained by SORTA.
Signage and Wayfinding	**2. Bus Stop Topper:** Highlights the bus stop for pedestrians.  	12" diameter (circular). See **Chapter 6** for more detailed specifications.	Reflective decals and/or screenprints applied to both sides of aluminum (double-sided). **Two variations:** a simple logo (first image at left) should be used at most bus stops, while a bus bay letter (second image at left) should be used at transit centers.	Place atop signpost using a standard 2" aluminum signpost bracket: 	Provided and maintained by SORTA.

	Amenity Name, Number, and Description	Dimensional Needs	Materials and Model	Placement and Siting	Maintenance Responsibilities
Signage and Wayfinding	**3. Regulatory Sign:** Indicates the bus stop's no parking zone. 	12"x18" (portrait). See **Chapter 6** for more detailed specifications.	Reflective screenprint applied to one side of aluminum (single-sided).	Place first sign at head of bus stop (right tow zone arrow) and second sign at rear of bus stop (left tow zone arrow) to demarcate the length to keep clear. Ensure both signs are at least 7' above the ground, but no more than 10' above the ground.	Provided and maintained by the locality.
Signage and Wayfinding	**4. QR Code Sign:** Allows smartphone users to obtain additional route information. 	4"x8" (portrait). The QR code should be at least 1" high for smartphone readability, but 2" or more is preferred. See **Chapter 6** for more detailed specifications.	Reflective decal or screenprint applied to one side of aluminum (single-sided). The stop ID and contact information should also be embossed into the aluminum in braille, but make sure to keep the QR code area clear of embossing.	Place on the same signpost containing the bus stop sign (at the head of the bus stop where the accessible boarding/ alighting pad is). Ensure the sign is at least 48" above the ground, but no more than 67" above the ground.	Provided and maintained by SORTA.
Signage and Wayfinding	**5. Signpost:** Hosts the four signs listed above. 	2" square channel; 10' to 12' long. See **Chapter 6** for more detailed specifications.	Blue painted or powder-coated aluminum square channel. Signposts do not contain predrilled bolt holes, which need to be added manually upon sign installation.	Place at head of bus stop where the accessible boarding/ alighting pad is (but not *in* the pad itself!). To accommodate the bus stop's rear regulatory sign, a second signpost may be needed at the rear of the stop (or an existing nearby post/pole can be used).	Provided and maintained by SORTA.

	Amenity Name, Number, and Description	Dimensional Needs	Materials and Model	Placement and Siting	Maintenance Responsibilities
Signage and Wayfinding	**6. Real-Time (RTIS) Display:** Displays the next arriving buses at the bus stop in real time. 	Varies depending on the RTIS model; typical e-paper displays are approximately 9”x13” (portrait) and typical LED/LCD displays are larger.	Varies depending on the RTIS model; most model casings typically use some combination of heavy-duty plastic, plexiglass, aluminum, and/or steel.	E-paper displays are preferred in locations where power must be supplied via solar battery and where data must be transmitted wirelessly. LED/LCD displays are preferred in transit centers where both power and data conduits are available.	Provided and maintained by SORTA.
Signage and Wayfinding	**7. Entrance Pylon:** Highlights the entrances to transit centers. 	10’ to 12’ high but can vary proportionally as needed. See **Chapter 6** for more detailed specifications.	Varies but typically consists of some combination of heavy-duty plastic, aluminum, and/or steel. Requires a concrete footing.	Place at and around entrances to transit centers and BRT stops. Pylons can be internally lit for nighttime visibility if a power conduit is available but should still be legible without having to rely on lighting.	Provided and maintained by SORTA.
Signage and Wayfinding	**8. Ticket Vending Machine:** Allows passengers to purchase tickets and passes before boarding the bus. 	Varies as needed but a typical footprint is 3’x2’.	Varies as needed.	Place at and around entrances to transit centers and BRT stops to allow passengers to purchase tickets and passes before boarding buses. Requires power and data conduits.	Provided and maintained by SORTA.

TABLE 2: RECOMMENDED ACCESSIBILITY AMENITIES

	Amenity Name, Number, and Description	Dimensional Needs	Materials and Model	Placement and Siting	Maintenance Responsibilities
Accessibility	**9. Accessible Boarding/Alighting Pad:** Provides space to deploy a bus's wheelchair ramp. 	A 5'x8' area on the sidewalk is needed for the bus's wheelchair ramp and must be kept clear of *all* obstructions.	Concrete; can be dyed or marked for visibility if desired.	Place at the head of the bus stop where the bus is expected to deploy its wheelchair ramp. See **Figure 1** for placement and siting details.	Provided by SORTA but maintained by the locality.
Accessibility	**10. Accessible Sidewalk:** Allows everyone to access the bus stop. 	A minimum 3' wide sidewalk must be provided to the bus stop. On this and any wider sidewalks, a 3' width must be kept clear of *all* obstructions.	Concrete or asphalt is preferred, but other slip-resistant materials (e.g., brick or stone pavers) are acceptable.	Connect the sidewalk to the bus stop and make sure any obstructions (posts, poles, benches, trash cans, etc.) do not obstruct the minimum 3' wide clear area. See **Figure 1** for placement and siting details.	Provided and maintained by the locality.
Accessibility	**11. Accessible Crosswalk with Curb Ramps:** Allows everyone to access the bus stop. 	A minimum 6' wide crosswalk with ADA-compliant tactile curb ramps must be provided at each intersection around the bus stop. The crosswalk can be signaled, pedestrian-activated, or prominently signed for drivers.	Thermoplastic reflective white paint in zebra, ladder, or parallel line format (shown at left). Custom, artistic crosswalk designs can also be used and should be coordinated with the locality.	Place at the intersection's curb ramps. To the furthest extent possible, provide a crosswalk on *all four sides* of the intersection.	Provided and maintained by the locality.

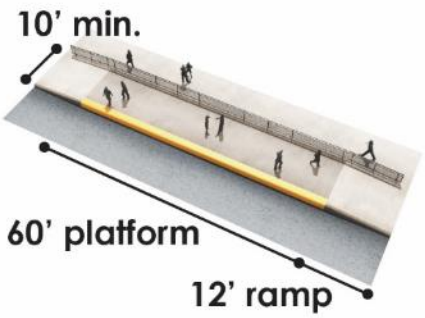
	Amenity Name, Number, and Description	Dimensional Needs	Materials and Model	Placement and Siting	Maintenance Responsibilities
Accessibility	**12. Level Boarding Platform:** Allows a bus to serve a high-ridership bus stop without "kneeling." 	60' long to serve articulated buses, and minimum 10' wide. Typically raised less than 1' above the surrounding sidewalk, for which approximately a 12' long access ramp is required (preferably at both ends of the platform).	Concrete platform and ramps, into which artwork (mosaics and murals) can be integrated. A tactile warning strip is required along the platform's outside edge and railings are required along the platform's inside edge and access ramps.	Add level boarding platforms to BRT stops and high-ridership stops to reduce the time it takes for passengers to step up and step down from buses, which contributes to their "dwell time."	Provided and maintained by SORTA. Locality provides and maintains the surrounding sidewalk.

TABLE 3: RECOMMENDED SAFETY AMENITIES

	Amenity Name, Number, and Description	Dimensional Needs	Materials and Model	Placement and Siting	Maintenance Responsibilities
Safety	**13. Lighting:** Provides nighttime visibility at the bus stop. 	Varies as needed but a low pedestrian-friendly height of 10' to 14' is recommended.	Varies as needed but should match the local neighborhood context.	Place as close to the bus stop as possible without interfering with the boarding/ alighting pad or the minimum 3' wide sidewalk clear area. Also provide a continuous lighted route along the sidewalks to the bus stop.	Provided and maintained by SORTA at transit centers and BRT stops, but otherwise provided and maintained by the locality at all other stops.
Safety	**14. Emergency Call Box:** Allows passengers to make emergency calls. 	Varies as needed but most models don't exceed 8' in height.	Varies as needed but most models are blue to highlight their emergency purpose.	Place at and around entrances to transit centers and BRT stops.	Provided and maintained by SORTA.

	Amenity Name, Number, and Description	Dimensional Needs	Materials and Model	Placement and Siting	Maintenance Responsibilities
Safety	**15. Video Surveillance:** Records activity at the bus stop via CCTV. 	Varies as needed.	Varies as needed but most models are white and/or black.	Distribute across the bus stop to give cameras the greatest possible visibility, with special attention paid to both congregational areas and out-of-the-way areas with poor natural visibility.	Provided and maintained by SORTA.

TABLE 4: RECOMMENDED COMFORT AMENITIES

	Amenity Name, Number, and Description	Dimensional Needs	Materials and Model	Placement and Siting	Maintenance Responsibilities
Comfort	**16. Trash Container:** Allows passengers to dispose of trash. 	Varies as needed.	Varies as needed but should match the local neighborhood context.	Place as close to the bus stop as possible without interfering with the boarding/ alighting pad or the minimum 3' wide sidewalk clear area. See **Figure 1** for placement and siting details.	Provided and emptied by SORTA at transit centers and BRT stops, but otherwise provided and emptied by the locality at all other stops.
Comfort	**17. Seating:** Allows passengers to sit at the bus stop. 	6'x2' footprint (assumes the "Oakley" bench model).	The black powder-coated "Oakley" bench model from Witt Industries should be used (see **Appendix**), but other models that are compatible with the local neighborhood context or included with bus shelters are also acceptable.	Place as close to the bus stop as possible without interfering with the boarding/ alighting pad or the minimum 3' wide sidewalk clear area. See **Figure 1** for placement and siting details.	Provided and maintained by SORTA.

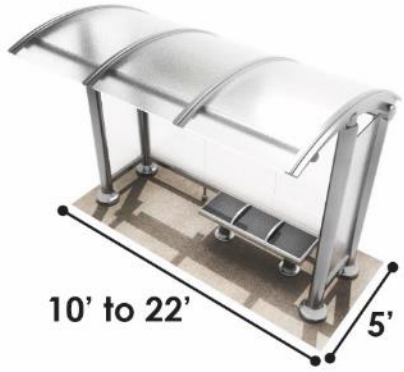
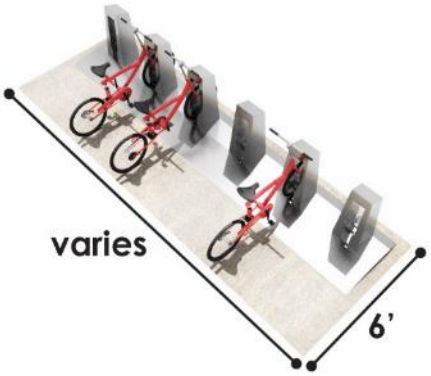
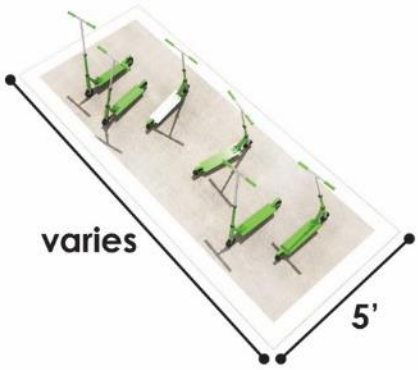
	Amenity Name, Number, and Description	Dimensional Needs	Materials and Model	Placement and Siting	Maintenance Responsibilities
Comfort	**18. Shelter:** Protects passengers from the elements.  	The smallest footprint is 5'x10', but this can increase to 5'x22' depending on the desired shelter length.	The silver powder-coated Signature Sunset 1 model from Tolar Manufacturing should be used (see **Appendix**), but custom shelters for specific neighborhoods are also acceptable. A concrete pad is required.	Place as close to the bus stop as possible without interfering with the boarding/ alighting pad or the minimum 3' wide sidewalk clear area, which can pass in front or behind the shelter. See **Figure 1** for placement and siting details.	Provided and maintained by SORTA.
Comfort	**19. Public Art:** Beautifies the bus stop and turns it into a neighborhood point of interest. 	Varies as needed but should not impede bus stop visibility.	Varies as needed but should be durable to withstand weathering and vandalism.	Place near the bus stop without impeding its visibility and without interfering with the boarding/ alighting pad or the minimum 3' wide sidewalk clear area.	Provided and maintained by a private organization or the locality.

TABLE 5: CONNECTIVITY AMENITIES

	Amenity Name, Number, and Description	Dimensional Needs	Materials and Model	Placement and Siting	Maintenance Responsibilities
Connectivity	**20. Bike Rack:** Allows passengers to store bikes at the stop.  	Typically 2' wide; multiple bike racks should be spaced at least 3' apart.	"Inverted u" racks should be used since they are more resistant to vandalism and theft compared to other racks. Black powder-coated models are preferred, but other styles and colors are acceptable.	Place near the bus stop without interfering with the boarding/ alighting pad or the minimum 3' wide sidewalk clear area. See **Figure 1** for placement and siting details.	Provided and maintained by SORTA at transit centers and BRT stops, but otherwise provided and maintained by the locality at all other stops.

	Amenity Name, Number, and Description	Dimensional Needs	Materials and Model	Placement and Siting	Maintenance Responsibilities
Connectivity	**21. Secure Bike Storage:** Allows passengers to store bikes in enclosed lockers or containers at the bus stop.  	3.5'x6.5' footprint (assumes the ProPark locker model).; a second locker can also be stacked atop the first.	The ProPark Standard Model from CycleSafe is preferred for its relatively low cost, durability, and modular flexibility, but other models are acceptable. Using a single model across the entire system is preferred for ease of stocking and replacing parts.	Place near the bus stop without interfering with the boarding/ alighting pad or the minimum 3' wide sidewalk clear area.	Provided and maintained by SORTA at transit centers and BRT stops, but otherwise provided and maintained by the locality at all other stops.
Connectivity	**22. Bikeshare Dock:** Allows passengers to rent bikes at the stop.  	Approximately 6' of width is needed, but the length varies depending on the anticipated number of bike slots (the number of slots per dock typically comes in modular increments).	Dock materials vary but a level paved surface is required. Power and data conduits are also required; contact Cincinnati Red Bike for details.	Place near the bus stop without interfering with the boarding/ alighting pad or the minimum 3' wide sidewalk clear area.	Provided and maintained by Cincinnati Red Bike.
Connectivity	**23. Scooter Corral:** Allows passengers to rent (pick up and drop off) scooters at the bus stop.  	Approximately 5' of width is needed, but the length varies depending on the amount of space anticipated to accommodate scooter demand.	Typically thermoplastic reflective white paint applied to the sidewalk or roadway surface, but materials can vary.	Place near the bus stop without interfering with the boarding/ alighting pad or the minimum 3' wide sidewalk clear area.	Provided and maintained by SORTA at transit centers and BRT stops, but otherwise provided and maintained by the locality at all other stops.

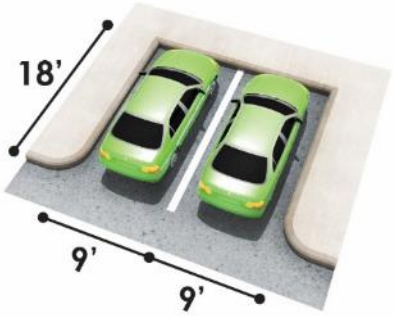
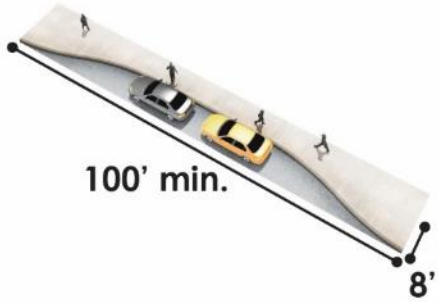
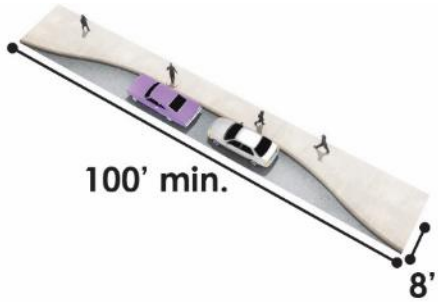
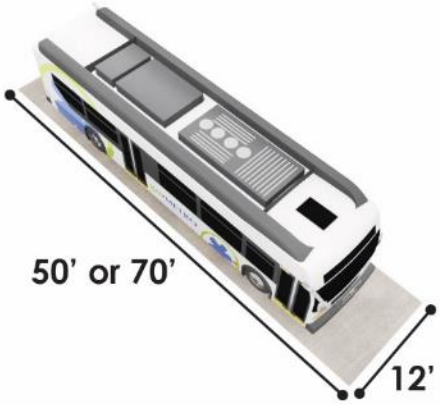
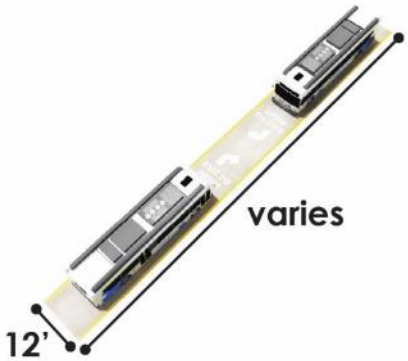
	Amenity Name, Number, and Description	Dimensional Needs	Materials and Model	Placement and Siting	Maintenance Responsibilities
Connectivity	**24. Carshare Parking:** Allows passengers to rent cars at the stop. 	Each parking space should be 9'x18' and signed to indicate its restricted use for carshare vehicles only.	Typically asphalt but can employ porous pavement to reduce runoff.	Place on roadway, driveway, and/or parking lot adjacent to the bus stop. Placement on roadways requires coordinating with the locality.	Provided and maintained by SORTA at transit centers and BRT stops, but otherwise provided and maintained by the locality at all other stops.
Connectivity	**25. Taxi/Microtransit Pickup/Dropoff:** Allows passengers to hail or alight from taxis, Ubers, or Lyfts at the bus stop. 	The pickup/ dropoff lane should be 8' wide and at least 100' long. If demand is light, the lane can be shared with a kiss-and-ride (see below).	Typically asphalt but concrete is recommended for durability.	Place on roadway or driveway adjacent to the bus stop. Placement on roadways requires coordinating with the locality.	Provided and maintained by SORTA at transit centers and BRT stops, but otherwise provided and maintained by the locality at all other stops.
Connectivity	**26. Kiss-and-Ride:** Allows passengers to be dropped off or picked up at the bus stop. 	The kiss-and-ride lane should be 8' wide and at least 100' long. If demand is light, the lane can be shared with taxis and microtransit (see above).	Typically asphalt but concrete is recommended for durability.	Place on roadway or driveway adjacent to the bus stop. Placement on roadways requires coordinating with the locality.	Provided and maintained by SORTA at transit centers and BRT stops, but otherwise provided and maintained by the locality at all other stops.
Connectivity	**27. Park-and-Ride:** Provides parking spaces for commuters. 	Each parking space should be 9'x18' and the access lane should be at least 20' wide. The number of parking spaces is dictated by anticipated commuting demand and available land.	Typically asphalt but can employ porous pavement to reduce runoff.	Place on land adjacent to the bus stop and provide walkways to the bus stop. A certain proportion of parking spaces closest to the bus stop must be reserved for accessible parking.	Provided and maintained by SORTA or leased from other property owners.

TABLE 6: OPERATIONAL AMENITIES

	Amenity Name, Number, and Description	Dimensional Needs	Materials and Model	Placement and Siting	Maintenance Responsibilities
Operational	**28. Bus Landing Pad:** Provides a durable concrete stopping space for the bus on the roadway. 	Not be to confused with boarding/ alighting pads, bus landing pads should be 12' wide. Those expected to serve 40' buses should be at least 50' long while those expected to serve 60' buses should be at least 70' long.	Concrete is required since it reduces surface deformations caused by bus traffic.	Place on roadway or driveway in front of the bus stop. See **Figure 1** for placement and siting details.	Provided and maintained by SORTA at transit centers and BRT stops, but otherwise provided and maintained by the locality at all other stops.
Operational	**29. Bus Layover Strip:** Provides a long-term parking space for buses separate from the bus stop itself. 	Layover strips should be 12' wide but length varies depending on the anticipated amount of long-term bus parking needed and the available space.	Concrete is required since it reduces surface deformations caused by bus traffic.	Provide in a separate area from the bus stop itself: the intention is to allow out-of-service buses to park without blocking the actual bus stop, which would continue to see activity from in-service buses.	Provided and maintained by SORTA.
Operational	**30. Operator Restroom:** Gives bus operators a place to rest and recover before resuming their driving. 	A layout that accommodates two accessible unisex toilets separated by a utility closet can fit on a 10'x18' footprint, but actual size depends on available space.	Varies as needed but durable materials such as brick, cinder block, and concrete are preferred over wooden construction.	Place near the bus stop without interfering with the boarding/ alighting pad or the minimum 3' wide sidewalk clear area. Restrooms must remain locked and are accessible *only* to bus operators.	Provided and maintained by SORTA.

Note that the signage and wayfinding amenities in **Table 1** are introduced only briefly since each recommended sign is described in more detail in **Chapter 6.** Additionally, recommended quantities for each bus stop amenity are identified separately by *Amenity Tier* further below.

Amenity Placement Requirements

The bus stop amenities in **Table 1 through Table 6** must be placed carefully to ensure they do not interfere with sidewalk traffic, with minimum clearances for accessibility, and with each other. As shown in **Figure 1**, two overarching placement requirements should be kept in mind at all bus stops:

Keep the accessible boarding/alighting pad clear of all obstructions.

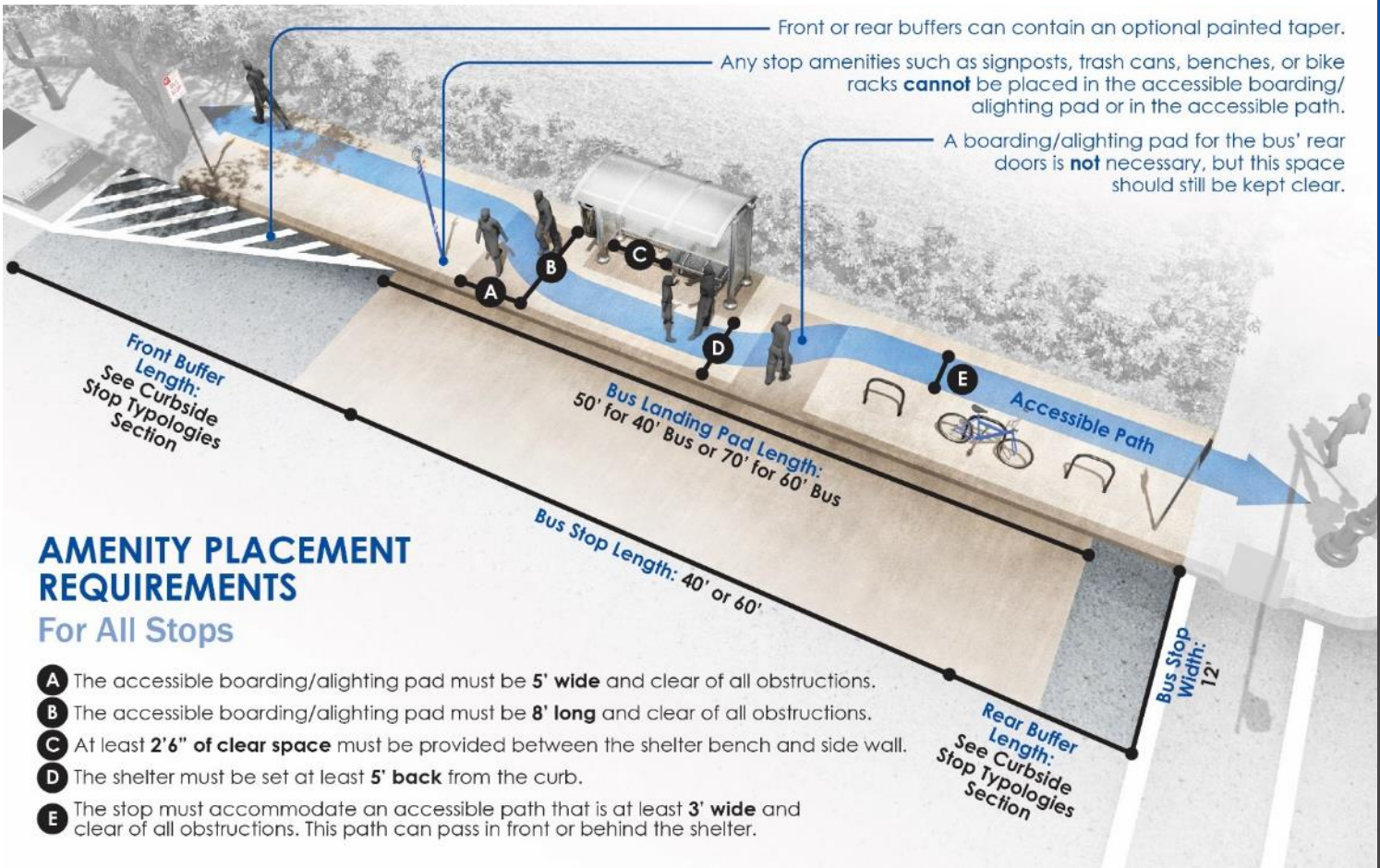
The 5'x8' accessible boarding/alighting pad on the sidewalk serves two functions: it provides space for the bus to deploy its wheelchair ramp and it provides space for passengers with mobility aids to wait and quickly access the wheelchair ramp with a minimal amount of maneuvering and movement. Therefore, this pad must be kept clear of signposts, trash cans, benches, shelters, and any other bus stop amenities.

Figure 1 shows two boarding/alighting pads: one for the bus's front door and one for the bus's rear door. The front door boarding/alighting pad is essential for wheelchair accessibility since most buses have wheelchair ramps only at their front doors. While not as necessary for wheelchair accessibility, a rear door boarding/alighting pad keeps the sidewalk at the bus's rear door clear of obstructions to provide a clear space for passengers of all abilities to get off the bus. The second pad also accommodates future buses with wheelchair ramps at both doors.

Keep a three-foot-wide path on the sidewalk clear of all obstructions.

In addition to the accessible boarding/alighting pad, a continuous accessible path at least 3' wide must be provided along the sidewalk and *through* the bus stop. This path can pass in front or behind the bus stop's bench and/or shelter (if present) and this path is also allowed to pass *through* the accessible boarding/alighting pad.

FIGURE 1: AMENITY PLACEMENT REQUIREMENTS FOR ALL STOPS



3. AMENITY TIERS

Due to limiting factors, particularly the availability of space, not all bus stops can be provided with all possible amenities. Each bus stop is designated into an *amenity tier*, which is a bus stop classification method in which bus stops receive different amenities (and quantities of amenities) based on a variety of prioritization criteria, including ridership, level of service, and demographics around the bus stop. This classification method and its contributing prioritization criteria are described in detail in the **Classifying Bus Stops by Amenity Tier** and **Prioritizing Bus Stop Improvements by Amenity Tier** sections later in this chapter.

SORTA has developed the eight amenity tiers in **Table 7** to efficiently serve a variety of operating conditions across its system, ranging from busy transfer stops in Downtown Cincinnati to quiet suburban stops on the outskirts of the city. The eight amenity tiers are organized hierarchically, with Tier 1 serving the most routes and offering the most amenities for both passengers and bus operators, and Tier 5 serving the fewest routes and offering the fewest amenities. There are also three special-use tiers, two for future BRT service and one for park-and-ride service.

TABLE 7: RECOMMENDED SORTA AMENITY TIERS

Tier Number	Tier Name	Tier Description
Tier 1	Off-Street Transit Center	This tier contains two or more off-street bus bays to centralize and consolidate bus stops with very high ridership, bus stops with very high transfer activity, and/or bus stops serving numerous terminating bus routes (layovers).
Tier 2	On-Street Transit Center	This tier contains two or more on-street bus bays to centralize and consolidate bus stops with very high ridership, bus stops with very high transfer activity, and/or bus stops serving numerous terminating bus routes (layovers).
Tier 3	Major Stop	This tier serves bus stops on frequent transit corridors that also have high ridership and transfer activity.
Tier 4	Intermediate Stop	This tier serves bus stops with moderate ridership and transfer activity.
Tier 5	Minor Stop	This tier represents the minimum level of bus stop investment needed to adequately serve passengers and applies to low-ridership stops on SORTA's coverage corridors.
Tier BRT-A	Median BRT Stop with Center Platform	This tier provides amenities to support SORTA's future BRT service. A median BRT stop is in the center of the street and BRT buses traveling in both directions share and serve the stop's single center platform.
Tier BRT-B	Curbside BRT Stop with Side Platform	This tier provides amenities to support SORTA's future BRT service. A curbside BRT stop is located on the side of the street and serves BRT buses traveling in one direction. A pair of BRT stops (one on each side of the street) is needed to serve BRT buses traveling in both directions.
Tier PNR	Park-and-Ride Stop	This tier contains one or more off-street or on-street bus bays to centralize and consolidate bus stops with high commuting demand. The accompanying park-and-ride's size depends on commuting demand and available space.

The following pages contain annotated illustrations for each amenity tier and quantify their required, context-dependent, and varying amenities. A *context-dependent* amenity is *not* required and is provided only if certain local conditions are met: some context-dependent amenities may require a certain level of demand to justify their addition, while others may require a certain amount of space that may not be available at every location. Meanwhile, a *varying* amenity *is* required but is left unquantified due to its fluid nature: the number of accessible sidewalks, crosswalks, and lighting at any amenity tier will vary depending on the bus stop's size and location.

It is important to remember that the amenity tier illustrations represent ideal conceptual conditions: even when all required amenities and as many context-dependent amenities as practical are provided, real-world applications almost always deviate from these conceptual conditions due to their local contexts and constraints. These amenity tiers are intended to serve more as inspirational guidance than as rigid templates.

Amenity tiers should not be confused with *bus stop typologies.* Amenity tiers offer guidance on which amenities to provide at bus stops, but do not address the *position and placement* of those bus stops relative to the intersection and curbside. Bus stop position and placement recommendations are addressed separately in **Chapter 3.**

Tier 1: Off-Street Transit Center

The Off-Street Transit Center tier contains two or more off-street bus bays to centralize and consolidate bus stops with very high ridership, bus stops with very high transfer activity, and/or bus stops serving numerous terminating bus routes (layovers).

TABLE 8: REQUIRED AND CONTEXT-DEPENDENT AMENITIES AT TIER 1 STOPS

	Amenity	Quantity		Amenity	Quantity
1	Bus Stop Sign	1 per bus bay	16	Trash Container	1 per bus bay
2	Bus Stop Topper	1 per bus bay (use the letter version)	17	Seating	At least 1 bench per bus bay
3	Regulatory Sign	1 at each entrance/exit to the transit center	18	Shelter	1 per bus bay
4	QR Code Sign	1 per bus bay	19	Public Art	Varies
5	Signpost	1 per bus bay	20	Bike Rack	At least 4 racks
6	Real-Time (RTIS) Display	1 per bus bay (LED/LCD preferred)	21	Secure Bike Storage	Context-dependent
7	Entrance Pylon	1 at each entrance/exit to the transit center	22	Bikeshare Dock	Context-dependent
8	Ticket Vending Machine	Context-dependent	23	Scooter Corral	Context-dependent
9	Accessible Boarding/Alighting Pad	1 per bus bay	24	Carshare Parking	Context-dependent
10	Accessible Sidewalk	Varies	25	Taxi/Microtransit Pickup/Dropoff	Context-dependent
11	Accessible Crosswalk with Curb Ramps	Varies	26	Kiss-and-Ride	Context-dependent
12	Level Boarding Platform	Context-dependent	27	Park-and-Ride	Context-dependent
13	Lighting	Varies	28	Bus Landing Pad	1 per bus bay
14	Emergency Call Box	1 at each entrance/exit to the transit center	29	Bus Layover Strip	Context-dependent
15	Video Surveillance	Varies	30	Operator Restroom	2 unisex toilets

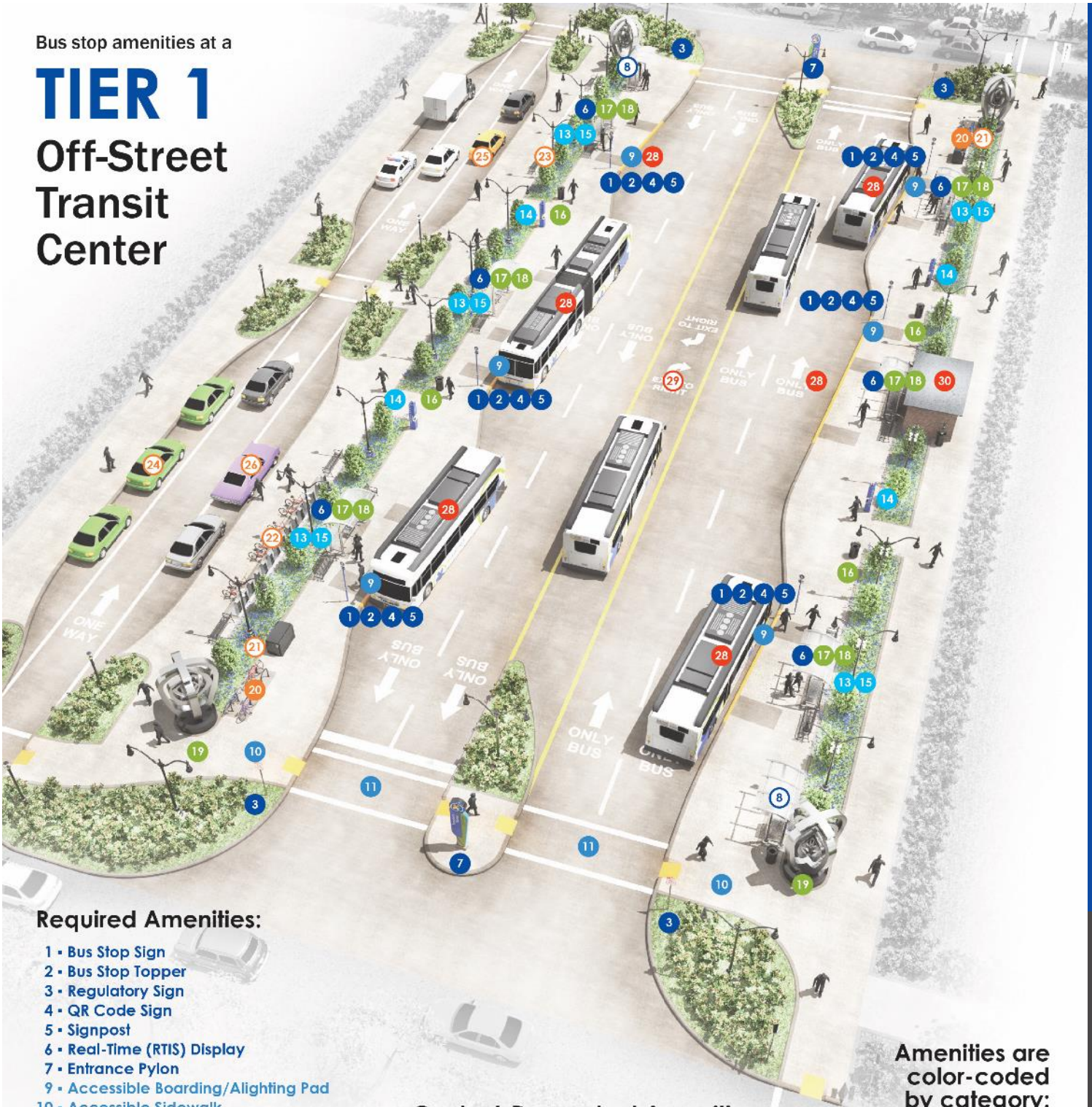
EXAMPLE: NORTHSIDE TRANSIT CENTER

This transit center, built in 2020, currently serves seven bus routes. Built into a triangular off-street site in Cincinnati's Northside neighborhood, the transit center offers custom shelters, seating, real-time (RTIS) displays, trash containers, bike racks, ticket vending machines, public art integrated into its shelters and entrance pylons, an operator restroom, and a park-and-ride lot for commuters. Landscaping and plantings beautify the transit center.

Bus stop amenities at a

TIER 1

Off-Street Transit Center



Required Amenities:

1 • Bus Stop Sign
2 • Bus Stop Topper
3 • Regulatory Sign
4 • QR Code Sign
5 • Signpost
6 • Real-Time (RTIS) Display
7 • Entrance Pylon
9 • Accessible Boarding/Alighting Pad
10 • Accessible Sidewalk
11 • Accessible Crosswalk with Curb Ramps
13 • Lighting
14 • Emergency Call Box
15 • Video Surveillance
16 • Trash Container
17 • Seating
18 • Shelter
19 • Public Art
20 • Bike Rack
28 • Concrete Bus Landing Pad
30 • Operator Restroom

Context-Dependent Amenities:

8 • Ticket Vending Machine
12 • Level Boarding Platform *(Not Shown)*
21 • Secure Bike Storage
22 • Bikeshare Dock
23 • Scooter Corral
24 • Carshare Parking
25 • Taxi/Microtransit Pickup/Dropoff
26 • Kiss-and-Ride (General Pickup/Dropoff)
27 • Park-and-Ride *(Not Shown)*
29 • Concrete Bus Layover Strip

Amenities are color-coded by category:

Signage and Wayfinding •
Accessibility •
Safety •
Comfort •
Connectivity •
Operational •

Context-dependent amenities are provided if space, resources, ridership, demand, and/or other factors justify their provision.

AMENITY TIERS

FIGURE 2: AMENITIES AT TIER 1 STOPS

Tier 2: On-Street Transit Center

On-Street Transit Centers are for locations with significant ridership where off-street space is unavailable. This tier contains two or more on-street bus bays to centralize and consolidate bus stops with very high ridership, bus stops with very high transfer activity, and/or bus stops serving numerous terminating bus routes (layovers).

TABLE 9: REQUIRED AND CONTEXT-DEPENDENT AMENITIES AT TIER 2 STOPS

	Amenity	Quantity		Amenity	Quantity
1	Bus Stop Sign	1 per bus bay	16	Trash Container	1 per bus bay
2	Bus Stop Topper	1 per bus bay (use the letter version)	17	Seating	At least 1 bench per bus bay
3	Regulatory Sign	1 each at the head and rear of the transit center	18	Shelter	1 per bus bay
4	QR Code Sign	1 per bus bay	19	Public Art	Varies
5	Signpost	1 per bus bay	20	Bike Rack	At least 4 racks
6	Real-Time (RTIS) Display	1 per bus bay (LED/LCD preferred)	21	Secure Bike Storage	Context-dependent
7	Entrance Pylon	1 each at the head and rear of the transit center	22	Bikeshare Dock	Context-dependent
8	Ticket Vending Machine	Context-dependent	23	Scooter Corral	Context-dependent
9	Accessible Boarding/Alighting Pad	1 per bus bay	24	Carshare Parking	Context-dependent
10	Accessible Sidewalk	Varies	25	Taxi/Microtransit Pickup/Dropoff	Context-dependent
11	Accessible Crosswalk with Curb Ramps	Varies	26	Kiss-and-Ride	Context-dependent
12	Level Boarding Platform	Context-dependent	27	Park-and-Ride	Context-dependent
13	Lighting	Varies	28	Bus Landing Pad	1 per bus bay
14	Emergency Call Box	At least 1 call box	30	Operator Restroom	2 unisex toilets
15	Video Surveillance	Varies			

EXAMPLE: GOVERNMENT SQUARE

This transit center was remodeled and improved in 2006 to serve as the central transfer node in the SORTA system. Built into Fifth Street in Downtown Cincinnati, the transit center offers custom shelters, seating, real-time (RTIS) displays, trash containers, bike racks, ticket vending machines, and other amenities for passengers. The transit center integrates landscaping and plantings into its shelters and seating areas.

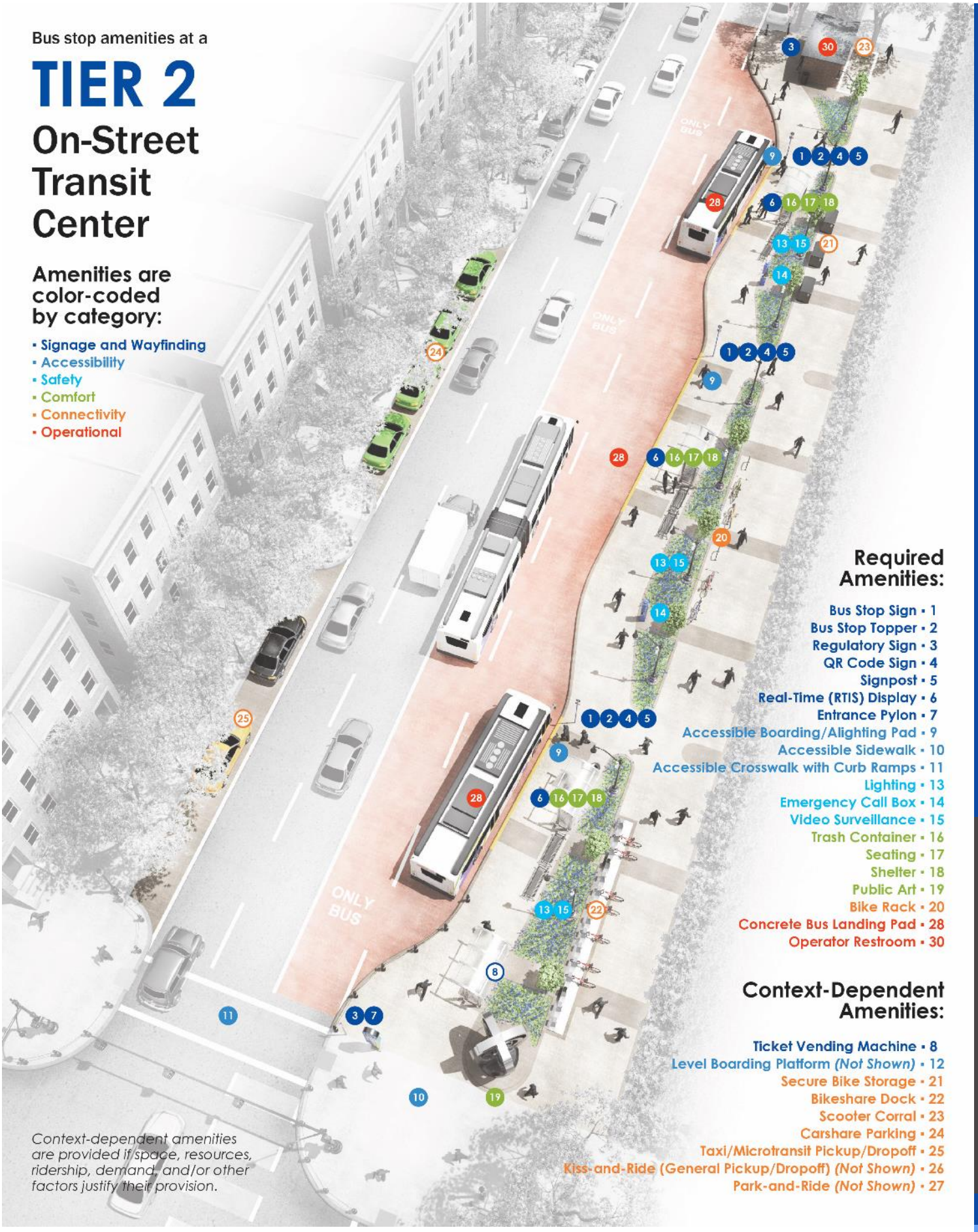
Bus stop amenities at a

TIER 2

On-Street Transit Center

Amenities are color-coded by category:

- Signage and Wayfinding
- Accessibility
- Safety
- Comfort
- Connectivity
- Operational



Required Amenities:

- Bus Stop Sign • 1
- Bus Stop Topper • 2
- Regulatory Sign • 3
- QR Code Sign • 4
- Signpost • 5
- Real-Time (RTIS) Display • 6
- Entrance Pylon • 7
- Accessible Boarding/Alighting Pad • 9
- Accessible Sidewalk • 10
- Accessible Crosswalk with Curb Ramps • 11
- Lighting • 13
- Emergency Call Box • 14
- Video Surveillance • 15
- Trash Container • 16
- Seating • 17
- Shelter • 18
- Public Art • 19
- Bike Rack • 20
- Concrete Bus Landing Pad • 28
- Operator Restroom • 30

Context-Dependent Amenities:

- Ticket Vending Machine • 8
- Level Boarding Platform *(Not Shown)* • 12
- Secure Bike Storage • 21
- Bikeshare Dock • 22
- Scooter Corral • 23
- Carshare Parking • 24
- Taxi/Microtransit Pickup/Dropoff • 25
- Kiss-and-Ride (General Pickup/Dropoff) *(Not Shown)* • 26
- Park-and-Ride *(Not Shown)* • 27

Context-dependent amenities are provided if space, resources, ridership, demand, and/or other factors justify their provision.

FIGURE 3: AMENITIES AT TIER 2 STOPS

Tier 3: Major Stop

The Major Stop tier is for bus stops on frequent transit corridors, which are streets served by three or more bus routes with combined service every 8 minutes or better. As a result, these corridors typically have high ridership and transfer activity. This tier prioritizes amenities that improve the transfer and waiting experience for passengers.

Major Stops support SORTA's Frequent Transit Network (FTN) and, as discussed in the **Classifying Bus Stops by Amenity Tier** section, are prioritized for most amenities before lower-tier stops.

TABLE 10: REQUIRED AND CONTEXT-DEPENDENT AMENITIES AT TIER 3 STOPS

	Amenity	Quantity		Amenity	Quantity
1	Bus Stop Sign	1 per bus stop	15	Video Surveillance	Context-dependent
2	Bus Stop Topper	1 per bus stop (use the logo version)	16	Trash Container	1 per bus stop
3	Regulatory Sign	2 per bus stop (1 each at the head/rear)	17	Seating	1 bench per bus stop
4	QR Code Sign	1 per bus stop	18	Shelter	1 per bus stop
5	Signpost	At least 2 per bus stop	19	Public Art	Context-dependent
6	Real-Time (RTIS) Display	Context-dependent (e-paper preferred)	20	Bike Rack	At least 1 rack per bus stop
9	Accessible Boarding/Alighting Pad	1 per bus stop	21	Secure Bike Storage	Context-dependent
10	Accessible Sidewalk	Varies	22	Bikeshare Dock	Context-dependent
11	Accessible Crosswalk with Curb Ramps	Varies	23	Scooter Corral	Context-dependent
12	Level Boarding Platform	Context-dependent	27	Park-and-Ride	Context-dependent
13	Lighting	Varies	28	Bus Landing Pad	1 per bus stop
14	Emergency Call Box	Context-dependent	30	Operator Restroom	Context-dependent (if a layover is present)

EXAMPLE: MAIN & CENTRAL (4826)

Located on Main Street in Downtown Cincinnati next to the Hamilton County Courthouse, this bus stop currently serves three bus routes and contains several Tier 3 amenities including a shelter, bench, and trash container. It also is a good candidate for additional Tier 3 amenities such as a real-time (RTIS) display, public art, bike racks, and a scooter corral given the multiple scooters frequently spotted scattered around the bus stop.

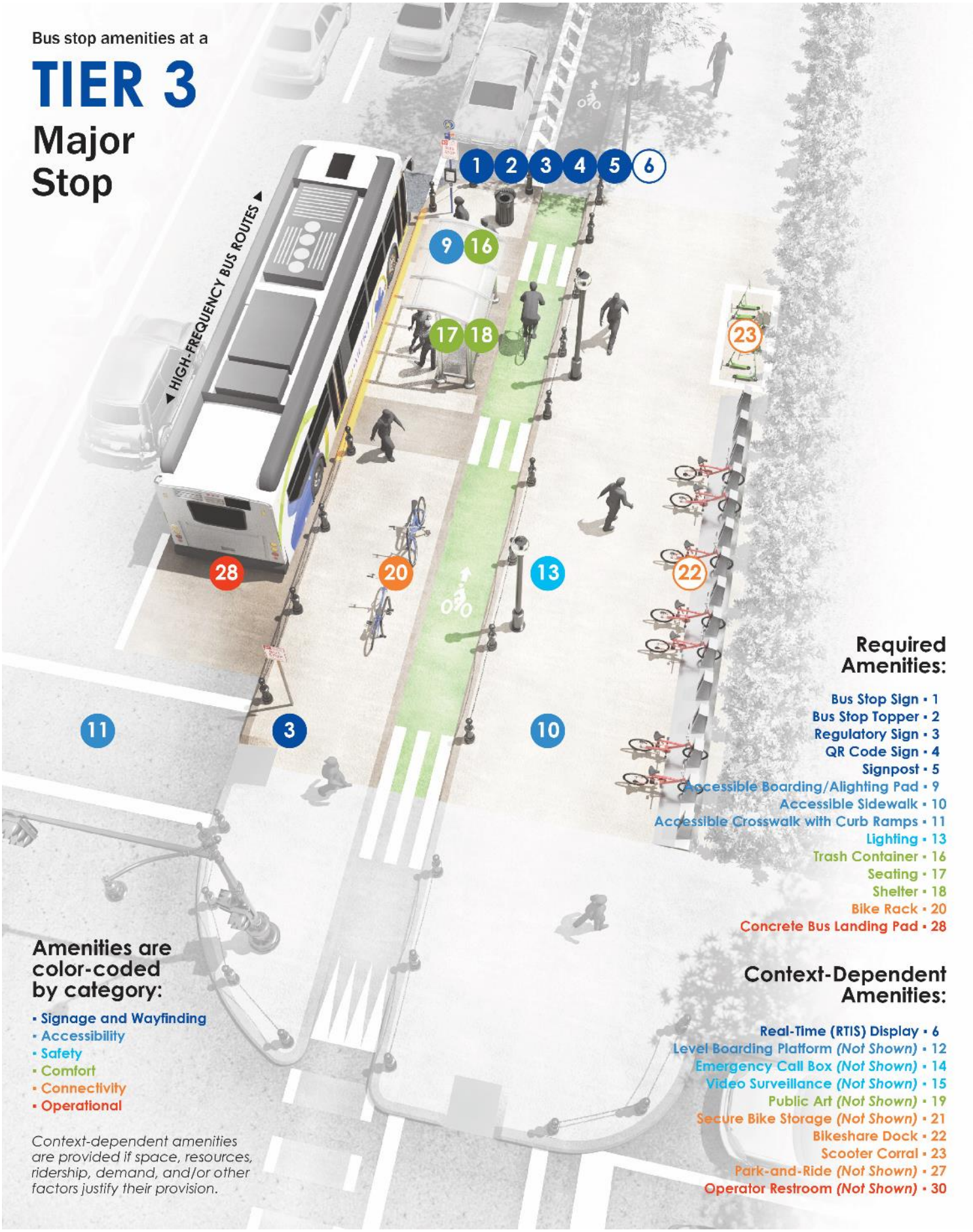


FIGURE 4: AMENITIES AT TIER 3 STOPS

Tier 4: Intermediate Stop

The Intermediate Stop tier is for bus stops that see moderate ridership and transfer activity. They offer several amenities to improve the waiting experience for passengers.

Together, Intermediate Stops (Tier 4) and Minor Stops (Tier 5) make up approximately 90 percent of the bus stops in the SORTA system. As discussed in the **Classifying Bus Stops by Amenity Tier** section, many of their amenities are consequently context-dependent: improvements are encouraged only after improvements to Tier 3 (and higher) stops have been made, or if local circumstances justify their placement.

For example, while shelters are required at Tier 3 stops, they are only context-dependent at Tier 4 stops. Shelters can be added to the latter once all Tier 3 (and higher) stops have been outfitted with shelters, or if a local circumstance such as a moderate-ridership stop serving a high proportion of senior citizens justifies addition.

TABLE 11: REQUIRED AND CONTEXT-DEPENDENT AMENITIES AT TIER 4 STOPS

	Amenity	Quantity		Amenity	Quantity
1	Bus Stop Sign	1 per bus stop	13	Lighting	Varies
2	Bus Stop Topper	1 per bus stop (use the logo version)	16	Trash Container	1 per bus stop
3	Regulatory Sign	2 per bus stop (1 each at the head/rear)	17	Seating	1 bench per bus stop
4	QR Code Sign	1 per bus stop	18	Shelter	Context-dependent
5	Signpost	At least 2 per bus stop	19	Public Art	Context-dependent
6	Real-Time (RTIS) Display	Context-dependent (e-paper preferred)	20	Bike Rack	Context-dependent
9	Accessible Boarding/Alighting Pad	1 per bus stop	27	Park-and-Ride	Context-dependent
10	Accessible Sidewalk	Varies	28	Bus Landing Pad	Context-dependent
11	Accessible Crosswalk with Curb Ramps	Varies	30	Operator Restroom	Context-dependent (if a layover is present)

EXAMPLE: EIGHTH & DEPOT (3325)

Located on Eighth Street in Cincinnati's Lower Price Hill neighborhood, this bus stop currently serves three bus routes and contains several Tier 4 amenities including a bench and trash container. It also is a good candidate for additional Tier 4 amenities such as improved lighting and a rebuilt sidewalk with a new accessible boarding/alighting pad. Since Eighth Street is a cycling route, the bus stop could also benefit from a bike rack.

FIGURE 5: AMENITIES AT TIER 4 STOPS

Tier 5: Minor Stop

The Minor Stop tier represents the minimum level of bus stop investment needed to adequately serve passengers. It applies to low-ridership stops on SORTA's coverage corridors, which are streets served by one or more bus routes with combined bus service every 60 minutes or better.

Together, Minor Stops (Tier 5) and Intermediate Stops (Tier 4) make up approximately 90 percent of the bus stops in the SORTA system. As discussed in the **Classifying Bus Stops by Amenity Tier** section, many of their amenities are consequently context-dependent: improvements are encouraged only after improvements to Tier 3 (and higher) stops have been made, or if local circumstances justify their placement.

For example, while seating is required at Tier 4 stops, it is only context-dependent at Tier 5 stops: seating can be added to the latter once all Tier 4 (and higher) stops have been outfitted with seating, or if a local circumstance such as a low-ridership stop serving a high proportion of senior citizens justifies addition.

TABLE 12: REQUIRED AND CONTEXT-DEPENDENT AMENITIES AT TIER 5 STOPS

	Amenity	Quantity		Amenity	Quantity
1	Bus Stop Sign	1 per bus stop	11	Accessible Crosswalk with Curb Ramps	Varies
2	Bus Stop Topper	1 per bus stop (use the logo version)	13	Lighting	Varies
3	Regulatory Sign	2 per bus stop (1 each at the head/rear)	16	Trash Container	Context-dependent
4	QR Code Sign	1 per bus stop	17	Seating	Context-dependent (bench or Simme Seat)
5	Signpost	At least 2 per bus stop	20	Bike Rack	Context-dependent
9	Accessible Boarding/Alighting Pad	1 per bus stop	30	Operator Restroom	Context-dependent (if a layover is present)
10	Accessible Sidewalk	Varies			

EXAMPLE: READING & MCGREGOR (5240)

Located on Reading Road in Cincinnati's Mount Auburn neighborhood, this bus stop currently serves one bus route. It reflects a typical Tier 5 stop, which make up the majority of the bus stops in the SORTA system. In addition to containing required amenities such as a sidewalk with an accessible boarding/alighting pad, it currently contains a context-dependent trash container to serve the sidewalk traffic on Reading Road.

FIGURE 6: AMENITIES AT TIER 5 STOPS

Tier BRT-A: Median BRT Stop with Center Platform

The BRT-A tier provides amenities to support SORTA's future BRT service by offering a high-quality waiting and transfer experience for future BRT passengers. A median BRT stop is in the center of the street and BRT buses traveling in both directions share and serve the stop's single center platform.

TABLE 13: REQUIRED AND CONTEXT-DEPENDENT AMENITIES AT TIER BRT-A STOPS

	Amenity	Quantity		Amenity	Quantity
1	Bus Stop Sign	2 per BRT stop (1 per direction)	15	Video Surveillance	Context-dependent
2	Bus Stop Topper	2 per BRT stop (1 per direction; use the logo version)	16	Trash Container	1 per BRT stop
4	QR Code Sign	2 per BRT stop	17	Seating	At least 1 bench per BRT stop
5	Signpost	2 per BRT stop	18	Shelter	At least 1 per BRT stop
6	Real-Time (RTIS) Display	1 per BRT stop (LED/LCD preferred)	19	Public Art	Context-dependent
7	Entrance Pylon	1 per BRT stop	20	Bike Rack	At least 1 rack per BRT stop
8	Ticket Vending Machine	Context-dependent	21	Secure Bike Storage	Context-dependent
9	Accessible Boarding/Alighting Pad	2 per BRT stop (1 per direction)	22	Bikeshare Dock	Context-dependent
10	Accessible Sidewalk	Varies	23	Scooter Corral	Context-dependent
11	Accessible Crosswalk with Curb Ramps	Varies	27	Park-and-Ride	Context-dependent
12	Level Boarding Platform	Context-dependent	28	Bus Landing Pad	2 per BRT stop (1 per direction)
13	Lighting	Varies	30	Operator Restroom	Context-dependent (if a layover is present)
14	Emergency Call Box	Context-dependent			

EXAMPLE: CLEVELAND HEALTHLINE

While Cincinnati does not yet have BRT service, several Cleveland HealthLine BRT median stations closely resemble the Tier BRT-A stop in this plan. Cleveland HealthLine BRT median stations contain a single center platform serving BRT buses in both directions. Their amenities include custom shelters, seating, ticket vending machines, trash containers, real-time (RTIS) displays, level boarding platforms, and public art (typically sculptures).

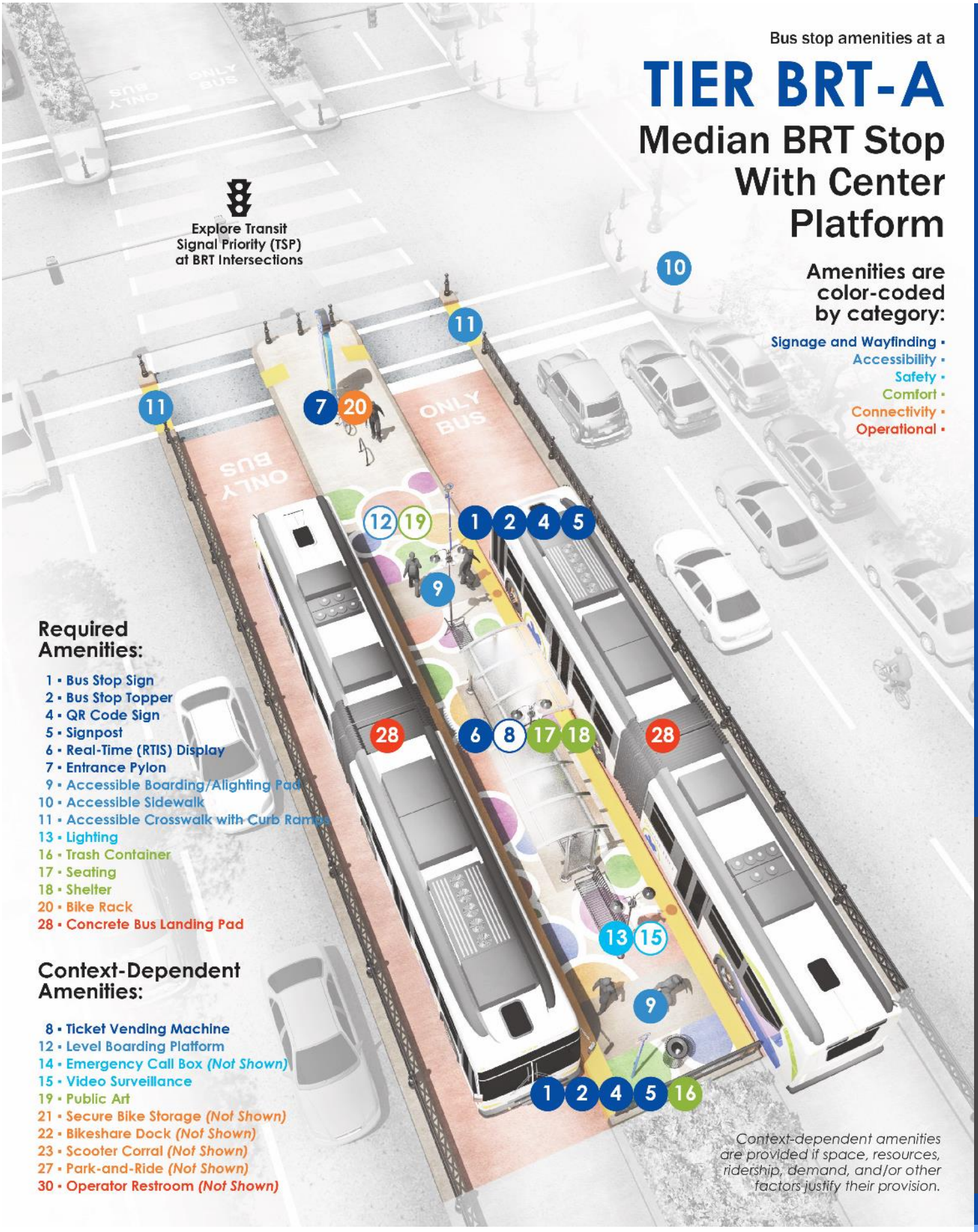


FIGURE 7: AMENITIES AT TIER BRT-A STOPS

Tier BRT-B: Curbside BRT Stop with Side Platform

The BRT-B tier provides amenities to support SORTA's future BRT service by offering a high-quality waiting and transfer experience for future BRT passengers. A curbside BRT stop is located on the side of the street and serves BRT buses traveling in one direction. Therefore, a pair of BRT stops (one on each side of the street) is needed to serve BRT buses traveling in both directions.

TABLE 14: REQUIRED AND CONTEXT-DEPENDENT AMENITIES AT TIER BRT-B STOPS

	Amenity	Quantity		Amenity	Quantity
1	Bus Stop Sign	1 per BRT stop	14	Emergency Call Box	Context-dependent
2	Bus Stop Topper	1 per BRT stop (use the logo version)	15	Video Surveillance	Context-dependent
3	Regulatory Sign	2 per BRT stop (1 each at the head/rear)	16	Trash Container	1 per BRT stop
4	QR Code Sign	1 per BRT stop	17	Seating	At least 1 bench per BRT stop
5	Signpost	At least 2 per BRT stop	18	Shelter	At least 1 per BRT stop
6	Real-Time (RTIS) Display	1 per BRT stop (LED/LCD preferred)	19	Public Art	Context-dependent
7	Entrance Pylon	1 per BRT stop	20	Bike Rack	At least 1 rack per BRT stop
8	Ticket Vending Machine	Context-dependent	21	Secure Bike Storage	Context-dependent
9	Accessible Boarding/Alighting Pad	1 per BRT stop	22	Bikeshare Dock	Context-dependent
10	Accessible Sidewalk	Varies	23	Scooter Corral	Context-dependent
11	Accessible Crosswalk with Curb Ramps	Varies	27	Park-and-Ride	Context-dependent
12	Level Boarding Platform	Context-dependent	28	Bus Landing Pad	1 per BRT stop
13	Lighting	Varies	30	Operator Restroom	Context-dependent (if a layover is present)

EXAMPLE: METRO PLUS BUS STOPS

While Cincinnati does not yet have BRT service, many current Metro Plus bus stops closely resemble the Tier BRT-B stop in this plan. Metro Plus bus stops, such as the University of Cincinnati stop shown here, are located on the side of the street and their amenities include custom shelters and lighting, seating, trash containers, real-time (RTIS) displays, entrance pylons, and public art integrated into the shelters.

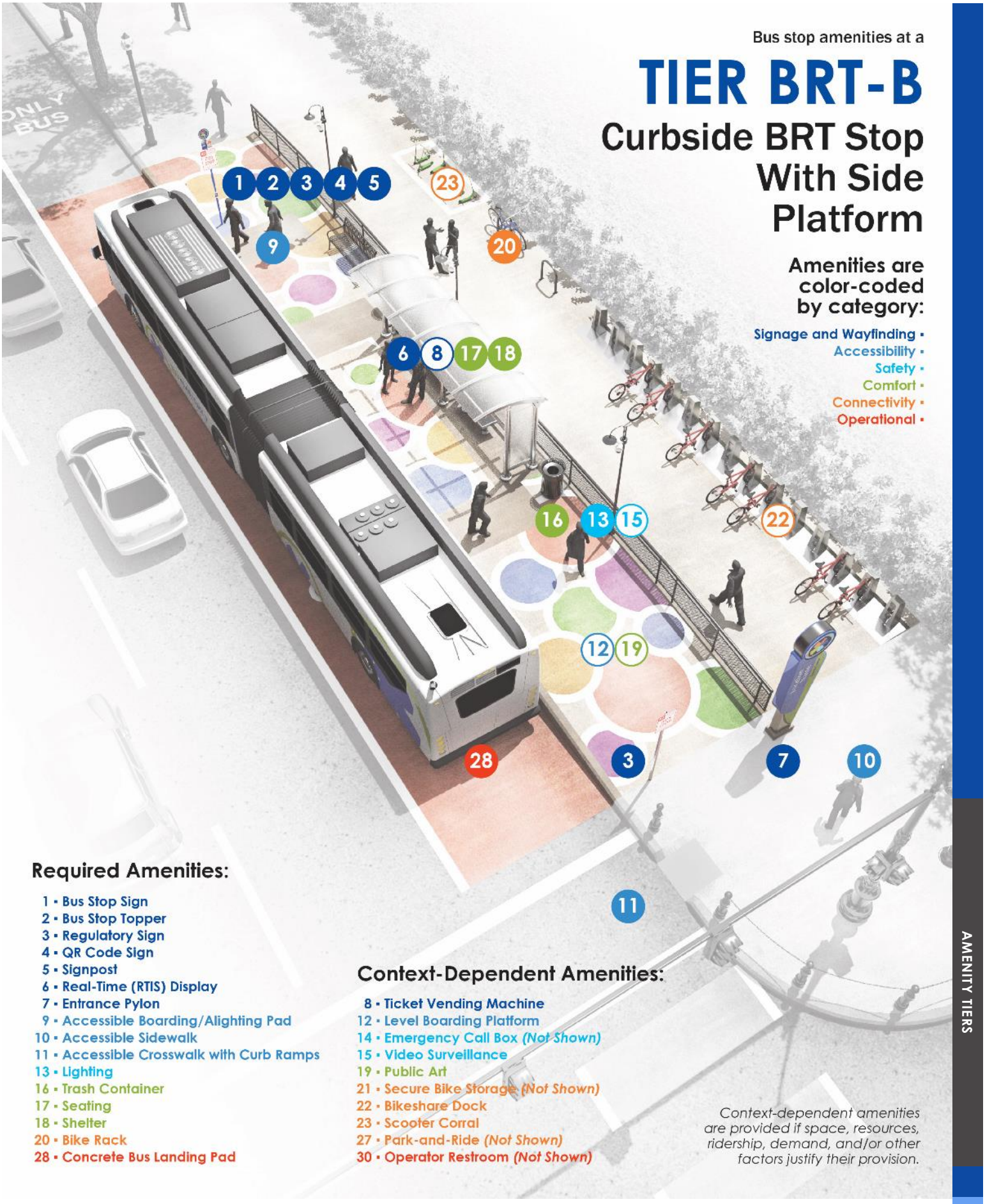


FIGURE 8: AMENITIES AT TIER BRT-B STOPS

Tier PNR: Park-and-Ride Stop

The PNR (Park-and-Ride) tier contains one or more off-street or on-street bus bays to centralize and consolidate bus stops with high commuting demand. The accompanying park-and-ride's size depends on commuting demand and available space.

TABLE 15: REQUIRED AND CONTEXT-DEPENDENT AMENITIES AT TIER PNR STOPS

	Amenity	Quantity		Amenity	Quantity
1	Bus Stop Sign	1 per bus bay	16	Trash Container	1 per bus bay
2	Bus Stop Topper	1 per bus bay (use the letter version)	17	Seating	At least 1 bench per bus bay
3	Regulatory Sign	1 at each entrance/exit to the park-and-ride	18	Shelter	1 per bus bay
4	QR Code Sign	1 per bus bay	19	Public Art	Context-dependent
5	Signpost	1 per bus bay	20	Bike Rack	At least 2 racks
6	Real-Time (RTIS) Display	Context-dependent (e-paper preferred)	21	Secure Bike Storage	Context-dependent
7	Entrance Pylon	1 at each entrance/exit to the park-and-ride	22	Bikeshare Dock	Context-dependent
8	Ticket Vending Machine	Context-dependent	23	Scooter Corral	Context-dependent
9	Accessible Boarding/Alighting Pad	1 per bus bay	24	Carshare Parking	Context-dependent
10	Accessible Sidewalk	Varies	25	Taxi/Microtransit Pickup/Dropoff	Context-dependent
11	Accessible Crosswalk with Curb Ramps	Varies	26	Kiss-and-Ride	Context-dependent
12	Level Boarding Platform	Context-dependent	27	Park-and-Ride	Varies
13	Lighting	Varies	28	Bus Landing Pad	1 per bus bay
14	Emergency Call Box	Context-dependent	29	Bus Layover Strip	Context-dependent
15	Video Surveillance	Context-dependent	30	Operator Restroom	Context-dependent (if a layover is present)

EXAMPLE: GLENWAY CROSSING TRANSIT CENTER PARK-AND-RIDE

The transit center at the Glenway Crossing Shopping Center in Cincinnati's Westwood neighborhood contains four bus bays serving nine bus routes. Its amenities include custom shelters, seating, trash containers, and an operator restroom. The transit center includes an approximately 20-space park-and-ride lot for commuters, two spaces of which are accessible.

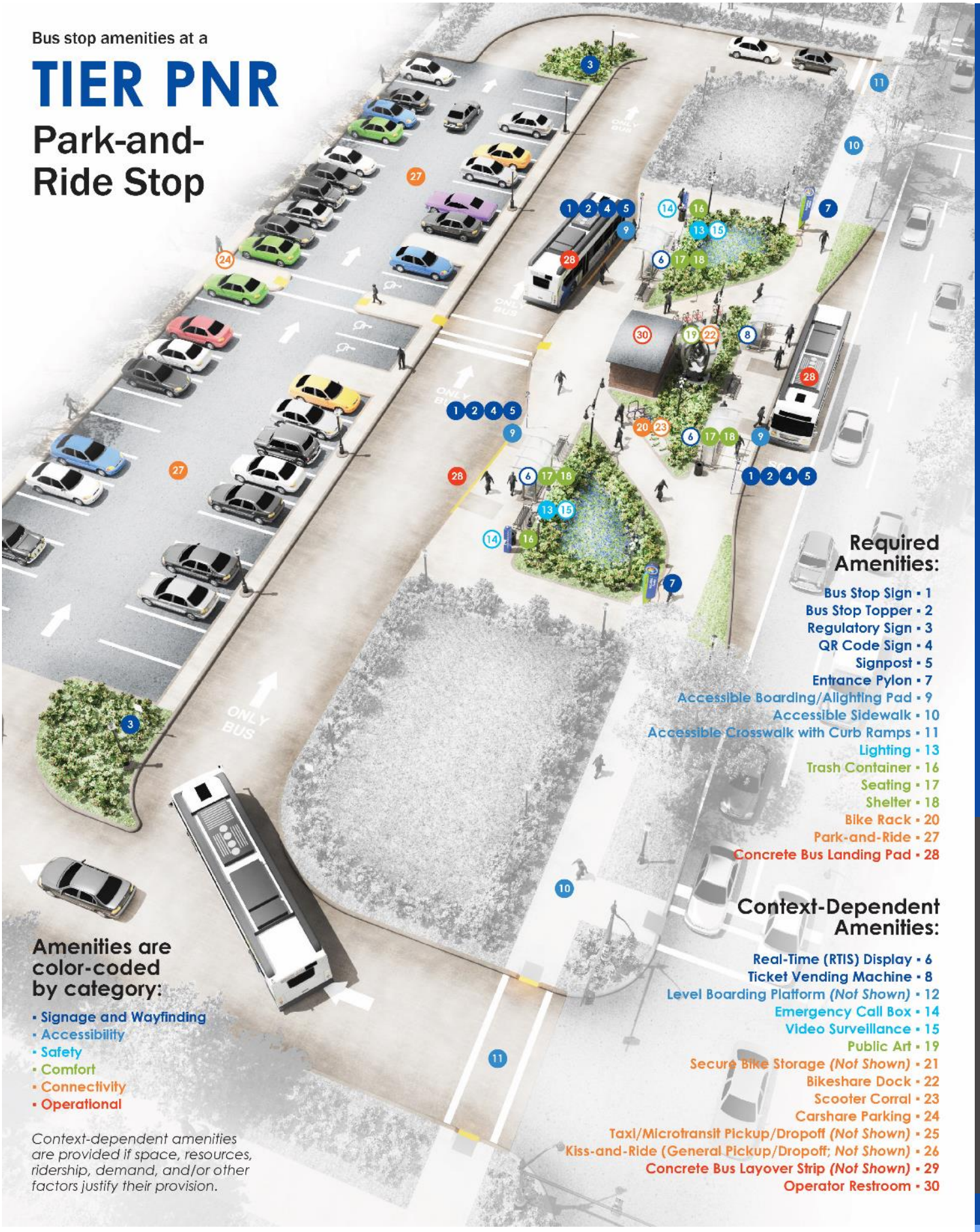


FIGURE 9: AMENITIES AT TIER PNR STOPS

Classifying Bus Stops by Amenity Tier

Bus stops are assigned to an amenity tier based on two data-driven rating steps: (1) a preliminary rating, and (2) a secondary rating. All bus stops in the SORTA system are classified under this methodology, including inactive bus stops that do not have any service as of December 2022.

PRELIMINARY RATING

Six data inputs are used for the preliminary rating, as shown in **Table 16**. The Census portion of the screening is performed for the half-mile buffer around each bus stop using 2022 Five-Year American Community Survey (ACS) data. The bus stop portion of the screening is performed using December 2022 GTFS data.

TABLE 16: TIER CALCULATION FIELDS AND WEIGHTING FOR A PRELIMINARY RATING

Category Name	Description	Weighting
Average Weekday Boardings	Average weekday boardings for each bus stop, calculated as the greater of average weekday boardings between September 2022 and January 2023 monthly averages.[1]	30%
Number of Routes Served	The number of bus routes serving each bus stop, calculated from December 2022 GTFS data.	10%
Number of Trips Served	The number of trips per hour serving each bus stop during the weekday AM peak period, calculated from December 2022 GTFS data.	25%
Overall Population per Acre Plus Jobs per Acre	The total number of jobs and residents per acre within a half-mile of each bus stop, calculated from ACS and LEHD data.	15%
Poverty Population per Acre	The number of residents per acre living below 150 percent of the federal poverty line within a half-mile of each bus stop, calculated from ACS demographic data.	10%
Disability Population per Acre	The number of disabled residents per acre within a half-mile of each bus stop, calculated from ACS demographic data.	10%
	Total:	**100%**

SECONDARY RATING

After rating each bus stop on the six data fields above by using the designated breaking buckets described in the *Bus Stop Classification, Improvement, and Prioritization* memo in the **Appendix**, each bus stop proceeds to a secondary rating. The secondary rating is performed based on a bus stop's overall ridership and whether it is located at a park-and-ride or if it is served by a BRT route.[1]

In the secondary rating, bus stops are reassigned to higher amenity tiers if they meet certain ridership and service characteristic criteria. This step ensures that high-ridership bus stops, bus stops with park-and-ride service, and bus stops with BRT service are assigned into the proper amenity tiers.

- All bus stops with an average weekday ridership greater than 300 are automatically assigned Tier 1/2 status.
- If a bus stop is located at a park-and-ride and if it has an average weekday ridership greater than 30, but less than 300, it is automatically assigned Tier PNR status.
- If a bus stop is served by a BRT route, it is automatically classified as Tier BRT.[2]

[1] *The greater of the average weekday ridership number between the September 2022 monthly average and the January 2023 monthly average was used for this category to ensure that ridership was included for new bus stops implemented in December 2022. For most bus stops, September 2022 ridership was higher due to seasonal factors (including holidays and weather) that typically lead to lower ridership in the winter.*

[2] *The BRT amenity tier does **not** include bus stops currently served by Metro Plus routes. No bus stops are currently classified into the BRT amenity tier under this methodology since BRT service has not yet been implemented as of this plan's writing. This category is included in preparation for future BRT implementation.*

The total number and percentage of bus stops assigned to each amenity tier based on this methodology is shown in **Table 17.** Note that stops assigned to Tiers 1 and 2 are combined into a single classification, as the determining factor that differentiates Tier 1 from Tier 2 is the availability of space for off-street facilities at the location, which is not factored into this stage of rating.

TABLE 17: TIER CALCULATION SUMMARY

Tiers	Tier Count	Tier Percent	Active Stops in Tier	Inactive Stops in Tier
Tiers 1/2	44	1%	43	1
Tier 3	161	3%	161	0
Tier 4	945	20%	935	10
Tier 5	3,641	76%	2,600	1,041
Tier BRT	0	0%	0	0
Tier PNR	8	0%	8	0
Totals	**4,799**	**100%**	**3,747**	**1,052**

A GIS dashboard that shows the latest amenity tier classification is also available at:
https://experience.arcgis.com/experience/5475df59ca864673a85e6252d6afc1a0

Prioritizing Bus Stop Improvements by Amenity Tier

This plan also prioritizes bus stop improvements to gives SORTA and its local partners an actionable list of bus stops designated for improvements when funding for additional amenities becomes available. The prioritized list allows the agency and its local partners to direct funding for the most important amenities to bus stops serving areas demonstrating the highest need.

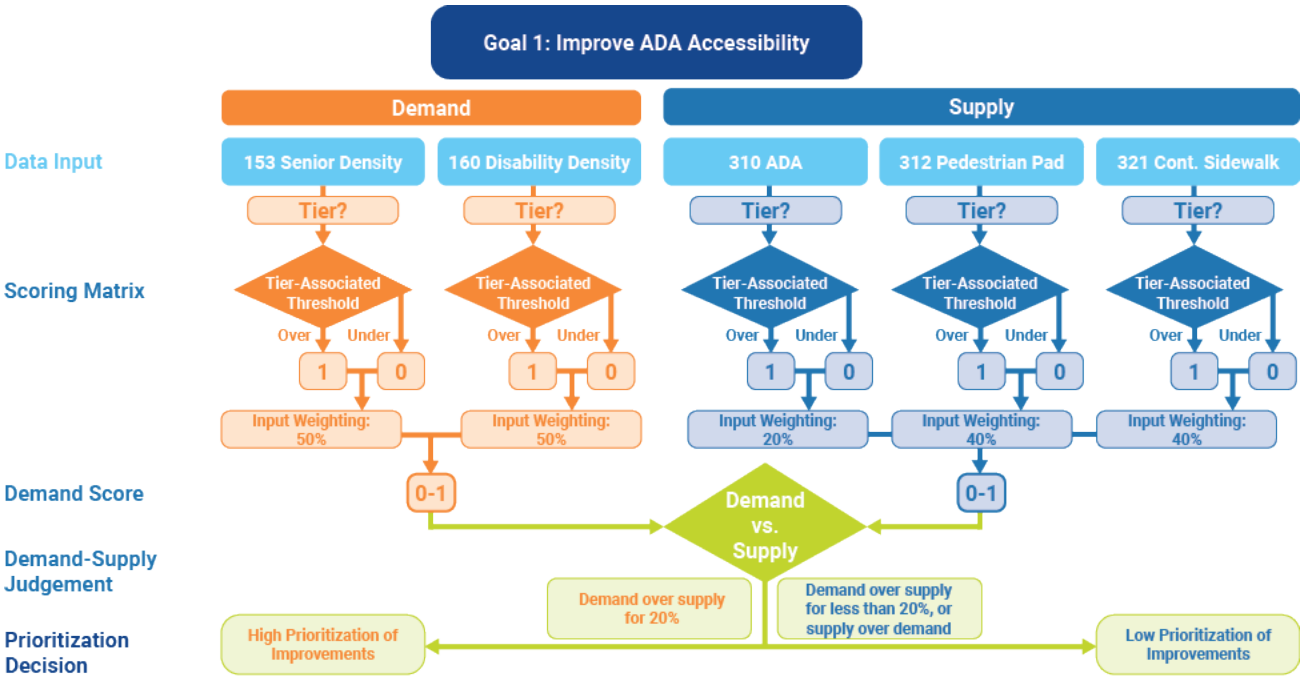
The prioritization strategy includes four separate prioritization categories based on four primary SORTA bus stop improvement goals, each of which may be associated with different funding streams. SORTA's four primary goals for bus stop improvement include:

- **Goal 1:** Improve ADA accessibility.
- **Goal 2:** Improve equity.
- **Goal 3:** Improve the bus transfer experience.
- **Goal 4:** Improve bike accessibility.

This plan uses a "demand-supply" model to make a data-driven judgement for whether a bus stop improvement should be prioritized, demonstrated in **Figure 10.** The demographic characteristics of the communities that surround each bus stop are used to assess "demand" for amenities, representing transit passengers' profiles and their potential needs when using the SORTA system. An inventory of existing amenities at each bus stop is used to represent the "supply" of amenities at each stop.

Prioritization in this "demand-supply" model is based on the difference between the score assigned to each bus stop for the "demand" for amenities based on the presence of certain demographics in areas surrounding the bus stop, and the score assigned to each bus stop for the "supply" of amenities based on the availability of recommended amenities in the stop's amenity tier. This prioritization is conducted for amenities associated with each prioritization category above. Within each prioritization category, bus stops with the greatest gap between "demand" and "supply" are considered the highest priority for improvement.

FIGURE 10: EXAMPLE OF THE PRIORITIZATION DEMAND-SUPPLY METHODOLOGY FOR GOAL 1



The detailed methodology and calculation process can be found in the *Bus Stop Classification, Improvement, and Prioritization* memo in the **Appendix.** The resulting count of *active* bus stops identified for prioritization under each SORTA bus stop improvement goal is shown in **Table 18.**

TABLE 18: COUNT OF ACTIVE BUS STOPS TO PRIORITIZE FOR IMPROVEMENT

	Prioritize	Do Not Prioritize	Prioritization Rate	Total Bus Stops
Goal 1: Improve ADA Accessibility	**290**	**3,457**	**8%**	**3,747**
Tier 1/2	4	39	9%	43
Tier 3	8	153	5%	161
Tier 4	95	840	10%	935
Tier 5	182	2,418	7%	2,600
Goal 2: Improve Equity	**318**	**3,429**	**8%**	**3,747**
Tier 1/2	9	34	21%	43
Tier 3	40	121	25%	161
Tier 4	217	718	23%	935
Tier 5	51	2,549	2%	2,600
Goal 3: Improve the Bus Transfer Experience	**334**	**3,413**	**9%**	**3,747**
Tier 1/2	2	41	5%	43
Tier 3	28	133	17%	161
Tier 4	248	687	27%	935
Tier 5	55	2,545	2%	2,600
Goal 4: Improve Bike Accessibility	**32**	**3,715**	**1%**	**3,747**
Tier 1/2	8	35	19%	43
Tier 3	23	138	14%	161
Tier 4	0	935	0%	935
Tier 5	0	2,600	0%	2,600

4. BUS STOP TYPOLOGIES

The *position and placement* of bus stops relative to the intersection and curbside is another key factor influencing bus stop design. This chapter introduces three recommended intersection bus stop typologies and ten recommended curbside bus stop typologies.

Each bus stop typology includes a diagram depicting its typical bus movement; each curbside bus stop typology also includes a table with the dimensional needs for this movement. Dimensions are sourced from NACTO's *Transit Street Design Guide* and vary if the bus stop is anticipated to serve standard (40-foot) or articulated (60-foot) buses. This chapter concludes with recommendations on where each bus stop typology may be most appropriate.

Intersection Stop Typologies

These typologies reflect how bus stops are positioned at roadway intersections. Most of SORTA's on-street bus stops use a *farside, nearside,* or *midblock* intersection position.

FARSIDE STOP

At a farside stop, the bus stops to pick up and drop off passengers *after* crossing the intersection, allowing the bus to take advantage of a green light at an intersection before stopping. This typology is particularly beneficial when paired with transit signal priority (TSP) and it is the **recommended intersection stop typology for all SORTA bus stops,** except where safety or operational limitations prevent its application.

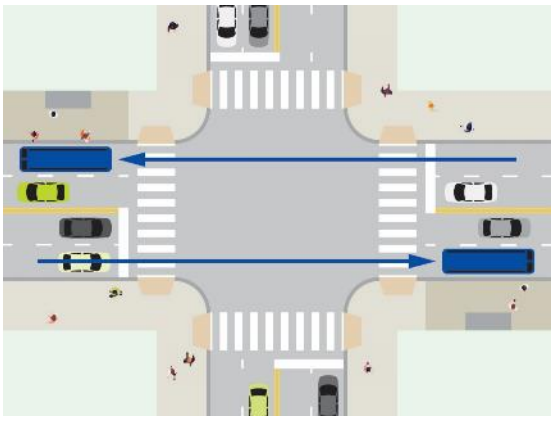


FIGURE 11: TYPICAL FARSIDE BUS STOP

NEARSIDE STOP

At a nearside stop, the bus stops to pick up and drop off passengers *before* it crosses the intersection. Farside stops are usually preferred to nearside since a traffic light at the intersection may turn red before the bus resumes traveling. However, in many locations nearside bus stops may be preferred due to space availability or safety reasons, such as:

- Sidewalks and crosswalks are safer on the near side, or most pedestrian activity is on the near side.
- The bus is making a turn at the intersection.
- Heavier vehicular traffic, lack of space, or other operational limitations are present on the far side.

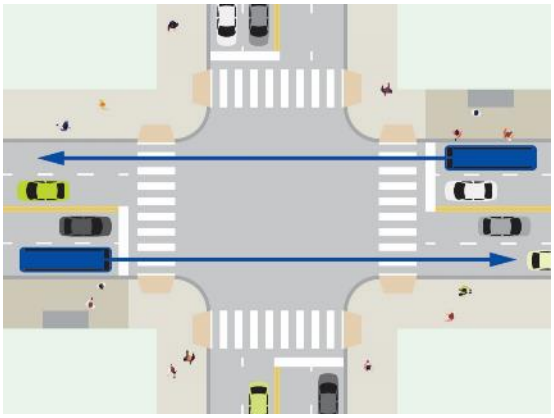


FIGURE 12: TYPICAL NEARSIDE BUS STOP

MIDBLOCK STOP

In this typology the bus stops in the middle of the block. SORTA generally recommends avoiding midblock bus stops as they are often far from crosswalks, but locations where they may be necessary include:

- Long blocks – especially suburban blocks – where significant distances between bus stops or gaps in sidewalks and crosswalks may justify midblock stops that are closer to passenger destinations such as shopping centers or office parks.
- Intersections where space is already taken up by turn lanes, slip lanes, or other vehicular functions may require the bus stop to be pushed away from the intersection and toward the middle of the block.

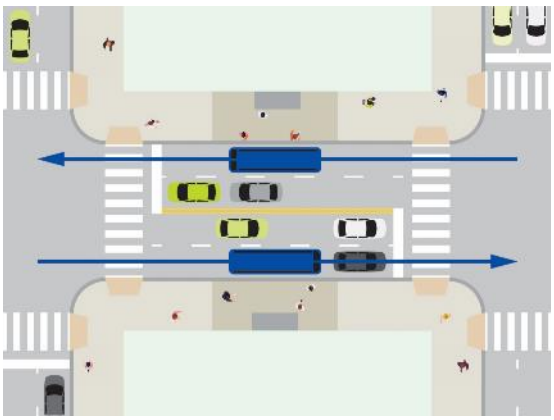


FIGURE 13: TYPICAL MIDBLOCK BUS STOP

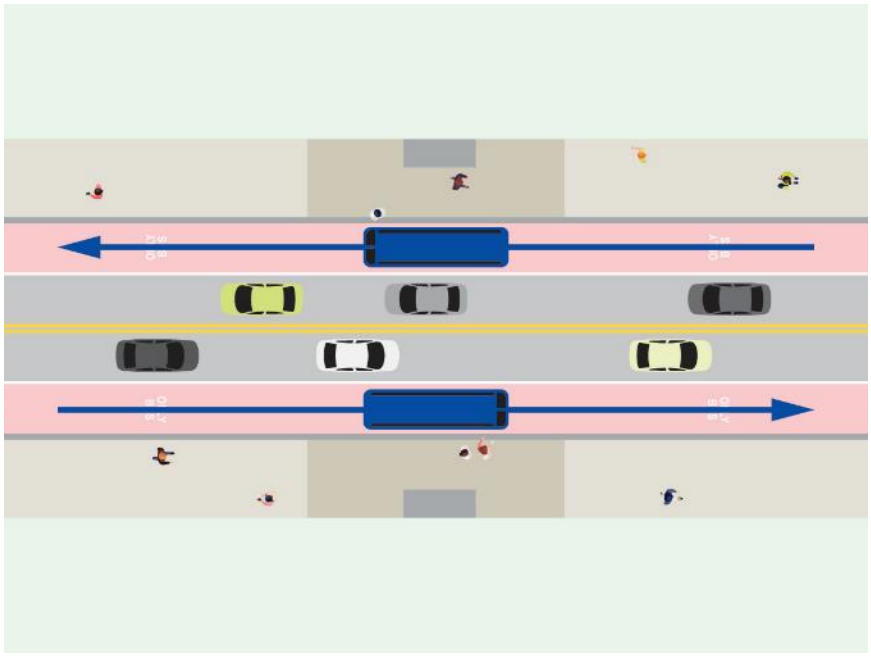
Curbside Stop Typologies

These typologies reflect how bus stops are positioned at roadway curbsides. While many curbside positions are possible depending on local roadway context, SORTA has distilled these possibilities into ten general recommended curbside positions. Each curbside position has different advantages and disadvantages.

IN-LANE

If a street lacks curbside parking or bike lanes, then the bus can stop directly in the curbside travel lane. This curbside travel lane can be open to all traffic or it can be dedicated to buses.

FIGURE 14: TYPICAL IN-LANE BUS STOP



Advantages

- The bus can reach the curbside with ease: minimal maneuvering, turning, or pulling-in is required.
- Passengers can reach the bus with ease: no boarding bulbs or other sidewalk extensions are required.

Disadvantages

- Unless the curbside travel lane is dedicated to buses, the bus must stop in general traffic. This may induce some drivers to attempt to pass it, posing safety issues on roadways with only one lane of traffic in each direction.

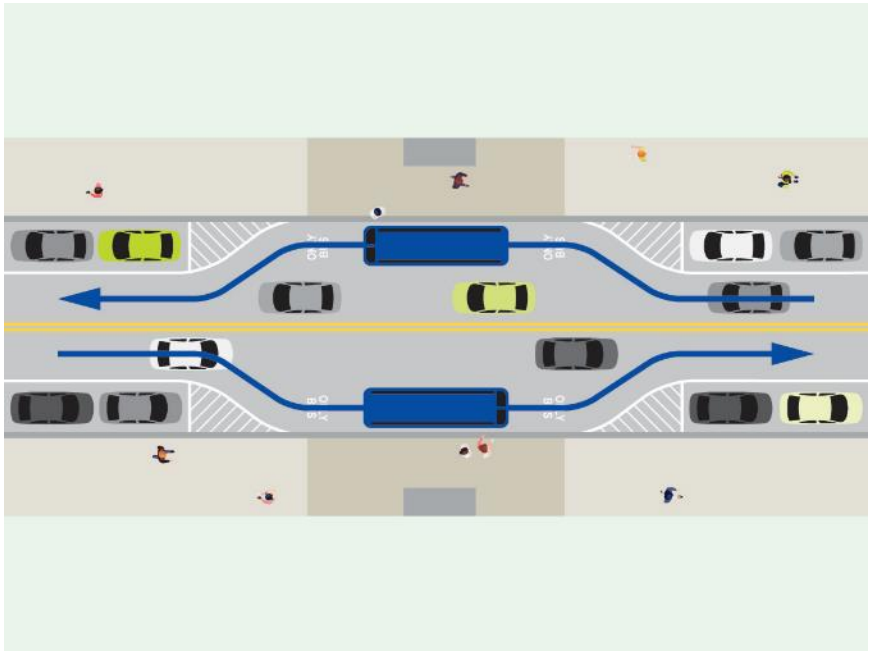
TABLE 19: DIMENSIONAL NEEDS FOR IN-LANE BUS STOPS

Stop Location	Front Buffer	Stop (Bus) Length	Rear Buffer	Full Length
Nearside, Standard Bus	10' from crosswalk	40' (add 45' for each additional standard bus)	n/a	50'
Nearside, Articulated Bus	10' from crosswalk	60' (add 65' for each additional articulated bus)	n/a	70'
Midblock, Standard Bus	15' only if a midblock crosswalk is desired in front	40' (add 45' for each additional standard bus)	15' only if a midblock crosswalk is desired in back	40'+
Midblock, Articulated Bus	15' only if a midblock crosswalk is desired in front	60' (add 65' for each additional articulated bus)	15' only if a midblock crosswalk is desired in back	60'+
Farside, Standard Bus	n/a	40' (add 45' for each additional standard bus)	10' from crosswalk (+15' if after a left turn; +45' if after a right turn)	50'+
Farside, Articulated Bus	n/a	60' (add 65' for each additional articulated bus)	10' from crosswalk (+15' if after a left turn; +45' if after a right turn)	70'+

PULL-OUT INTO PARKING

If a street has curbside parking, then the bus can pull out of the travel lane and stop in the parking lane.

FIGURE 15: TYPICAL PULL-OUT INTO PARKING BUS STOP



Advantages

- A pull-out into parking allows bus stops to coexist with curbside parking, especially on residential streets.
- Minimal infrastructural investment is needed compared to boarding bulb bus stops, which require the sidewalk to extend across the parking lane.

Disadvantages

- Since the bus needs to pull out of the travel lane, it needs to wait for a break in traffic to merge back into it and resume traveling. This typology usually increases the amount of time the bus spends stopped at the bus stop compared to in-lane stops.
- In addition to the curbside space needed for the bus stop itself, a significant amount of buffer space is needed for the bus to pull in and out of the travel lane, as shown in **Table 20.** On residential streets, this can lead to a reluctance to sacrifice curbside parking for bus stops. In comparison, boarding bulb bus stops reduce the amount of buffer space needed for bus stops that are integrated into curbside parking.

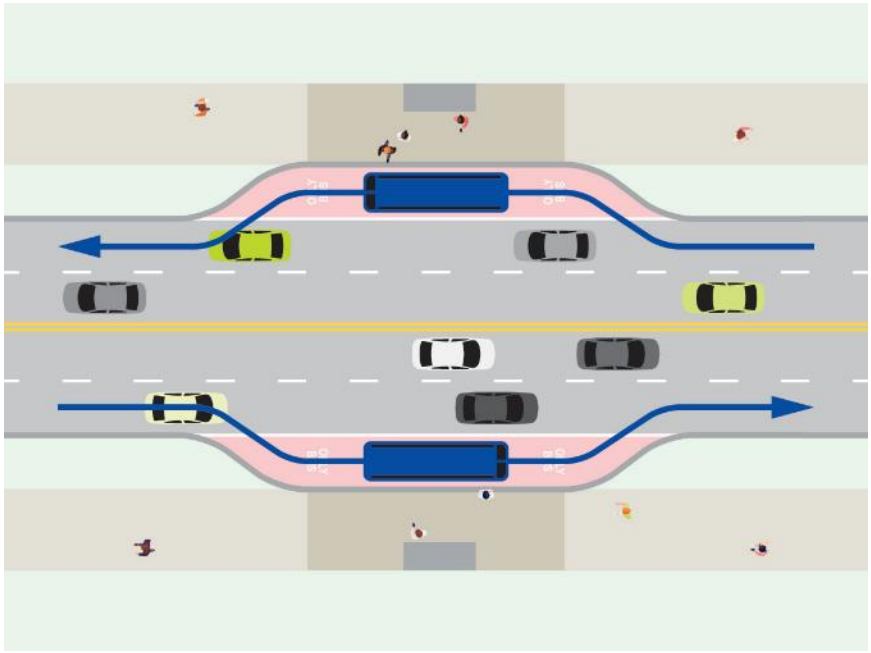
TABLE 20: DIMENSIONAL NEEDS FOR PULL-OUT INTO PARKING BUS STOPS

Stop Location	Front Buffer	Stop (Bus) Length	Rear Buffer	Full Length
Nearside, Standard Bus	10' from crosswalk	40' (add 45' for each additional standard bus)	50'	100'
Nearside, Articulated Bus	10' from crosswalk	60' (add 65' for each additional articulated bus)	50'	120'
Midblock, Standard Bus	25' - 50' (increases as posted speed limit increases)	40' (add 45' for each additional standard bus)	50'	115'+
Midblock, Articulated Bus	25' - 50' (increases as posted speed limit increases)	60' (add 65' for each additional articulated bus)	50'	135'+
Farside, Standard Bus	25'	40' (add 45' for each additional standard bus)	10' from crosswalk (+15' if after a left turn; +45' if after a right turn)	75'+
Farside, Articulated Bus	25'	60' (add 65' for each additional articulated bus)	10' from crosswalk (+15' if after a left turn; +45' if after a right turn)	95'+

PULL-OUT INTO CURB

If a street lacks curbside parking and the bus cannot safely stop in the curbside travel lane, a distinct pull-out can be provided. This pull-out may need to cut into the curbside sidewalk and/or street tree strip.

FIGURE 16: TYPICAL PULL-OUT INTO CURB BUS STOP



Advantages

- A pull-out into the curb allows bus stops to exist on busy, fast arterial roadways where the bus cannot safely stop in the curbside travel lane.
- A dedicated curbside pull-out space allows buses to stop for extended periods or to lay over at the bus stop without interfering with traffic.

Disadvantages

- Buses must wait for a break in traffic to merge back onto the roadway and resume traveling. This can add significant delay on busy arterial roadways where breaks in traffic may be sparse.
- Modifying a curb for the pull-out, building the pull-out itself, and providing a bus landing pad require significant infrastructure investment to install this type of bus stop.

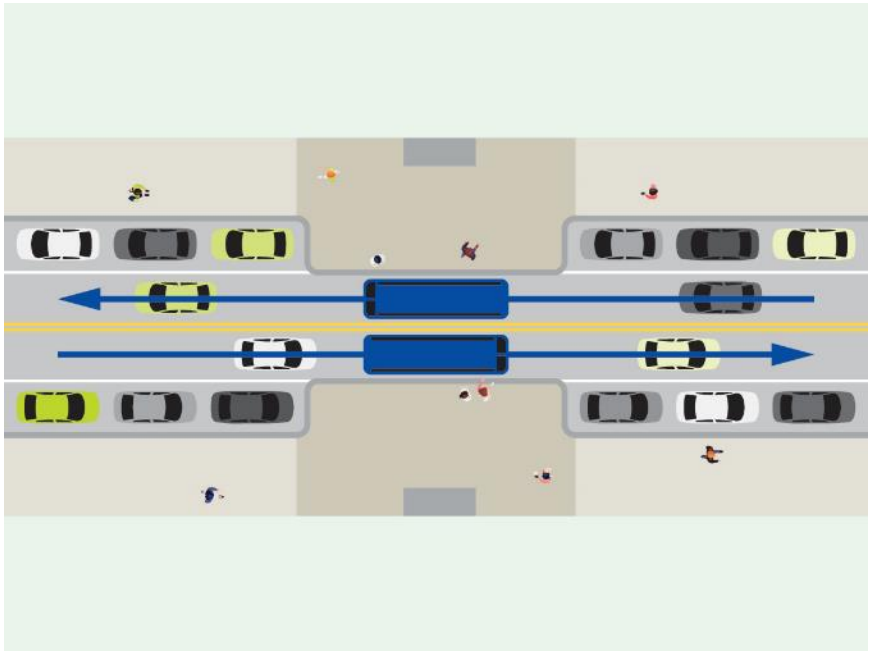
TABLE 21: DIMENSIONAL NEEDS FOR PULL-OUT INTO CURB BUS STOPS

Stop Location	Front Buffer	Stop (Bus) Length	Rear Buffer	Full Length
Nearside, Standard Bus	10' from crosswalk	40' (add 45' for each additional standard bus)	50'	100'
Nearside, Articulated Bus	10' from crosswalk	60' (add 65' for each additional articulated bus)	50'	120'
Midblock, Standard Bus	25' - 50' (increases as posted speed limit increases)	40' (add 45' for each additional standard bus)	50'	115'+
Midblock, Articulated Bus	25' - 50' (increases as posted speed limit increases)	60' (add 65' for each additional articulated bus)	50'	135'+
Farside, Standard Bus	25'	40' (add 45' for each additional standard bus)	10' from crosswalk (+15' if after a left turn; +45' if after a right turn)	75'+
Farside, Articulated Bus	25'	60' (add 65' for each additional articulated bus)	10' from crosswalk (+15' if after a left turn; +45' if after a right turn)	95'+

BOARDING BULB

If a street has curbside parking, the bus stop can "bulb" into the parking lane by extending the curb so the bus can stop without having to pull out of the travel lane.

FIGURE 17: TYPICAL BOARDING BULB BUS STOP



Advantages

- A boarding bulb brings the benefits of in-lane bus stops to bus stops integrated with curbside parking: the bus can reach the sidewalk with minimal maneuvering, turning, or pulling-in.
- Boarding bulb stops require much less buffer space than pull-out into parking bus stops (see **Table 22**).
- In addition to providing more space for the accessible boarding/alighting pad, the boarding bulb provides more space for amenities such as benches, shelters, and trash cans, which is particularly helpful if the roadway's existing sidewalks are narrow.
- Boarding bulbs can be paired with crosswalk bulbs to reduce intersection crossing distance for pedestrians.

Disadvantages

- Permanently extending the curb to build the boarding bulb may require significant infrastructure investment that may include modifying storm drain inlets, raising or relocating utility covers, and modifying adjacent crosswalks and curb cuts. Temporary boarding bulbs made of plastic or wood platforms allow for quicker and less expensive implementation of accessible boarding bulbs without modifying existing utilities.

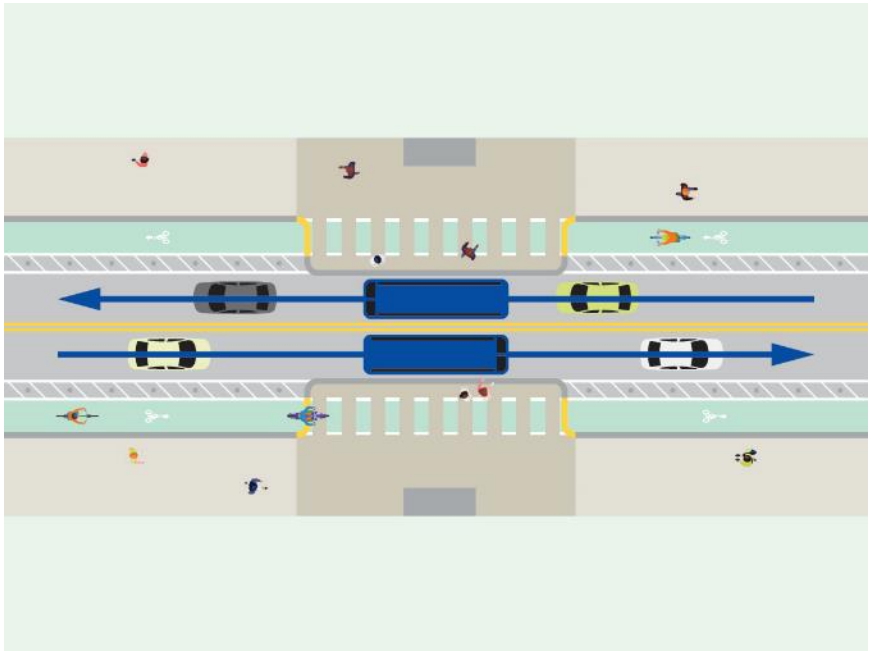
TABLE 22: DIMENSIONAL NEEDS FOR BOARDING BULB BUS STOPS

Stop Location	Front Buffer	Stop (Bus) Length	Rear Buffer	Full Length
Nearside, Standard Bus	10' from crosswalk	40' (add 45' for each additional standard bus)	n/a	50'
Nearside, Articulated Bus	10' from crosswalk	60' (add 65' for each additional articulated bus)	n/a	70'
Midblock, Standard Bus	15' only if a midblock crosswalk is desired in front	40' (add 45' for each additional standard bus)	15' only if a midblock crosswalk is desired in back	40'+
Midblock, Articulated Bus	15' only if a midblock crosswalk is desired in front	60' (add 65' for each additional articulated bus)	15' only if a midblock crosswalk is desired in back	60'+
Farside, Standard Bus	n/a	40' (add 45' for each additional standard bus)	10' from crosswalk (+15' if after a left turn; +45' if after a right turn)	50'+
Farside, Articulated Bus	n/a	60' (add 65' for each additional articulated bus)	10' from crosswalk (+15' if after a left turn; +45' if after a right turn)	70'+

BOARDING BULB WITH CYCLETRACK

If a street has a curbside bike lane, the bus stop's boarding bulb can extend across the bike lane. The resulting bulb is shared between passengers and cyclists, as shown in **Figure 18**.

FIGURE 18: TYPICAL BOARDING BULB BUS STOP WITH CYCLETRACK



Advantages

- A boarding bulb with a cycletrack brings the benefits of in-lane bus stops to bus stops that are integrated with curbside bike lanes: the bus can reach the sidewalk with minimal maneuvering, turning, or pulling-in.
- This design improves safety for cyclists by allowing buses to stop without crossing the bike lane.

Disadvantages

- The boarding bulb with cycletrack introduces conflicts between cyclists and passengers. Conflicts can be mitigated by using traffic calming measures to force cyclists to slow down and yield to pedestrians when crossing the boarding bulb.
- Similar to boarding bulbs without cycling facilities, a permanent installation of this type of bus stop may require significant investment. Temporary boarding bulbs made from wood or plastic platforms can be deployed as an alternative without modifying existing utilities.

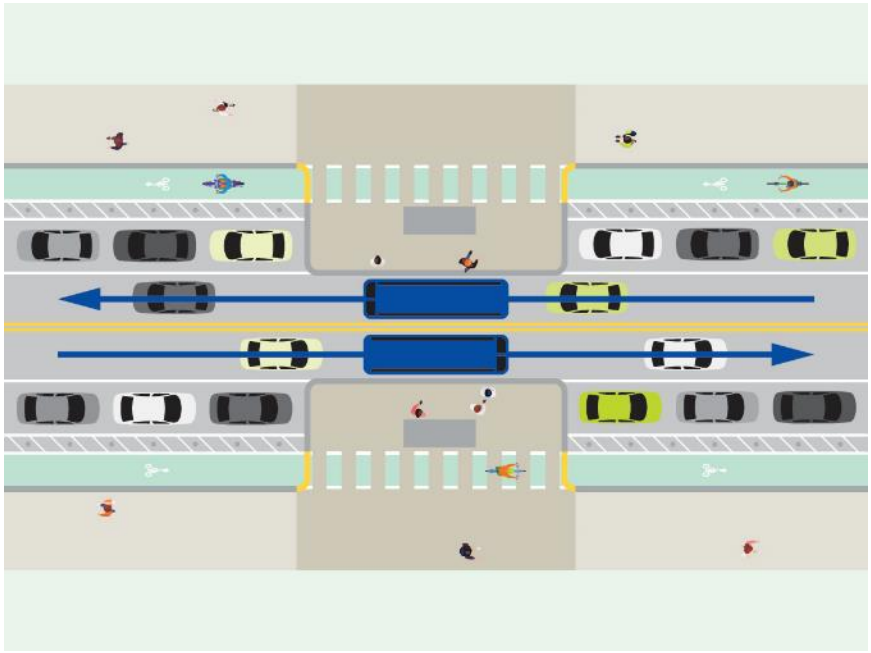
TABLE 23: DIMENSIONAL NEEDS FOR BOARDING BULB BUS STOPS WITH CYCLETRACKS

Stop Location	Front Buffer	Stop (Bus) Length	Rear Buffer	Full Length
Nearside, Standard Bus	10' from crosswalk	40' (includes 5' bike ramps at each end; add 45' for each additional standard bus)	n/a	50'
Nearside, Articulated Bus	10' from crosswalk	60' (includes 5' bike ramps at each end; add 65' for each additional articulated bus)	n/a	70'
Midblock, Standard Bus	15' only if a midblock crosswalk is desired in front	40' (includes 5' bike ramps at each end; add 45' for each additional standard bus)	15' only if a midblock crosswalk is desired in back	40'+
Midblock, Articulated Bus	15' only if a midblock crosswalk is desired in front	60' (includes 5' bike ramps at each end; add 65' for each additional articulated bus)	15' only if a midblock crosswalk is desired in back	60'+
Farside, Standard Bus	n/a	40' (includes 5' bike ramps at each end; add 45' for each additional standard bus)	10' from crosswalk (+15' if after a left turn; +45' if after a right turn)	50'+
Farside, Articulated Bus	n/a	60' (includes 5' bike ramps at each end; add 65' for each additional articulated bus)	10' from crosswalk (+15' if after a left turn; +45' if after a right turn)	70'+

BOARDING ISLAND

If a street has a parking-protected curbside bike lane, the bus stop can "float" in the parking lane so that the bike lane passes behind the bus stop.

FIGURE 19: TYPICAL BOARDING ISLAND BUS STOP



Advantages

- A boarding island brings the benefits of in-lane bus stops to bus stops that are integrated with parking-protected curbside bike lanes: the bus can reach the sidewalk with minimal maneuvering, turning, or pulling-in.
- This design improves safety for cyclists by allowing buses to stop without crossing the bike lane.
- As indicated in **Table 24**, minimal buffer space is needed to integrate the bus stop into the parking lane.

Disadvantages

- The boarding island design can often be installed with minimal changes to existing utilities, but permanent installation using concrete may still require a significant investment. Temporary boarding islands made of plastic or wood platforms can allow for quicker and less expensive implementation of accessible boarding islands without modifying existing utilities.
- Boarding islands introduce conflicts between cyclists and passengers, which can be mitigated by using traffic calming measures to force cyclists to slow down and yield to pedestrians when crossing the boarding bulb.

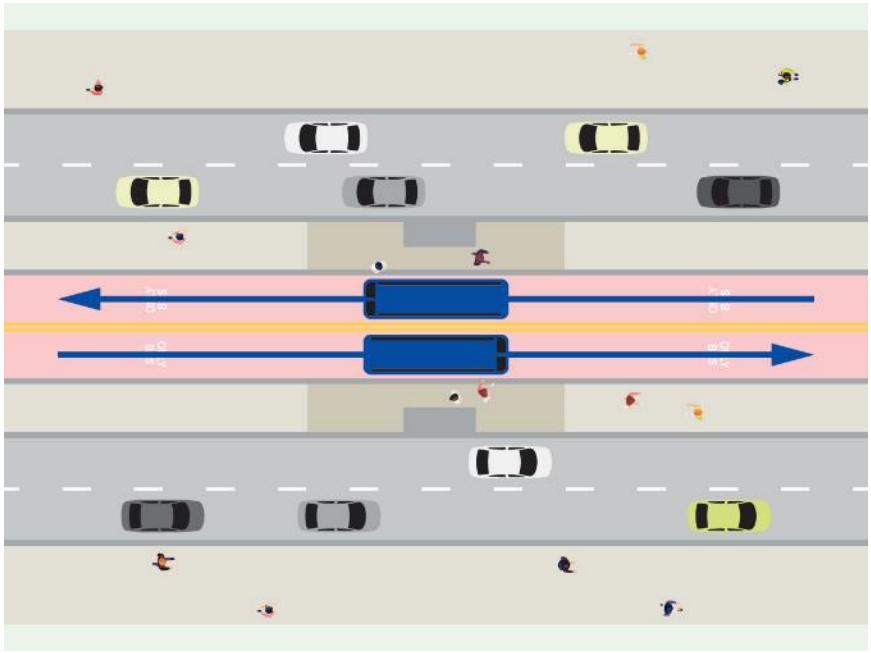
TABLE 24: DIMENSIONAL NEEDS FOR BOARDING ISLAND BUS STOPS

Stop Location	Front Buffer	Stop (Bus) Length	Rear Buffer	Full Length
Nearside, Standard Bus	10' from crosswalk	40' (add 45' for each additional standard bus)	n/a	50'
Nearside, Articulated Bus	10' from crosswalk	60' (add 65' for each additional articulated bus)	n/a	70'
Midblock, Standard Bus	15' only if a midblock crosswalk is desired in front	40' (add 45' for each additional standard bus)	15' only if a midblock crosswalk is desired in back	40'+
Midblock, Articulated Bus	15' only if a midblock crosswalk is desired in front	60' (add 65' for each additional articulated bus)	15' only if a midblock crosswalk is desired in back	60'+
Farside, Standard Bus	n/a	40' (add 45' for each additional standard bus)	10' from crosswalk (+15' if after a left turn; +45' if after a right turn)	50'+
Farside, Articulated Bus	n/a	60' (add 65' for each additional articulated bus)	10' from crosswalk (+15' if after a left turn; +45' if after a right turn)	70'+

BOARDING MEDIAN, SIDE PLATFORMS

Streets with medians dedicated for BRT can use side platforms. A separate platform is required for buses in each direction. Platforms can be parallel or offset depending on the available median space, with the BRT guideway located in between.

FIGURE 20: TYPICAL BOARDING MEDIAN BUS STOP WITH SIDE PLATFORMS



Advantages

- A boarding median allows buses to pick up and drop off passengers with minimal interference from other roadway traffic, and its side platforms offer dedicated space for amenities separated from any activities on the nearby sidewalks.
- Side platforms allow for buses with passenger-side doors to operate in a dedicated guideway.
- BRT guideways with boarding medians can provide faster bus service than buses in mixed traffic, especially when paired with transit signal priority (TSP) at intersections.

Disadvantages

- Boarding medians are costly and require significant investment for the BRT guideway, side platforms, and supporting infrastructure.
- Passengers need to cross roadway traffic to reach side platforms. Pedestrian crossings can be accommodated with crosswalks at intersections, but passengers may still cross at other points to reach the side platforms.

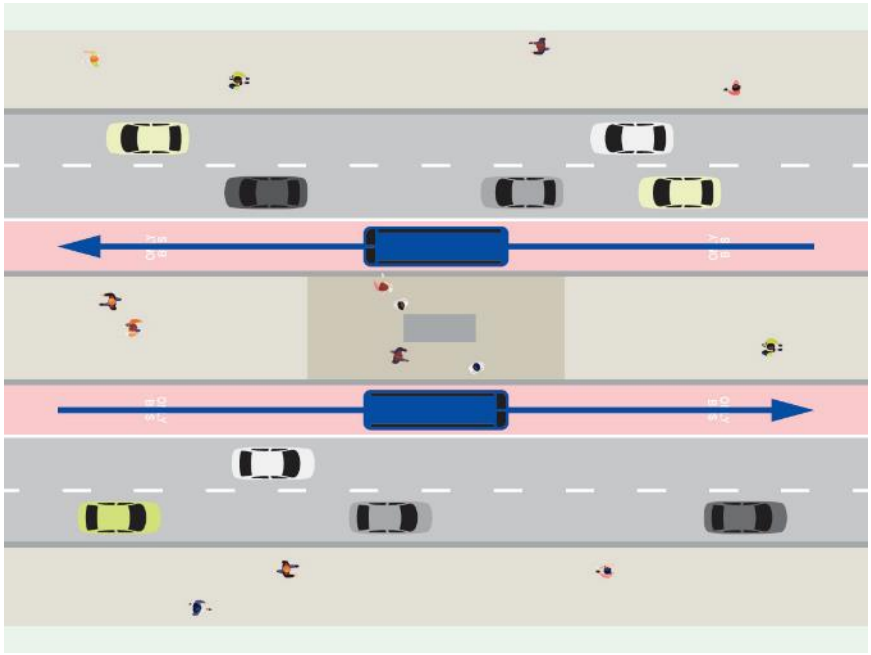
TABLE 25: DIMENSIONAL NEEDS FOR BOARDING MEDIAN BUS STOPS WITH SIDE PLATFORMS

Stop Location	Front Buffer	Stop (Bus) Length	Rear Buffer	Full Length
Nearside, Standard Bus	10' from crosswalk	40' (add 45' for each additional standard bus)	n/a	50'
Nearside, Articulated Bus	10' from crosswalk	60' (add 65' for each additional articulated bus)	n/a	70'
Midblock, Standard Bus	15' only if a midblock crosswalk from/across the median is desired in front	40' (add 45' for each additional standard bus)	15' only if a midblock crosswalk from/across the median is desired in back	40'+
Midblock, Articulated Bus	15' only if a midblock crosswalk from/across the median is desired in front	60' (add 65' for each additional articulated bus)	15' only if a midblock crosswalk from/across the median is desired in back	60'+
Farside, Standard Bus	n/a	40' (add 45' for each additional standard bus)	10' from crosswalk	50'
Farside, Articulated Bus	n/a	60' (add 65' for each additional articulated bus)	10' from crosswalk	70'

BOARDING MEDIAN, CENTER PLATFORM

As an alternative to side platforms, streets with medians dedicated for BRT can use a single center platform serving buses in both directions.

FIGURE 21: TYPICAL BOARDING MEDIAN BUS STOP WITH CENTER PLATFORM



Advantages

- In addition to offering many of the same advantages as side platforms, a center platform shared between buses in both directions may require less space than separate side platforms, which may be more practical on narrower roadways.

Disadvantages

- Center platforms require buses with driver-side doors. If the BRT service has both center platform (driver-side boarding) and curbside (passenger-side boarding) bus stops, then buses with both-side doors are necessary.
- Boarding medians are costly and require significant investment for the BRT guideway, center platform, and supporting infrastructure.
- Passengers need to cross roadway traffic to reach side platforms. Pedestrian crossings can be accommodated with crosswalks at intersections, but passengers may still cross at other points to reach the side platforms.

TABLE 26: DIMENSIONAL NEEDS FOR BOARDING MEDIAN BUS STOPS WITH CENTER PLATFORMS

Stop Location	Front Buffer	Stop (Bus) Length	Rear Buffer	Full Length
Nearside, Standard Bus	10' from crosswalk	40' (add 45' for each additional standard bus)	n/a	50'
Nearside, Articulated Bus	10' from crosswalk	60' (add 65' for each additional articulated bus)	n/a	70'
Midblock, Standard Bus	15' only if a midblock crosswalk from/across the median is desired in front	40' (add 45' for each additional standard bus)	15' only if a midblock crosswalk from/across the median is desired in back	40'+
Midblock, Articulated Bus	15' only if a midblock crosswalk from/across the median is desired in front	60' (add 65' for each additional articulated bus)	15' only if a midblock crosswalk from/across the median is desired in back	60'+
Farside, Standard Bus	n/a	40' (add 45' for each additional standard bus)	10' from crosswalk	50'
Farside, Articulated Bus	n/a	60' (add 65' for each additional articulated bus)	10' from crosswalk	70'

BUS BAY, FLUSH

For bus stops serving multiple bus routes, sections of the curbside lane can be divided into flush bus bays to reduce conflicts between coinciding bus arrivals.

Advantages

- In addition to reducing conflicts between coinciding bus arrivals, dividing the curbside into separate adjacent pickup and dropoff areas distributes and dilutes the sidewalk congestion from waiting passengers.

Disadvantages

- Flush bus bays need significant curbside buffer space to allow for buses to pull in and out from the curb.

FIGURE 22: TYPICAL FLUSH BUS BAY

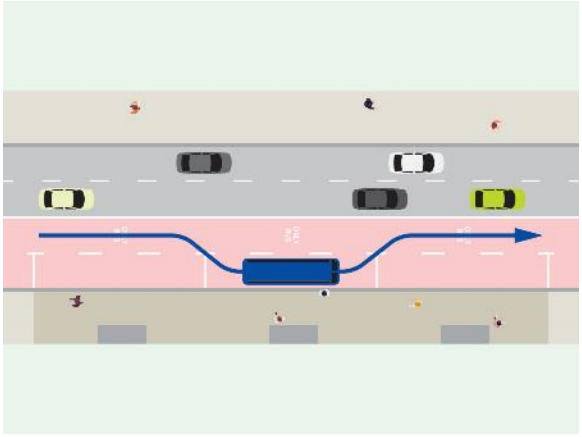


TABLE 27: DIMENSIONAL NEEDS FOR FLUSH BUS BAYS

Stop Location	Front Buffer	Bay Length	Rear Buffer	Full Length
Linear Array of 2+ Bays, Standard Bus	50' from the bay in front	40'	70' from the bay in back	160'
Linear Array of 2+ Bays, Articulated Bus	50' from the bay in front	60'	70' from the bay in back	180'

BUS BAY, SAWTOOTH

Bus bays can be bulbed in a sawtooth pattern to make it easier for buses to pull in and out from the curb.

Advantages

- Sawtooth bus bays reduce the amount of curbside space needed for buses and increase the amount of space for amenities compared to flush bus bays.

Disadvantages

- Sawtooth bus bays may require the costly modification or relocation of curbs, storm drain inlets, utility covers, sidewalks, crosswalks, and curb cuts.

FIGURE 23: TYPICAL SAWTOOTH BUS BAY

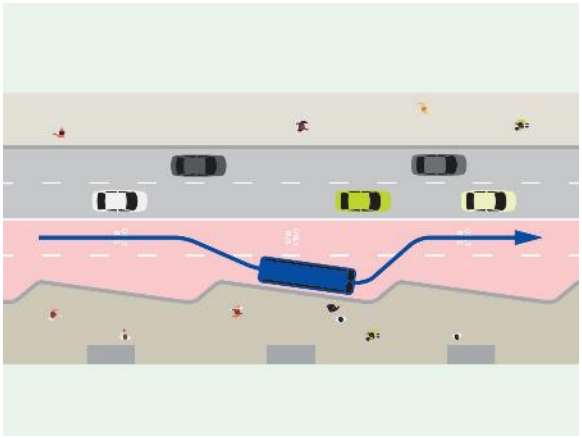
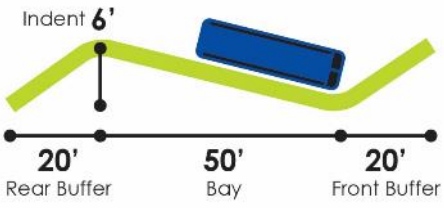
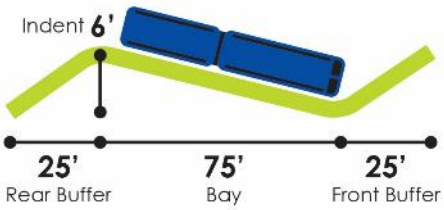


TABLE 28: DIMENSIONAL NEEDS FOR SAWTOOTH BUS BAYS

Stop Location	Front Buffer	Bay Length	Rear Buffer	Full Length
Linear Array of 2+ Bays, Standard Bus	20' from the bay in front		20' from the bay in back	90'
Linear Array of 2+ Bays, Articulated Bus	25' from the bay in front		25' from the bay in back	125'

Applying Stop Typologies

In addition to the advantages and disadvantages discussed previously, the recommended stop typology for any given bus stop can vary depending on different local operating conditions. **Table 29** lists several common operating conditions and SORTA's recommended stop typology for each operating condition. Since the presence of curbside parking has a significant impact on operating conditions, SORTA has sorted recommended stop typologies into two categories: streets with and without curbside parking.

TABLE 29: RECOMMENDED STOP TYPOLOGY BY OPERATING CONDITION

Operating Condition	Recommendation for Streets With Curbside Parking	Recommendation for Streets Without Curbside Parking
A bike lane is present	Boarding Island, Farside	Boarding Bulb With Cycletrack, Farside
A bus layover is needed	Pull-Out Into Parking, Midblock	Pull-Out Into Curb, Midblock
The bus is making a turn at the intersection	Boarding Bulb, Nearside	In-Lane, Nearside
The street is congested with multiple bus routes	Bus Bay, Flush or Bus Bay, Sawtooth (use full block)	Bus Bay, Flush or Bus Bay, Sawtooth (use full block)
A dedicated bus lane is present	Boarding Bulb, Farside	In-Lane, Farside
There are numerous driveways or a lack of sidewalks on the far side of the intersection	Boarding Bulb, Nearside	In-Lane, Nearside
There are high volumes of left-turning buses and/or trucks on the cross street	Pull-Out Into Parking, Farside	Pull-Out Into Curb, Farside
There are multiple intersecting bus routes with many transferring passengers on the cross street	Pair a Boarding Bulb, Nearside stop with a Boarding Bulb, Farside stop on the cross street	Pair an In-Lane, Nearside stop with a Boarding Bulb, Farside stop on the cross street
The bus stop has large passenger volumes	Boarding Bulb, Farside	In-Lane, Farside
There are high volumes of right-turning traffic onto the street	Boarding Bulb, Nearside	In-Lane, Nearside
Local and limited-stop bus services share the street	Pair a Pull-Out Into Parking, Nearside stop for the local service with a Boarding Bulb, Farside stop for the limited-stop service	Pair a Pull-Out Into Curb, Nearside stop for the local service with an In-Lane, Farside stop for the limited-stop service
A long traffic signal cycle is present	Boarding Bulb, Farside	In-Lane, Farside
A major midblock destination is present on a long urban block or a large suburban block	Boarding Bulb, Midblock	In-Lane, Midblock
A major destination is present on the near side of the block	Boarding Bulb, Nearside	In-Lane, Nearside
A queue jump or a shared right-turn lane allows the bus to advance to the intersection	Pull-Out Into Parking, Farside	Pull-Out Into Curb, Farside
A midblock BRT or rail station is present	Pull-Out Into Parking, Midblock	Pull-Out Into Curb, Midblock
It is safer for pedestrians to cross midblock than at the nearest intersection	Boarding Bulb, Midblock	In-Lane, Midblock
The street is at or near its capacity for vehicular throughput	Boarding Bulb, Farside	In-Lane, Farside
The intersection ahead has transit signal priority (TSP)	Boarding Bulb, Farside	In-Lane, Farside
The street's signal progression favors buses	Alternate between Pull-Out Into Parking, Farside stops and Pull-Out Into Parking, Nearside stops	Alternate between Pull-Out Into Curb, Farside stops and Pull-Out Into Curb, Nearside stops

5. BUS STOP PLACEMENT

Bus stop placement influences bus schedule reliability, the passenger experience, and equitable transit access for all residents. SORTA can strategically position bus stops to maximize efficiency and ridership by considering population density, employment center locations, and passenger demand.

Bus Stop Spacing and Optimization

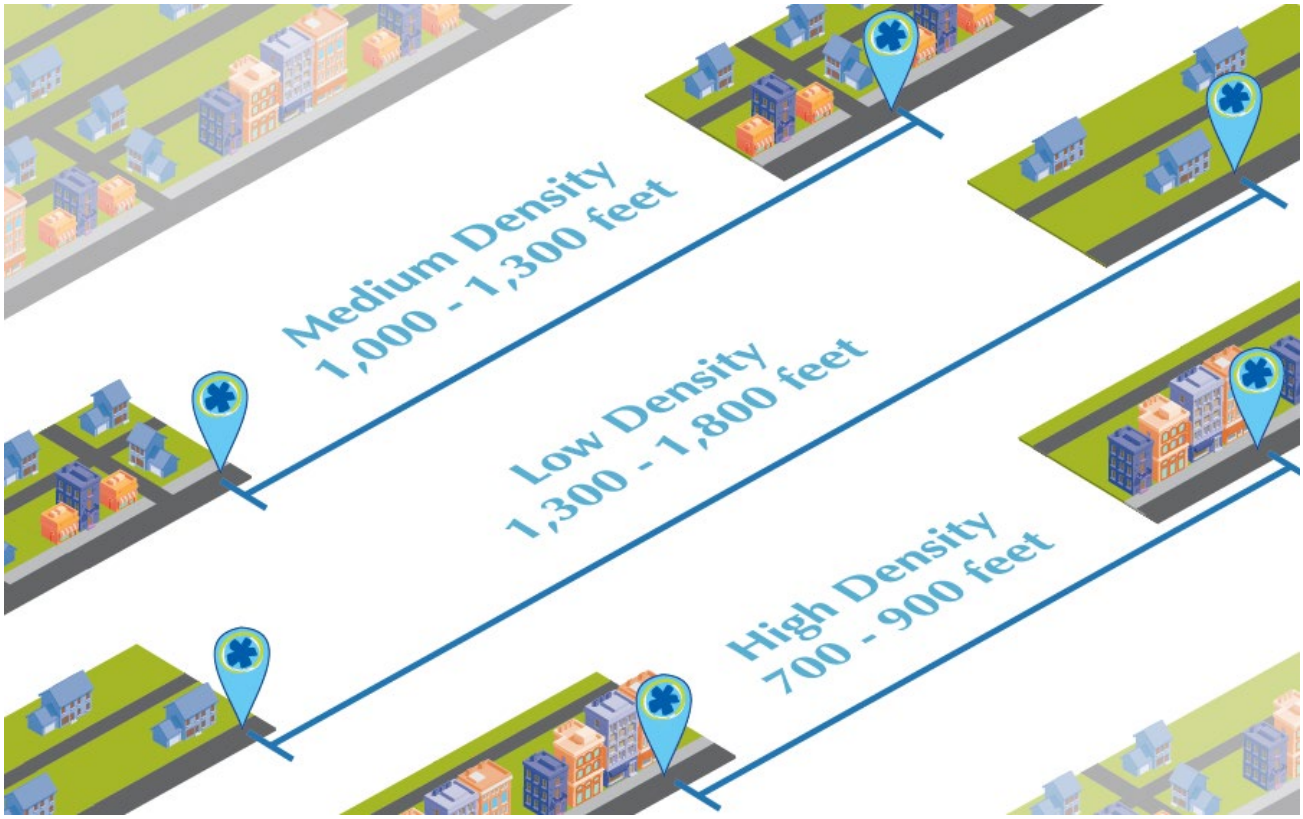
Bus stops should be closer together in areas where there are more people living and working, or in places where terrain such as extreme slopes make it difficult for passengers to walk to stops. Stops may be spaced further apart in less developed areas but should still be close enough together to ensure passengers near the route can access a bus stop within a reasonable walking distance. SORTA's recommended stop spacing based on residential and job densities is shown in **Table 30** and **Figure 24.**

Some bus routes may not stop at every bus stop: "skip-stop" or express service can speed up operations, but they also require passengers near skipped stops to walk further. Ridership, area demographics, employment center locations, and accessibility should all be considered when determining whether a stop can be skipped.

TABLE 30: RECOMMENDED STOP SPACING BASED ON SURROUNDING CONTEXT

Operating Condition	Density	Optimal Stop Spacing	Number of Stops per Mile
High Density	Greater than 20 residents per acre; greater than 10 jobs per acre	700 – 900 feet	6 – 8
Medium Density	10 – 20 residents per acre; 5 – 10 jobs per acre	1,000 – 1,300 feet	4 – 5
Low Density	Less than 10 residents per acre; less than 5 jobs per acre	1,300 – 1,800 feet	3 – 4

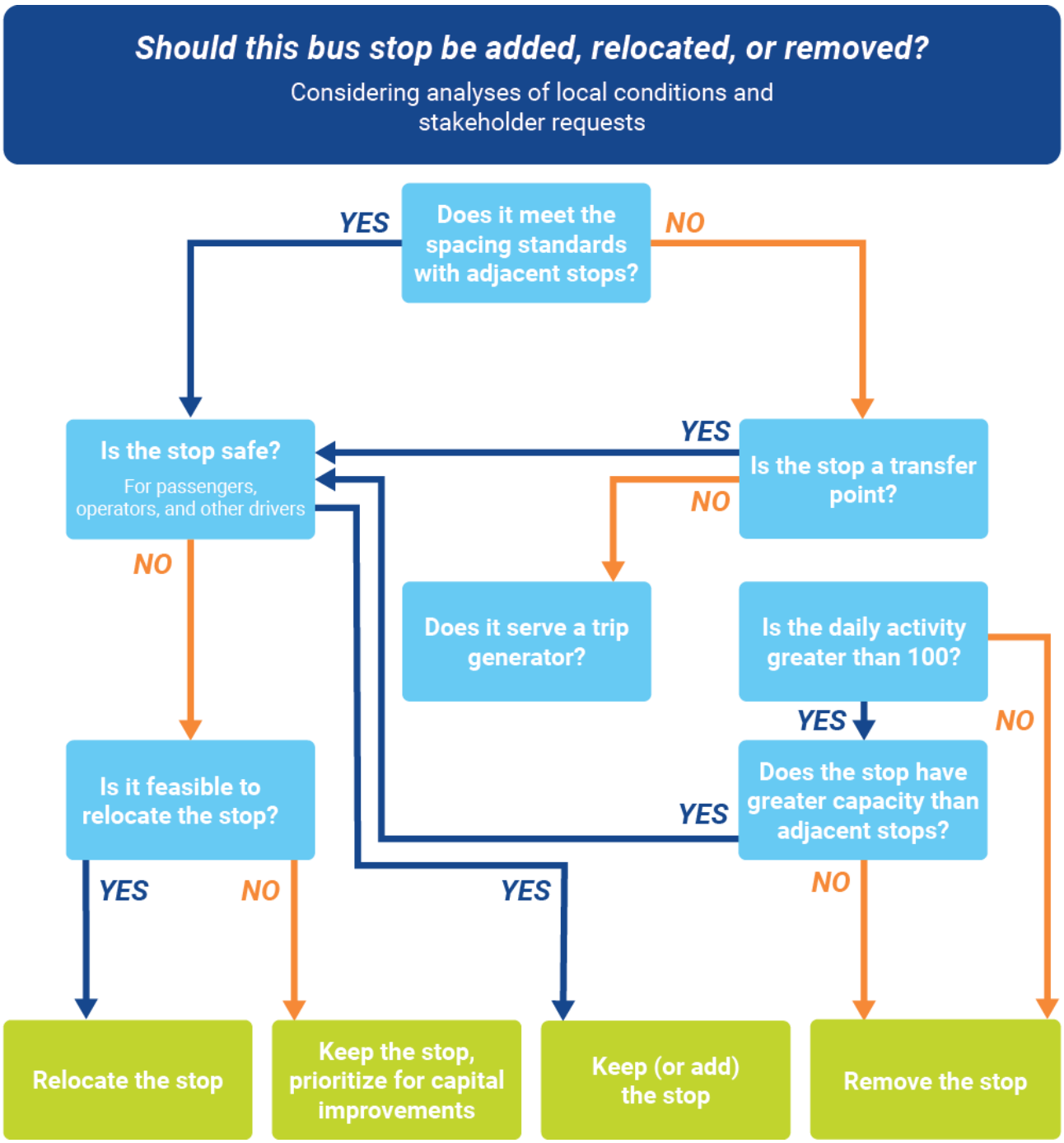
FIGURE 24: RECOMMENDED STOP SPACING BASED ON SURROUNDING CONTEXT



Adding, Relocating, or Removing Bus Stops

Bus stop modifications may originate through an analysis of local conditions using the guidelines in **Figure 25,** or by request from stakeholders including elected officials, community organizations, passengers, or property owners. Most SORTA bus stops are located within the public right-of-way on public property. While not everyone uses public transit, it plays an essential role in the economy upon which all residents of the Cincinnati area depend, and SORTA has a legal obligation to serve people of all races, ethnicities, ages, abilities, and incomes. Adding, relocating, or removing a bus stop is a complex and costly process that involves many issues related to access, safety, and operational efficiency. Modifying bus stops also requires analysis and coordination among stakeholders.

FIGURE 25: DECISION TREE FOR ADDING, RELOCATING, OR REMOVING BUS STOPS



Other Placement Considerations

VISIBILITY

Ensuring bus stops are placed in locations with proper visibility is crucial for the safety of passengers, pedestrians, and all road users. SORTA prioritizes the selection of bus stop locations that offer clear sightlines for waiting passengers, transit vehicle operators, and drivers of other vehicles. To achieve this goal, bus stops should not be situated over the crest of a hill, around blind curves, or near corners, gullies, traffic islands, or intersections if they obstruct sight lines. When calculating sight distances for a bus stop, it is important to consider the target speeds or posted speed limits rather than relying on 85th-percentile design speeds.

LAYOVERS

Layover stops in the SORTA system require careful attention to ensure the needs of bus operators are met. Providing convenient access to restroom facilities for operators during their breaks is a crucial consideration in the selection of layover facilities. Accessible and well-maintained restrooms near layover stops are essential to support the comfort and satisfaction of operators. Additionally, layover stops should be designed to prioritize operator safety and security. This may involve adequate lighting, surveillance measures, and clear signage to indicate designated areas for operators. Amenities such as seating, shade structures, and access to drinking water should be considered to enhance operator comfort during their downtime.

DRIVEWAYS AND LOADING ZONES

As shown in **Figure 26,** safety and accessibility are key considerations when siting bus stops around driveways, parking entrances/exits, alleys, loading zones, and other curb cuts. Bus stops should not obstruct sight distances for exiting vehicles or block driveways that provide sole access to properties. Unloading areas for passengers should be separated from driveways and placed within safe sight distances for exiting vehicles. Finally, special care should be taken to avoid blocking alleys and other curb cuts while the bus is stopped.

FIGURE 26: RECOMMENDATIONS FOR POSITIONING BUS STOPS AROUND DRIVEWAYS

TURNING CONSIDERATIONS

The specific turning radii and speed limitations of different bus lengths must be considered when selecting bus stop locations. Standard 40 ft. buses have an inner turning radius of approximately 22 feet and an outer turn radius of approximately 44 feet. Turning speeds should be limited to 15 miles per hour or less, with the aim of achieving turn radii that are as small as feasible. Intersection geometry plays a crucial role in accommodating bus turns and maintaining safe pedestrian travel. Curb radii on streets where buses operate should be designed with a minimum corner radius of 15 feet. Restricting parking close to street corners may be necessary to ensure buses have enough space to complete turns, as shown in **Figure 27.** This strategy, known as "daylighting" an intersection, helps enhance visibility and maneuverability for vehicles while also improving pedestrian safety.

FIGURE 27: BUS SWEEP AT A DAYLIT INTERSECTION

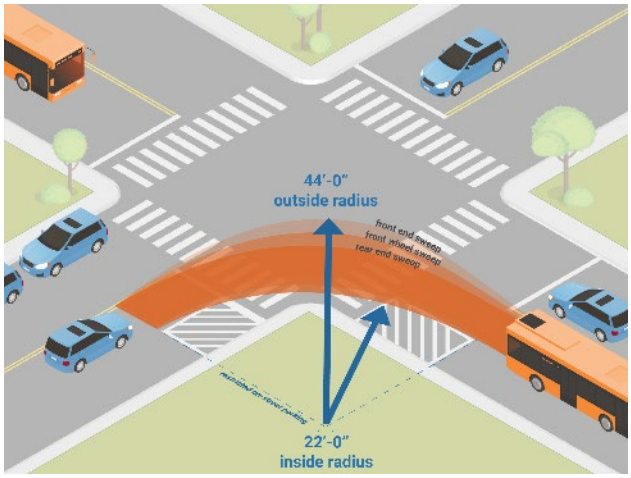
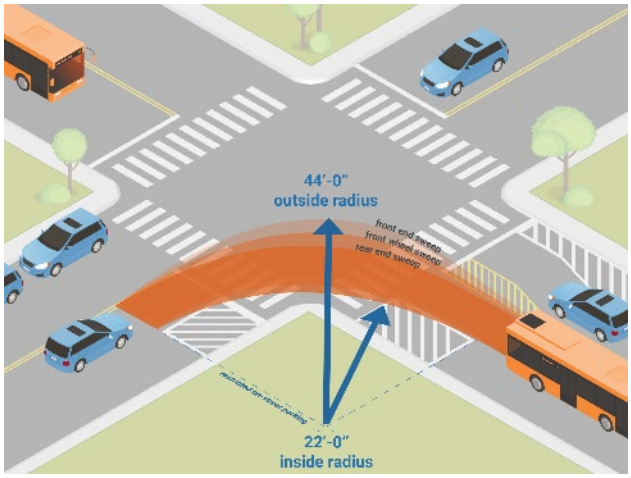


FIGURE 28: BUS SWEEP AT A LANE-SHIFTED INTERSECTION



In some cases, adjustments to striping and lane configurations may be necessary to allow buses enough space to complete turns. As shown in **Figure 28,** shifting through lanes to the left to increase the width of the curbside lane at the approach to the intersections can optimize the turning path for buses making right turns and improve overall traffic flow. In cases where the width of the curbside lane at a right turn is insufficient to allow buses space to complete turns, the stop bar in the opposite direction of travel on the street the bus is turning on to can be moved back to allow more space for the front swing of the bus to clear the intersection.

Stops located at intersections where a route makes a turn should be located on the far side of the intersection with enough space to allow buses to complete their turns and pull over to the curb before stopping. Stop locations in advance of left turns must be placed far enough in advance of the intersection to allow sufficient distance for the bus to safely move into the appropriate left turning lane after stopping. The minimum distance required for a safe left turn is determined by factors such as the posted speed limit and the number of required lane changes.

OPERATING ON PRIVATE PROPERTY

The SORTA bus system occasionally requires operating transit vehicles on private property. This typically occurs when a transit route's terminus or layover location is situated on private land (such as a shopping center parking lot), making reliable access to the property crucial for the success of the route. Agreements between SORTA and the property owners should be formalized with Memoranda of Agreement (MOA) or Memoranda of Understanding (MOU) that identifies the span and frequency of transit service and their impact on the property's infrastructure and other uses.

Requests for transit service on private property are evaluated based on SORTA service standards and adhere to the rule of directness, which emphasizes the placement of bus stops along a relatively straight path of travel. SORTA should pay particular attention to the durability of roadway surfaces, shoulders, and pull-outs to withstand the repetitive loads of buses when determining whether operating on private property is feasible.

6. BUS STOP SIGNS

Bus stop signs play an important role in both communicating information to the public and bus operations. Bus stop signs indicate to passengers where they should wait to be picked up and communicate which routes serve the stop. These signs also show bus drivers where they should stop to pick up passengers and communicate information to other street users that help keep curb space clear for bus operations, such as no parking restrictions.

Bus stops are identified on the street by a collection of standardized and cohesive signs. Each bus stop should have three main METRO-branded signs and supporting signage as outlined below:

1. **Signpost Topper:** Identifies METRO as the operator and provides branding identity.
2. **Stop Location Sign Panel:** Identifies the bus stop location by cross streets or by bus stop name.
3. **Route Info Sign Panel:** Identifies the bus routes serving the bus stop with destination and frequency information.
4. **QR Code Sign:** Provide access to real-time information, the METRO website, and the METRO customer service phone number.
5. **Regulatory Signage:** Defines a no-stopping zone to keep the bus stop clear of all vehicles other than buses.
6. **Entrance Pylon:** Tier 1, Tier 2, Tier BRT, and Tier PNR bus stops are supported by additional METRO branding via entrance pylons in a standardized design to be phased in alongside (and to eventually replace) existing entrance signage.

Each sign type is described in more detail below.

1. 

2. 

3. 

4. 

5. 

6. 

Branding Standards

The designs of bus stop signs are based on the overall METRO brand, including colors and fonts.

COLORS

The primary colors for use are Pantone 286 C, Pantone 7683 C, Pantone 297 C, and Pantone 611 C.

Additional colors for use are Pantone 715 C, Pantone 7578 C, Pantone Cool Gray 11 C, and Pantone Cool Gray 2 C.

TYPEFACE

METRO branding guidelines use the Optima typeface family, which is used to establish branding on these signs. Montserrat is added as a font for these bus stop designs to increase the legibility of crucial information, as sans serif fonts improve clarity and legibility. Montserrat is similar to the *Reinventing METRO!* typeface, is highly legible, and free to use.

Optima Bold

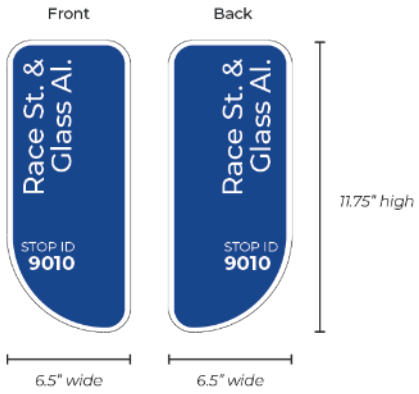
Montserrat Bold
Montserrat

Bus Stop Signs

Bus stop signs indicate the designated location of bus stops to both the general public and to bus operators. Primary bus stop signage includes two sign panels. Each sign panel is double-sided and mounted to the signpost near the panel edges, increasing visibility of the information from both approach directions.

STOP LOCATION SIGN PANEL

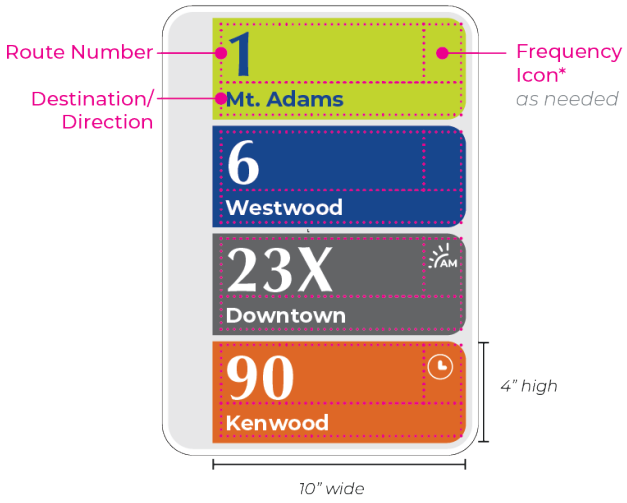
One sign panel provides information about the location of the bus stop, primarily by giving the cross streets of the bus stop. If a bus stop is usually identified by another name, that name is listed on this sign panel. The sign panel also lists the Stop ID for redundancy with the QR code sign.



The location sign panel is mounted on the side of the signpost toward the curb face, perpendicular to the roadway. The edge of the sign panel should be no closer than 24” from the curb face to reduce the risk of buses striking the sign assembly. These sign panels include a 2” wide clear space on their mounting side to allow for mounting equipment such as bolts, and to prevent any information from being obscured by the signpost.

ROUTE INFORMATION SIGN PANEL

A second sign panel lists all bus routes stopping at the bus stop. Each listed bus route includes its destination, providing directional wayfinding for passengers. Bus routes are also categorized by frequency, identified primarily by color. This color-coding should be supported by consistent coloration and identity across bus schedules and other public-facing materials. The frequency categories identified during the design process are as follows:

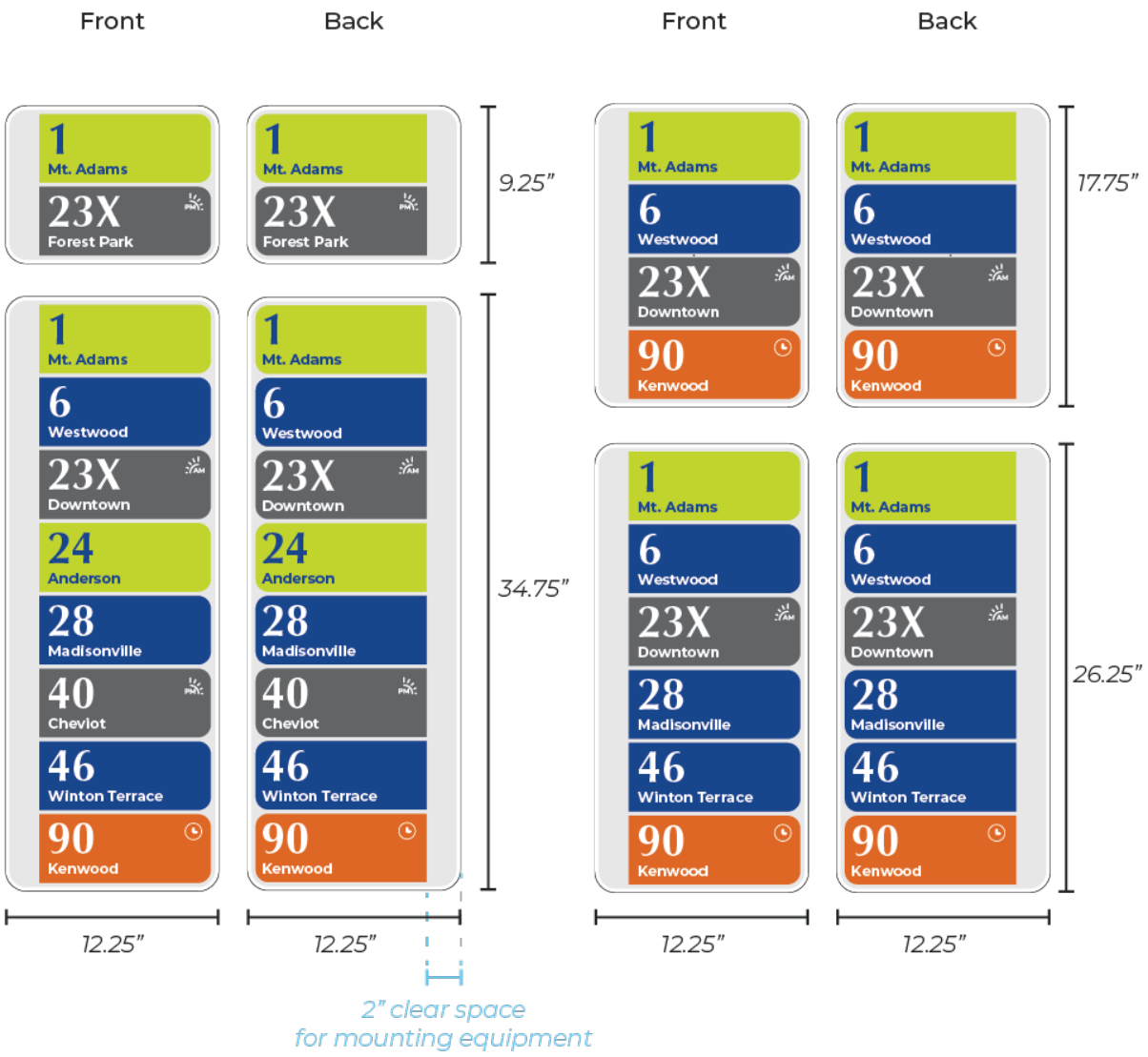


- **Orange:** Less than 15 minutes between buses at midday (frequent service)
- **Blue:** 16 to 30 minutes between buses at midday
- **Green:** More than 30 minutes between buses at midday
- **Gray:** Limited service, including AM-only and/or PM-only trips

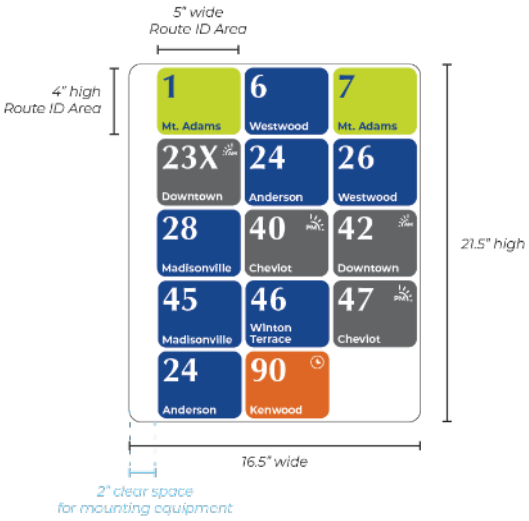
Each bus route listed on the sign is contained in a 10”x4” field of color. The background color of each field is determined by the frequency of service on that route. Each bus route number is typeset in 180pt (2.5”) Optima Bold in accordance with ADA standards. The destination below is set in 60pt (~.8”) Montserrat Bold. Type colors were selected to maintain sufficient contrast for legibility – white over orange, blue, or gray backgrounds and blue over green backgrounds.

The dotted red lines in the diagram above indicate the safe spaces that text for each element may fill, allowing for lengthier destination names (up to 18 characters).

Frequency icons appear in the upper right corner of each field, opposite the bus route number. These icons may be included or omitted depending on the information specific to each bus route. An AM-only indicator, PM-only indicator, and a clock icon indicating frequent service are recommended.



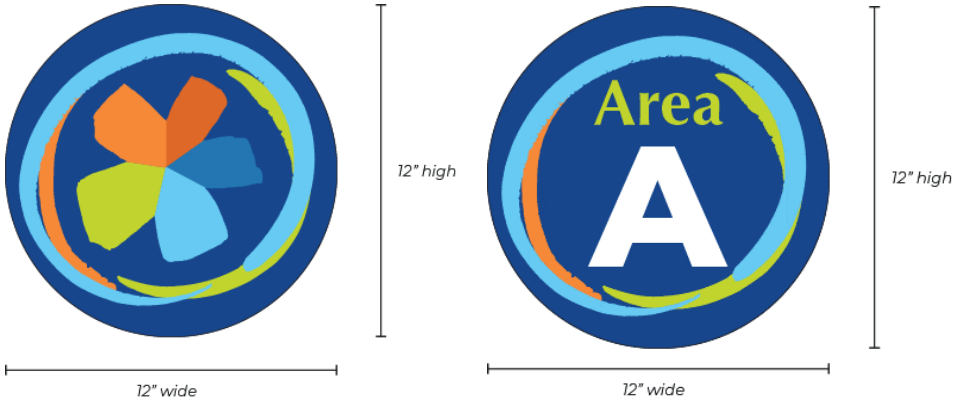
Due to the range in the number of bus routes stopping at each bus stop, variants of the route information sign panel are available. The smallest such panel displays one or two bus routes. Additional variants add slots for bus routes in multiples of two, up to a maximum of eight bus routes in this layout. An additional layout, shown at right, accommodates up to 15 bus routes – more than the current maximum of 14 routes serving any single stop in the system. While this layout differs from the standard layouts, it uses the same colors and fonts to maintain brand consistency.



The route information sign panel is mounted away from and perpendicular to the curb. The bottom of any sign should be no less than 7' (84") from the sidewalk surface. The top of any sign with critical information should be no more than 10' (120") from the sidewalk surface. These signs are designed with a 2" wide clear space on the mounting side to allow for mounting equipment such as bolts, and to prevent any information from being obscured by the signpost.

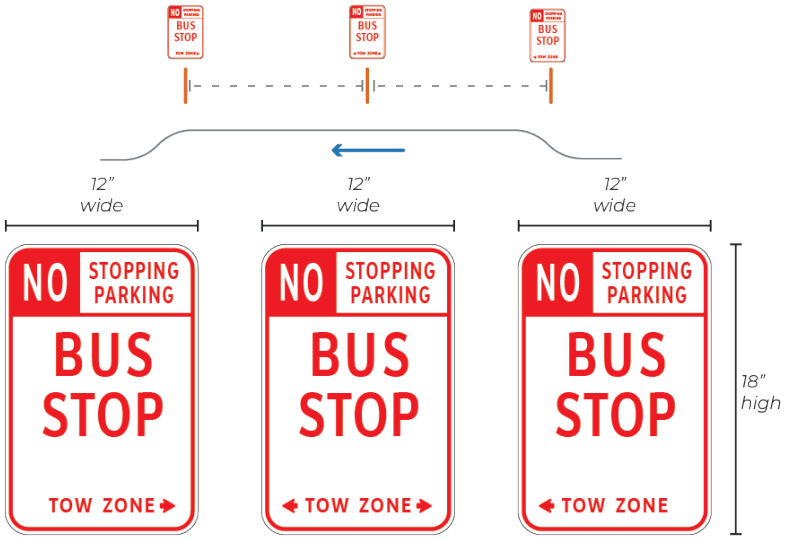
Bus Stop Topper

Bus stop signposts are topped with circular signs containing either a branding element or a boarding area location identifier, making bus stop locations visible to passengers and drivers from a distance. Toppers with a boarding area location identifier are useful at transit centers and at bus stops with multiple boarding areas to differentiate bus bays for passengers. The bright colors reinforce METRO branding and help passengers locate signs on visually busy streets.



Regulatory Sign

Standard regulatory signs indicate bus stops' no-stopping zones and prevent private vehicles from obstructing bus stops. Regulatory signs are 12"x18" and centrally mounted on square posts. The front regulatory sign may be mounted on the same post as the bus stop sign in instances where the placement of the regulatory sign 7' above the sidewalk surface does not push the top of the bus stop sign more than 10' above the sidewalk surface.

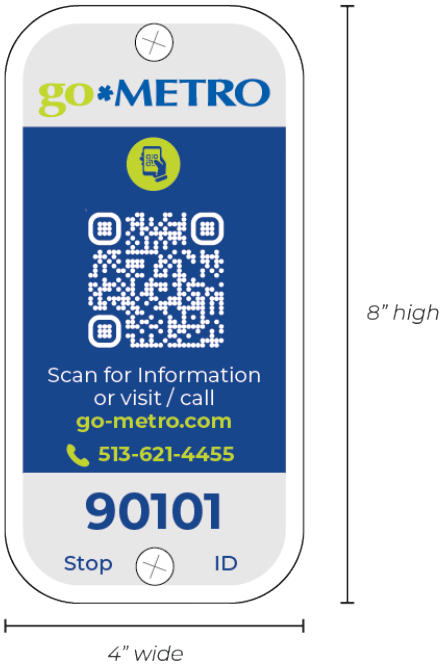


Regulatory signs should be mounted perpendicular to the road and facing traffic. At least two regulatory signs are recommended, one at the front and one at the back of each bus stop's no-stopping zone. At the front of the bus stop, the sign's arrow should point toward the back of the bus stop (i.e., point right at curbside stops), and at the back of the bus stop, the sign's arrow should point toward the front of the bus stop (i.e., point left at curbside stops). A continuation sign with a bidirectional arrow can be interspersed at one or more midpoints of unusually long no-stopping zones. For example, a large bus stop with multiple bus bays along the curbside may benefit from one or more continuation signs.

QR Code Sign

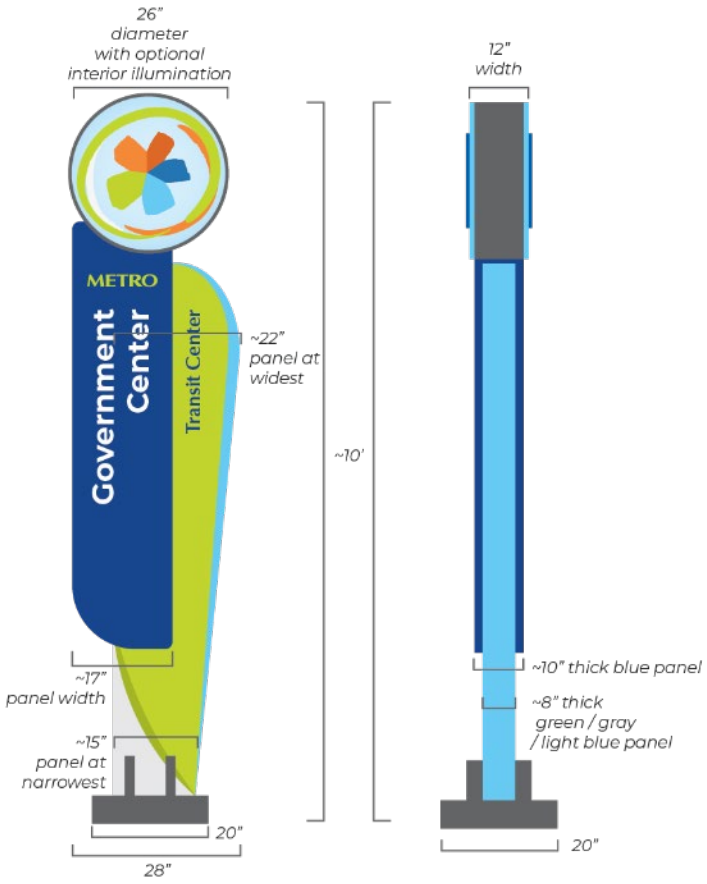
This supplemental sign directs passengers to go-metro.com via a QR code and web address, or to METRO customer service via a phone number. It also displays the Stop ID to expedite getting live information from the METRO website.

These signs are 4” wide by 8” high and they are center mounted on the same signposts as the bus stop signs, facing traffic. Their vertical center should be a minimum of 48” above the sidewalk and a maximum of 67” above the sidewalk to remain within ADA guidelines. The signs must not protrude more than 1” beyond the signposts to prevent snagging and obstruction. Finally, their QR codes should be at least 1” high for smartphone readability, but 2” or more is preferred.



Entrance Pylon

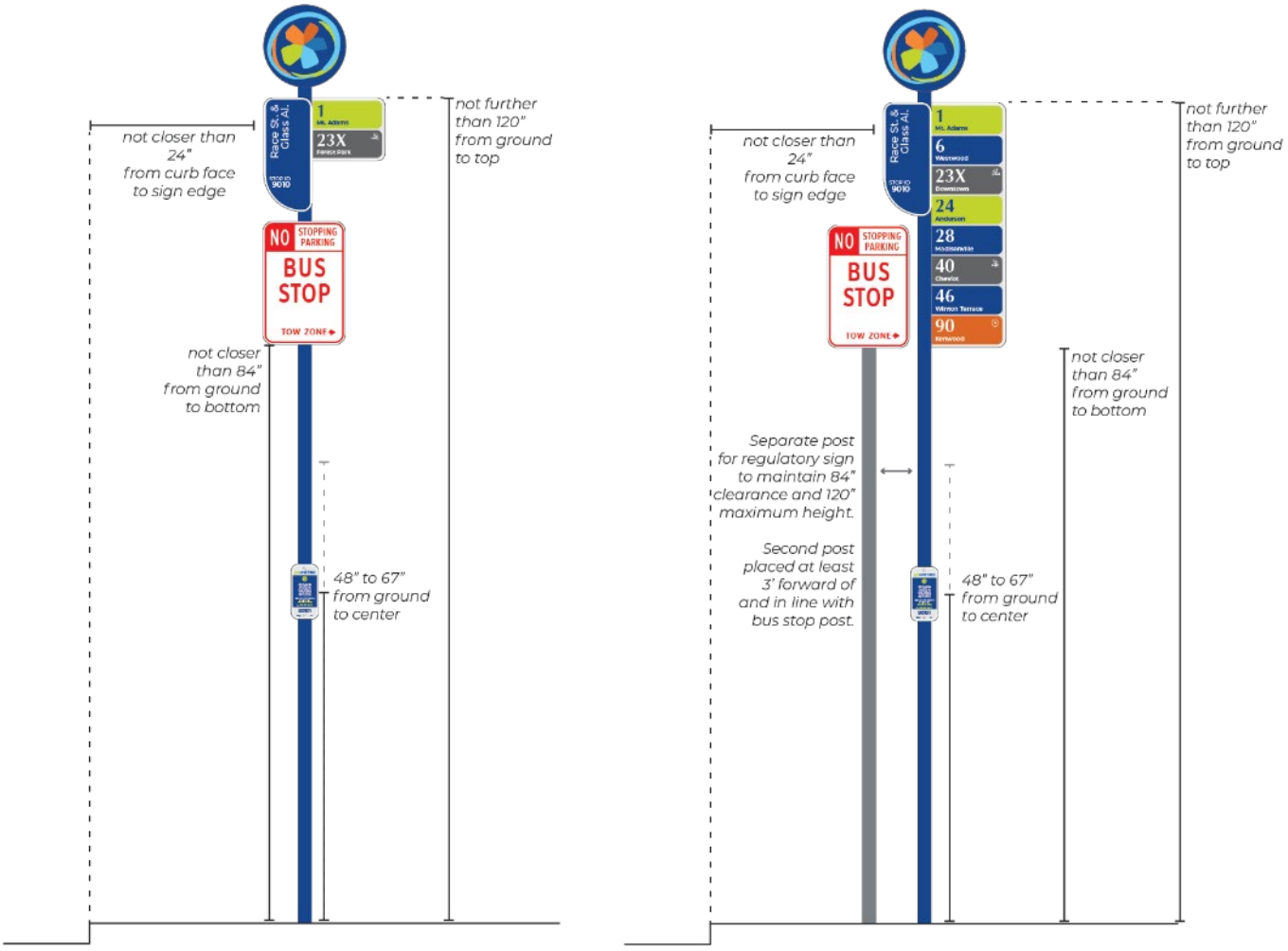
A new entrance pylon is designed to gradually replace the disparate current transit center signage. The new design serves as a unifying element that pulls its design inspiration from many of the current pylons while presenting a consistent METRO brand. These pylons can be manufactured out of any combination of heavy-duty plastic, aluminum, and/or steel, and they contain space for interior illumination in the METRO starburst element. These pylons also require concrete footings.



Signpost Placement and Assembly

Signposts consist of 2” unperforated square channel posts painted blue. To maximize mobility and ensure ADA compliance, signposts should be placed in such a way that sign edges are at least 24” from the curb face and 3’ from any other obstructions such as street furniture, bus shelters, or other amenities. Keeping the 24” minimum clear space referenced above in mind, signposts should still be placed close to the curb to provide a clear spatial relationship to the bus stop’s boarding/alighting area, but they may be placed further from the curb when other obstacles are present.

Regulatory signs may be posted on the same signposts as the bus stop signs if the signposts are in the appropriate position, providing the regulatory signs do not violate the 7’ clear space below the bottom of the bus stop sign. Regulatory signs may also be posted on separate posts nearby as needed for proper positioning. These separate posts do not need to be the standard blue signposts, which are required only for the bus stop signs themselves.



7. PUBLIC COMMUNICATION ABOUT BUS STOPS

Bus stops are public spaces that are as much a part of a community as streets, pathway, parks and plazas. SORTA encourages communities and citizens to recognize their value and to build a sense of ownership. SORTA also strives to keep passengers well-informed of any changes that will affect service, including changes to bus stops.

Communicating Bus Stop Changes

SORTA may relocate or remove bus stops for several reasons including better alignment with bus stop spacing guidelines, route realignments, safety issues, construction projects, or changes in land use. Whenever possible, it is SORTA's policy to post signs alerting customers and explaining the service change, including contact information for Customer Relations on all bus stops that are to be removed or have a major change in service prior to the change taking effect.

In circumstances where SORTA can control the relocation or removal of a bus stop, SORTA may seek additional public input concerning bus stop changes and will post signs several weeks before the change and again when a final decision is made. SORTA also strives to notify the public about proposed and final bus stops at public hearings and through information posted on our website and social media.

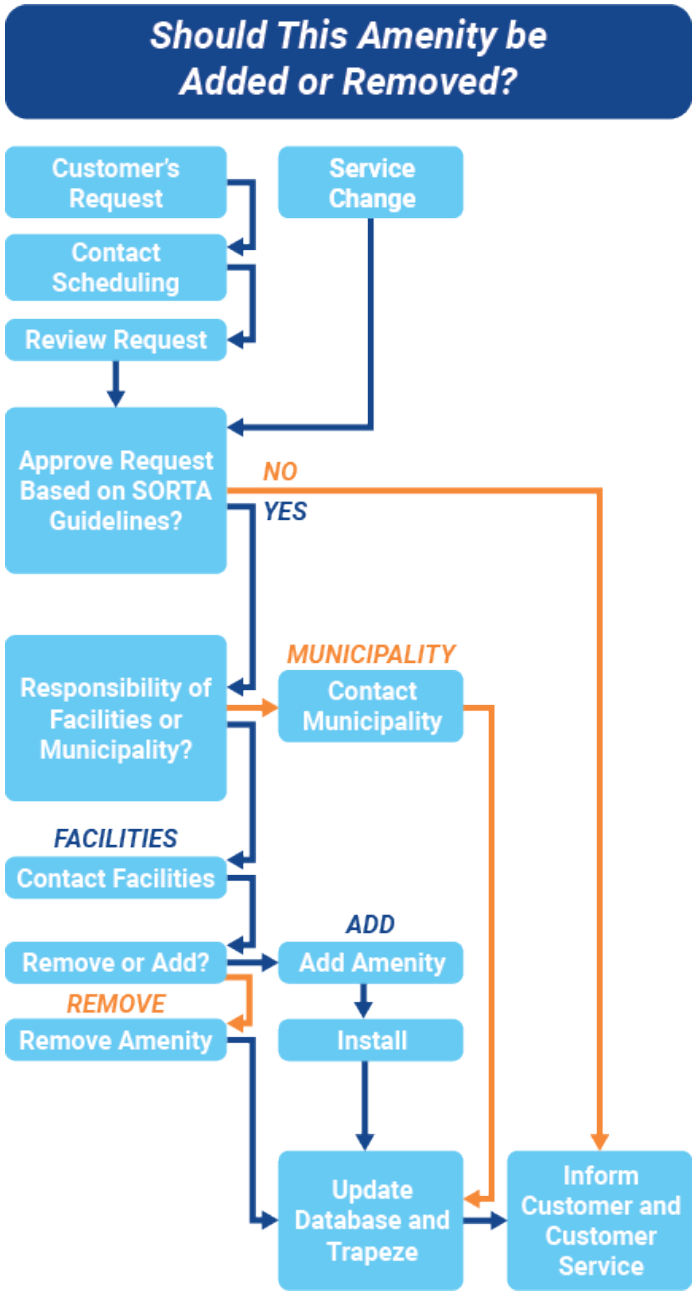
Public Feedback

SORTA encourages and welcomes input from the public about bus stops. All comments, questions or concerns including requests for new stops, shelters or other amenities, concerns about bus stop placement, or feedback about proposed stop removals should be directed to SORTA Customer Relations.

Amenity tiers, stop typologies, and stop placement considerations recommended in this guide are advisory only. SORTA may depart from these recommendations if feedback from the public or operations staff indicates a substantial need for stop relocation or additional amenities not already recommended for the stop.

SORTA follows a standard process when determining whether an amenity should be added or removed, shown in the flowchart in **Figure 29.** The process may be triggered by a request from the public or key stakeholders, or as part of regular SORTA service changes.

FIGURE 29: PROCESS FOR DETERMINING THE ADDITION OR REMOVAL OF AMENITIES



Who Should I Contact with Bus Stop Questions?

If you have questions about bus stops, please send an email to BusStops@go-metro.com. SORTA's bus stops team is composed of experts from multiple departments and is equipped to help with the following requests:

- **Adding, moving, or removing the bus stop.**
- **Adding an amenity**, such as a shelter, bench, or trash can, to the bus stop.
- **Fixing something** at the bus stop – for example, a broken sidewalk, shelter, or bench; a missing or damaged bus stop sign; or other vandalism.
- **Cleaning something** at the bus stop – for example, litter, weeds, an overflowing trash can, or graffiti.
- **Clearing snow or ice** from the bus stop.
- **Beautifying** the bus stop with artwork, landscaping, a custom shelter, or custom wayfinding.

APPENDICES

Appendix A: Technical Memo – Case Studies and Best Practices

This memo discusses best practices for bus stop design, including recommendations from national transit authorities and policies from peer transit agencies.

Appendix B: Technical Memo – Bus Stop Classification, Improvement, and Prioritization

This memo provides additional technical details about the methodologies used to determine amenity tiers for bus stops and to prioritize bus stop improvements.

Appendix C: Spec Sheets for Standardized Amenities

These drawings show exact specifications and standardized designs for amenities within the SORTA system, such as benches and shelters.

Appendix A: Case Studies and Best Practices

SORTA Bus Stop Evaluation and Design

August 18, 2023

go METRO

Prepared by:

FOURSQUARE ITP

CONTENTS

ABOUT THESE CASE STUDIES

Introduction

As the primary product for Task 1.1, this memo introduces and summarizes six case studies that were researched to develop best practices for SORTA's forthcoming *Bus Stop Evaluation and Design Guide.* These six case studies reflect best practices recommended by transit industry organizations and used at a diverse array of peer transit agencies.

These case studies include best practices guidelines for bus stop design (facility design) and bus stop signage (facility wayfinding). Some organizations and agencies publish their standards and specifications for both genres in one document, while others separate their standards and recommendations across multiple documents. The case studies analyzed include:

- Industry Publications:
  - **National Association of City Transportation Officials (NACTO)** Transit Street Design Guide.
  - **Transportation Research Board (TRB)** Transit Agency Relationships and Initiatives to Improve Bus Stops and Pedestrian Access.
- Transit Agency Publications:
  - **Baltimore, MD:** Maryland Department of Transportation Maryland Transit Administration (MDOT MTA) Bus Stop Design Guide.
  - **Columbus, OH:** Central Ohio Transit Authority (COTA) Transit Stop Design Guide.
  - **Minneapolis, MN:** Metro Transit Bus Stop Design Guidelines and Bus Stop Information Guidelines.
  - **Vancouver, BC:** TransLink Bus Infrastructure Design Guidelines, Transit Passenger Facility Design Guidelines, and Wayfinding Standards Manual (not available online).

Key Takeaways

The following pages summarize key takeaways from each case study to provide guiding considerations for SORTA:

- **Roadway and Transit Vehicle Considerations:** How does the case study address variability in roadway/intersection configurations and transit vehicle types/lengths? Does the case study introduce a gradation or variety of bus stop typologies?
- **Essential Facility Considerations:** Which accessibility and spatial needs does the case study address, and which essential passenger amenities does it identify?
- **Enhanced Facility Considerations:** What supplemental (or "nice to have") passenger amenities does the case study recommend, and in what contexts should these amenities be included?
- **Signage and Wayfinding Considerations:** How does the case study address minimum bus stop signage needs and any supplemental or enhanced wayfinding?
- **Community Collaboration Guidance:** How does the case study address community outreach and collaboration in bus stop design?
- **Applicable Lessons for SORTA:** From the summaries above, are there any initial recommendations or guidelines for SORTA to consider?

NACTO (NATIONAL)

Transit Street Design Guide

The NACTO Transit Street Design Guide, published by the National Association of City Transportation Officials, is a comprehensive guide to public right-of-way design around transit that provides design recommendations for elements such as streets, intersections, and transit stops and stations that include specifications and graphic depictions. These recommendations are placed in the context of common roadway, vehicle, and operational characteristics found throughout the country. The guide is general enough to apply to most American transit agencies and its influence on design guidelines for agencies across the country is clear.

ROADWAY AND TRANSIT VEHICLE CONSIDERATIONS

The NACTO Transit Street Design Guide provides a diverse menu of options for bus stop design that account for a wide variety of street layouts, vehicle characteristics, and operational contexts. The chapter on transit stop and station design includes recommendations for:

- **Stop Placement**: The guide provides specifications for how much space is needed to place bus stops in relationship to nearby intersections based on where the stop is located in relation to the travel lanes and the volume of transit operations.
- **Stop Configurations:** The guide provides many examples of how a stop can be laid out according to different street characteristics such as the number of lanes, volume of traffic, and other pedestrian and bicycle infrastructure surrounding the stop. Each type of stop configuration is illustrated with a rendering, often showing multiple contexts such as both far-side and near-side stops adjacent to protected bicycle lanes.

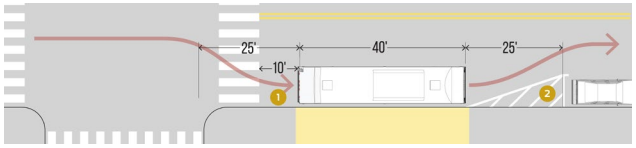


FIGURE 1: EXAMPLE BUS STOP PLACEMENT GRAPHIC

Desired Minimum Platform Length by Vehicle Type (feet)

Stop Position	40' Bus	60' Bus	2 x 40' Bus	2 x 60' Bus
Near-Side	100	120	145	185
Far-Side	90	100	125	165
Far-Side (right turn)	140	160	140	230
Mid-Block	120	145	185	210

FIGURE 2: EXAMPLE BUS STOP CONFIGURATION GRAPHICS

ESSENTIAL AND ENHANCED AMENITY CONSIDERATIONS

The NACTO guide provides a list of amenities that are recommended as part of the bus stop as below. The guide does not distinguish between essential and enhanced amenities but does provide multiple approaches that could be considered during the evaluation process.

- Bench: Based on Ridership, Sidewalk Width.
- Route or Patron Information: Highly recommended at all stops
- Vending Machines: Discouraged at stops
- Bike Storage: Recommended but separate from the bus stop with paved path from storage to the stop.
- Trash Receptacles: Recommended at all stops.
- Phone: Recommended but separate from the bus stop.
- Shopping Cart Storage Area: Recommended only when stop adjacent to a commercial shopping mall.
- Lighting: Highly recommended. For safety and security for both riders and non-riders.
- Security: landscaping, walls, advertising panels, and solid structures can restrict sight lines and provide spaces to hide

RECOMMENDATIONS FOR STOP HIERARCHY

The NACTO Transit Street Design Guide provides a significant number of options for bus stop design from a simple pull-out curbside stop to on-street transit terminals along with recommendations for passenger and service volumes at which each design is suitable but does not provide a framework for prioritizing designs. The guide's purpose is to provide recommendations that are universally adaptable to all transit contexts and as such does not provide specifics on prioritization as those decisions are unique to every agency.

CLASSIFICATION METHODOLOGY

The NACTO Transit Street Design Guide provides some guidance on what types of stops are appropriate for a context based on the street layout and volume of ridership and transit vehicles but does not provide specifics on classification due to the generalized purpose of the document.

SIGNAGE AND WAYFINDING CONSIDERATIONS

The NACTO Transit Street Design Guide includes a short section on generalized best practices for signage and wayfinding at transit stops. Essential elements recommended in the guide include: a stop name or identifier (destination/cross street or numbered/lettered identifier); route identification; network and route map; schedule and route information; and clear indication of stop location and position. The guide also provides guidance on ADA compliance, and recommendations for additional elements that may enhance the stop experience such as real time arrival information and the use of tactile cues in paving and other surfaces to guide users through transit facilities.

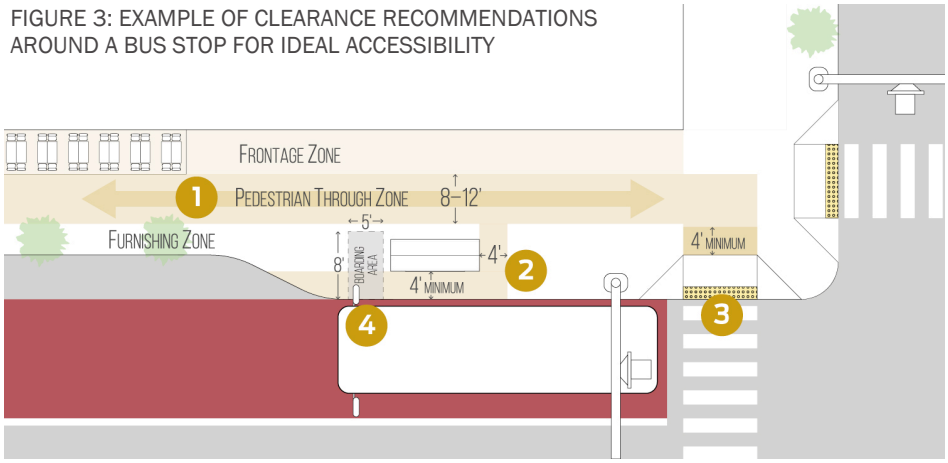
COMMUNITY COLLABORATION GUIDANCE

The NACTO Transit Street Design Guide does not include guidance on community collaboration as it is focused primarily on physical aspects of the bus stop design.

APPLICABLE LESSONS FOR SORTA

- The NACTO Transit Street Design Guide provides an extremely useful framework for designing and placing bus stops within their physical and operational contexts, and may be used as the basis for SORTA's bus stop design guide.
- The guide's recommendations for the curb space necessary to allow sufficient space for buses to pull in and out of stops in various relationships to nearby intersections are directly applicable to SORTA's bus stop design guidelines.
- Recommendations for bus stop configurations based on passenger and transit volume and street context can be directly adapted to SORTA's operational context.
- Recommendations for amenities to improve passenger safety and comfort as bus stops are also easily adaptable to SORTA's service area.
- The guide provides an excellent example of how to include ADA considerations throughout the design of transit stops, from the physical design and layout of stops to the design of included amenities.

FIGURE 3: EXAMPLE OF CLEARANCE RECOMMENDATIONS AROUND A BUS STOP FOR IDEAL ACCESSIBILITY



TRB (NATIONAL)

Transit Agency Relationships and Initiatives to Improve Bus Stops and Pedestrian Access

TCRP Synthesis 152: Transit Agency Relationships and Initiatives to Improve Bus Stops and Pedestrian Access is a research report focused on the current state of practice for bus stop and pedestrian infrastructure improvement programs and processes in place at transit agencies and other public organizations committed to public transportation. The report focuses much of its attention on improving the ADA accessibility of bus stops.

ROADWAY AND TRANSIT VEHICLE CONSIDERATIONS

The TRB TCRP 152 report provides limited information about recommended bus stop configurations according to vehicle and roadway characteristics, including only one example diagram of elements that should be included in an ADA accessible bus stop.

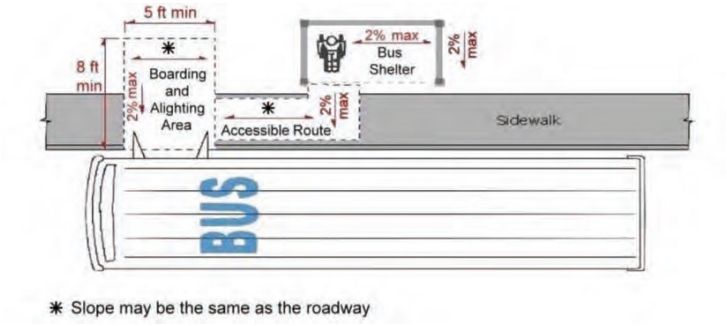


FIGURE 4 EXAMPLE DIMENSION WASHINGTON STATE DEPARTMENT OF TRANSPORTATION DESIGN MANUAL (2019)

ESSENTIAL AND ENHANCED AMENITY CONSIDERATIONS

This report provides some information on amenities that are typically included in bus stops. The report includes results from a survey of agencies across the country, including information on what amenities each agency has incorporated in their bus stop improvement programs, as pictured below.

- Bench
- Shelter
- Landing pad
- Rear-door areas
- Lighting
- Sidewalks and pathways
- Crossings
- Curb ramps
- Detectable warnings
- Bus stopping pad in roadway
- Signage

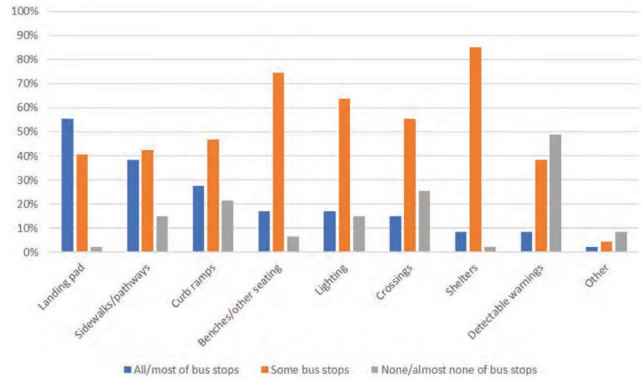


FIGURE 5: AMENITIES RECOMMENDED IN BUS STOP IMPROVEMENT PROGRAMS BY SURVEYED TRANSIT AGENCIES

RECOMMENDATIONS FOR STOP HIERARCHY

The TRB TCRP 152 report includes results from surveys of transit agencies throughout the country on the factors that agencies typically use to prioritize bus stop improvements. The figure below displays the frequency that various factors used to prioritize bus stop improvements are included in bus stop improvement programs. Fixed-route transit ridership is overwhelmingly the most important factor used by agencies to prioritize bus stop improvements. Route operational characteristics, condition of bus stops, customer and operator feedback, and surrounding land uses are all other important factors commonly considered in bus stop prioritization.

FIGURE 6: FACTORS INCLUDED IN CLASSIFICATION METHODOLOGY/HIERARCHIES EMPLOYED BY SURVEYED TRANSIT AGENCIES

Options that are being used for bus stops prioritization	Ranking				
	1	2	3	4	5
	Number of Respondents				
Fixed-route ridership	28	5	1	2	2
Worst condition	4	8	4	3	5
Observed problems by operators / staff	3	5	4	6	5
Space available	3	1	4	6	2
Customer complaints	2	8	8	10	3
Other infrastructure projects	2	4	5	3	3
ADA	2	0	0	0	0
Adjacent land uses (senior centers, hospitals, schools, etc.)	1	4	4	7	5
Route type (e.g., high-frequency or network connective routes)	0	8	6	2	0
Bus stop study priority list	0	1	0	0	0
Costs	0	0	4	2	2
Street or bus corridor type	0	0	3	0	1
Paratransit ridership	0	0	1	0	1
Bus network redesigns	0	0	0	1	1

CLASSIFICATION METHODOLOGY

This report provides high level descriptions of strategies that various transit agencies have used to classify bus stops and prioritize bus stop improvements using data. Factors used by these agencies include stop ridership, demographics of route ridership and the neighborhood surrounding each stop, transit service characteristics such as headways and spans, bus stop spacing, density of housing surrounding the stop, safety concerns, surrounding pedestrian infrastructure, public input, and the cost of installation. Most of the agencies described assigned numeric values and weights to some or all of these factors to prioritize stops for improvement. The report also includes survey results that detail what factors agencies include in their prioritization processes.

COMMUNITY COLLABORATION GUIDANCE

Within the literature review, this report details some outreach strategies used by various agencies around the country surrounding bus stop improvement programs. Some techniques used by other agencies to determine community needs and desires related to bus stop design include surveys (of both riders and operators), pop-up meetings, focus groups, and standing committees where agencies present plans and ideas to representatives of key community groups and stakeholders. The report also mentions strategies used to reach out to private property owners, who have in many cities been key partners in providing bus stop amenities such as lighting and seating around their properties. The report makes an important note about how collaboration with local jurisdictions and the private sector is a challenge that all agencies face in determining how to best improve and maintain bus stops.

APPLICABLE LESSONS FOR SORTA

- The TRB TCRP 152 report includes useful information on what factors are commonly used in prioritizing bus stop improvements by all agencies surveyed for the report.
- The report also includes some useful information on successful outreach strategies employed by transit agencies for their bus stop improvement programs, including outreach to community members, stakeholders, and property owners.

MDOT MTA (BALTIMORE, MD)

BaltimoreLink Bus Stop Design Guide

The Maryland Transit Administration, under the Maryland Department of Transportation, (MDOT MTA) operates local bus and rail service for the Baltimore Metropolitan area in addition to commuter bus and commuter rail service throughout the state. The BaltimoreLink Bus Stop Design Guide, published in 2019, addresses bus stop design for the agency's local bus system in Baltimore, Maryland. The 100-plus page guide provides guidance on stop design, amenity "tiers", sample configurations, and information on an Adopt-A-Stop program.

ROADWAY AND TRANSIT VEHICLE CONSIDERATIONS

The BaltimoreLink Bus Stop Design Guide provides an entire section on operational considerations, including guidance on:

- **Layovers:** the length of curb space required for layover based on the number of vehicles laying over at the stop
- **Roadway Surface:** pavement requirements at bus stops
- **Operations on Private Property:** required agreements for operating on private property such as Memoranda of Understanding (MOUs)
- **Turns:** placement of stops relative to intersections and required space (radii) for turning movements as well as the required length a stop should be placed prior to a left turn
- **Driveways:** the placement of stops relative to driveways for private property and businesses

FIGURE 7: LEFT TURN DISTANCE REQUIREMENTS FROM BUS STOP - EXCERPT FROM BALTIMORELINK BUS STOP DESIGN GUIDE

Table 16: Minimum Distance Between a Bus Stop and Left Turn (in ft.)[4,5]

Posted Speed Limit	Lane Changes			
	1	2	3	4
30 MPH or less	430	610	790	970
35 MPH	625	875	1,125	1,375
40 MPH	780	1,080	1,380	1,680
45 MPH	1,080	1,430	1,780	2,130
50 MPH	1,415	1,865	2,315	2,765
55 MPH	1,830	2,380	2,930	3,480

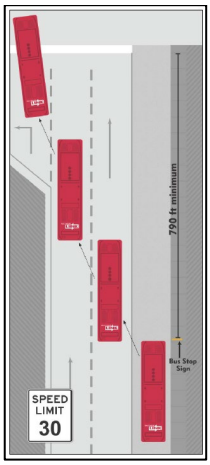
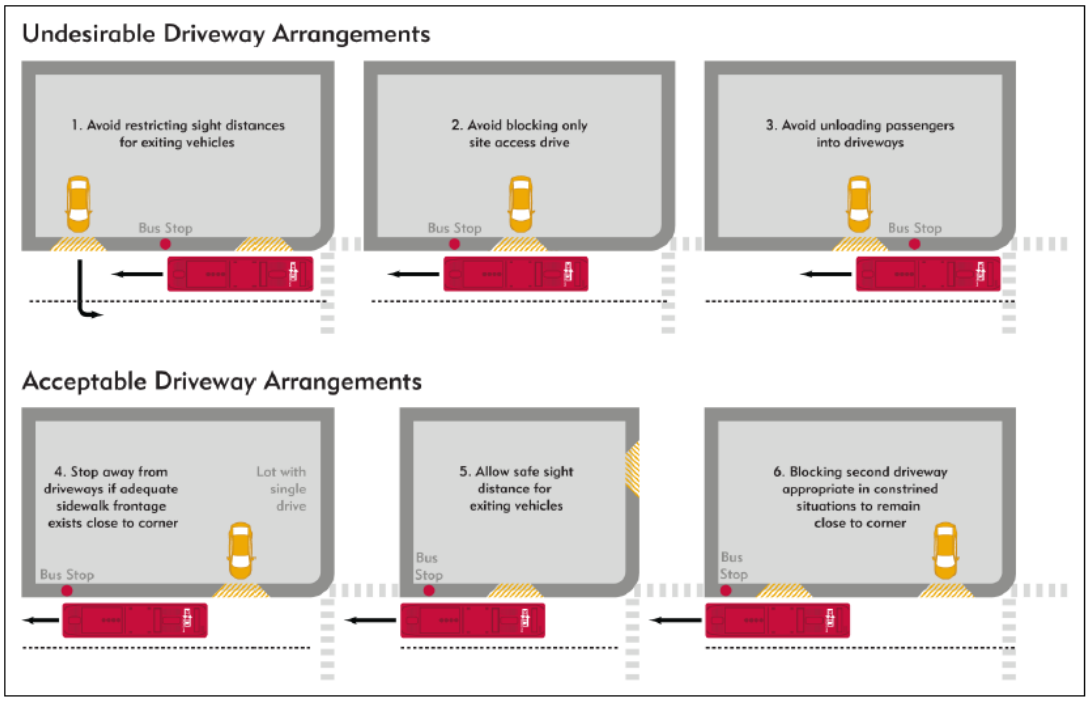


FIGURE 8: BUS STOP AND DRIVEWAY CONFIGURATIONS FROM THE BALTIMORELINK BUS STOP DESIGN GUIDE



ESSENTIAL AND ENHANCED AMENITY CONSIDERATIONS

This guide prescribes specific amenity requirements based on the "Bus Stop Hierarchy" as shown in the image below. At a minimum, a standard bus stop must have a bus stop sign, a boarding/alighting area, and a path to/from the stop. Additional items are required, as applicable, but not maintained by MDOT MTA such as lighting, and a curb ramp and detectible warning strips at nearby crossings. Enhanced stops require shelters as well as additional wayfinding such as system maps and realtime displays. MDOT MTA does not provide trash receptables and benches, but these are noted as optional amenities.

FIGURE 9: TABLE EXCERPT FROM BALTIMORELINK BUS STOP DESIGN GUIDE SHOWING REQUIRED AMENITIES BY BUS STOP TIER

Table 22 summarizes the features required (●), preferred (⦿), and optional (○) at BaltimoreLink bus stops.

Table 22: Bus Stop Features Hierarchy

Feature	Tier I Off-Street Transfer Center	Tier II On-Street Transfer Center	Tier III Frequent Network Stop	Tier IV Standard Bus Stop	Tier V Coverage Bus Stop
Signage					
Bus stop sign	●	●	●	●	●
Wayfinding blades	●	●	○	○	○
Accessible signage	○	○	○	○	○
Information box	○	○	○	○	○
Accessibility					
Boarding and alighting area	●	●	●	●	●
Path to/from stop	●	●	●	●	○*
Curb ramp at crossing	●	●*	●*	●*	○*
Detectable warning strips at crossing	●	●*	●*	●*	○*
Crosswalk at controlled intersection	●	●*	●*	○*	○*
Crosswalk with pedestrian refuge island	○	○*	○*	○*	○*
Safety and Security					
Lighting	●	●*	●*	●*	⦿*
Emergency call box	●	⦿	○*	○*	○*
Video surveillance	●	⦿	○	○	○
Amenities Provided by MDOT MTA					
Shelter	●	●	⦿	○	○
System map	●	●	⦿	○	○
Area map	●	⦿	○	○	○
Real-time information display	●	⦿	○	○	○
Fare machine	●	○	○	○	○
Covered bicycle rack	●	○	○	○	○
Public art	⦿	○	○	○	○
Amenities Not Provided by MDOT MTA					
Bench	○	○*	○*	○*	○*
Trash receptacle	○	○*	○*	○*	○*
Bicycle rack	○	○*	○*	○*	○*
Green infrastructure	○	○*	○*	○*	○*
Operational Enhancements					
Concrete bus pad (in-street)	●	●	⦿	○	○
Comfort station (for operators)	●	○	○	○	○

* MDOT MTA is not responsible for designing, installing, or maintaining these bus stop features.

RECOMMENDATIONS FOR STOP HIERARCHY

MDOT MTA describes five tiers of bus stops based on operational characteristics, from Tier I with the most amenities and features to Tier V with the least number of amenities.

Tier Level	Factors or Conditions Required for Tier	Amenity Summary
Tier V – Coverage Bus Stop	Provides basic level of access to transit in rural and suburban areas. Typically located on rural and suburban arterial roads.	A bus stop sign and accessible boarding and alighting area are required and all other features are optional.
Tier IV – Standard Bus Stop	Basic, on-street bus stops where buses arrive more than 15 minutes apart during the weekday AM peak, midday, and PM peak periods.	A bus stop sign, accessible boarding and alighting area, accessible crossings and lighting are required. All other features are optional.
Tier III – Frequent Network Stops	Provide access to the Frequent Transit Network, where buses arrive every 15 minutes or sooner between 7 AM and 7 PM on weekdays.	A crosswalk at a controlled intersection is required at Tier III Frequent Network Stops, in addition to all features required at Tier IV Standard Bus Stops. concrete bus pads, shelters, and system maps are preferred. Shelters are sited according to "Eligibility Scoring Criteria."
Tier II – On-Street Transfer Centers	Combines several on-street bus boarding and alighting areas arranged one after the other on the same block, creating an area where several buses can board and alight passengers at the same time	Emergency call boxes, video surveillance, area maps, and real-time information displays are preferred. All features required at Tier III Frequent Network Stops are also required.
Tier I – Off-Street Transfer Centers	Consists of an off-street bus loop served by several routes, often connected to a rail station to enable passengers to transfer between routes and modes quickly and efficiently.	Fare machines, covered bicycle racks, and operator comfort stations are required. All features required at Tier I Off-Street Transfer Centers are also required.

CLASSIFICATION METHODOLOGY

According to the BaltimoreLink Bus Stop Design Guide, stops are classified into amenity tier hierarchies based on 1) the level of service provided at the stop during the core of the weekday (frequent vs non-frequent) and 2) the stops location in rural, suburban or urban areas as well as along major/arterial streets versus neighborhood/local streets. Additional configurations for bus stop placement are described based on whether on-street parking is present, if a bus bulb can be built, if bike lanes are present, or if it is an "on-street transfer center."

Since MDOT MTA does not fund, install, or maintain benches and trash receptacles, the BaltimoreLink Bus Stop Design Guide does not address how those amenities should be allocated. MDOT MTA does provide shelters and has outlined specific scoring methodology to determine whether a bus stop is eligible for a shelter. Measured by the following criteria, bus stops must score a minimum of 100 points to be eligible for a new shelter:

- How many people are waiting?
  - Boardings – 1 point per average weekday boarding
- How long are people waiting? (up to 25 points)
  - Transfers – 15 points if the stop is located at a named place labeled on the official BaltimoreLink system map
  - Frequency – 10 points if the stop is outside of the Frequent Transit Network (less than four buses per hour serve the stop during the weekday AM peak, midday, and PM peak periods)
- Who is waiting? (up to 50 points)
  - Title VI – 25 points if the stop is in a predominantly minority area, low income area, or both (as defined by the FTA and measured at the Census block group-level)
  - Human services facilities – 15 points if one or more of the following are within 750 feet of the stop:

assisted living facility, dialysis center, hospital, pharmacy/clinic, public library, public school, recreation center, senior center, or supermarket

- Operator Reliefs – 10 points if the stop is used by MDOT MTA operators as a relief point

FIGURE 10: EXAMPLE SHELTER SCORING FOR A BUS STOP USING THE BALTIMORELINK SHELTER ELIGIBILITY CRITERIA

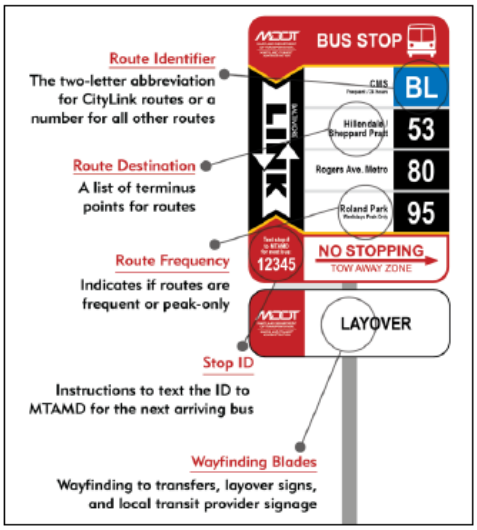
Stop #12302 North Ave & Howard St EB FS		
Criteria	**Value**	**Points**
Boardings	118 average daily boardings	118
Transfers	CityLink Gold to LocalLink 51 and 94	15
Frequency	14 buses per hour	0
Title VI	Both predominantly minority and low-income area	25
Human services facilities	Supermarket, pharmacy within 750 feet	15
Operator relief	Not an operator relief point	0
Total		**173**

SIGNAGE AND WAYFINDING CONSIDERATIONS

The BaltimoreLink Bus Stop Design Guide notes several wayfinding amenities, including:

- Bus stop signs with route and frequency information
- Regulatory signs such as “No stopping” and “No parking”
- Information Boxes containing schedules, maps, and/or other public announcements
- Realtime displays showing arrivals
- System maps
- Neighborhood or area maps
- Other wayfinding blade signs

FIGURE 11: EXAMPLE SIGNAGE FROM BALTIMORELINK BUS STOP DESIGN GUIDE



COMMUNITY COLLABORATION GUIDANCE

MDOT MTA notes in the BaltimoreLink Bus Stop Design Guide that public art is occasionally commissioned to enhances the "qualities of a place, generating more local activity and feeding a virtuous cycle of urban densification that increases transit ridership." However, MDOT MTA only provides a few guidelines for public art:

- Public art installations must not interfere with accessibility at bus stops and transfer stations.
- MDOT MTA may issue requests for proposals for public art with requirements that address unique site contexts or review unsolicited requests on a case-by-case basis.

FIGURE 12: EXAMPLE OF PUBLIC ART AT A BUS STOP IN BALTIMORE

An Adopt-A-Stop program is also outlined in the guide. A local business or neighborhood group can adopt a bus stop by agreeing to maintain the stop and report vandalism and dumping. Adopt-A-Stop participants receive a recognition blade, with their group's name, attached to the bus stop sign pole.

APPLICABLE LESSONS FOR SORTA

- Amenity hierarchies can be driven by service levels and roadway context, while specific amenity allocations can be determined by formulaic criteria.
- Configurations for placement can be independent of amenity classifications and instead based on presence/absent of things such as bike lanes or parking, and the location of the stop relative to the intersection.
- Stop placement should also consider operations of the bus routes serving the stop (e.g. stops should be X feet from the intersection if a left turn on the bus route alignment is imminent).
- Programs with basic guidelines can allow the public and community to collaborate on bus stop design and maintenance.

COTA (COLUMBUS, OH)

Transit Stop Design Guide

The Central Ohio Transit Authority (COTA) undertook a bus network redesign in 2017, which included new signs at all bus stops. COTA has since prepared a design guide to reinforce the principles established in the bus network redesign.

ROADWAY AND TRANSIT VEHICLE CONSIDERATIONS

In Section 5 (Roadway Design) of the design guide COTA defines the following:

- Dimensions, turning radii, and necessary clearances for all variations of COTA buses.
- Minimum lane widths and intersection curb radii to effectively accommodate buses.
- Dimensions for deceleration/acceleration, pull-in/pull-out, and landing zones for nearside, farside, and midblock stops.

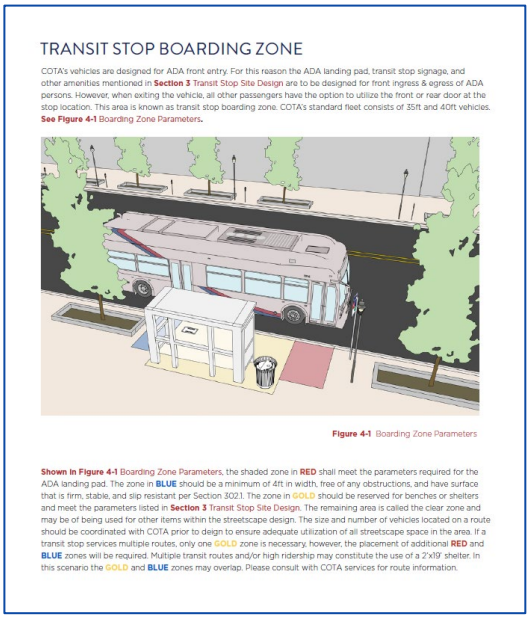


FIGURE 13: ILLUSTRATION SPECIFYING THE CLEARANCES AROUND AMENITIES AT COTA BUS STOPS

ESSENTIAL AND ENHANCED FACILITY CONSIDERATIONS

Section 3 (Transit Stop Site Design) in the guide defines the dimensions, clearances, and positions for the ADA landing pad, benches, shelters, trash cans, lighting, and other amenities. However, the guide does not sort these into a typology hierarchy to establish a minimum and tiered level of accommodations.

SIGNAGE AND WAYFINDING CONSIDERATIONS

COTA illustrates unranked sign types and applications in the appendix: notably, signs are offset and double-sided *so they are visible on approach from both sides*. COTA provides more detailed maps at some transfer stops (see page 16 in the link above), but the effort to maintain these may be significant.

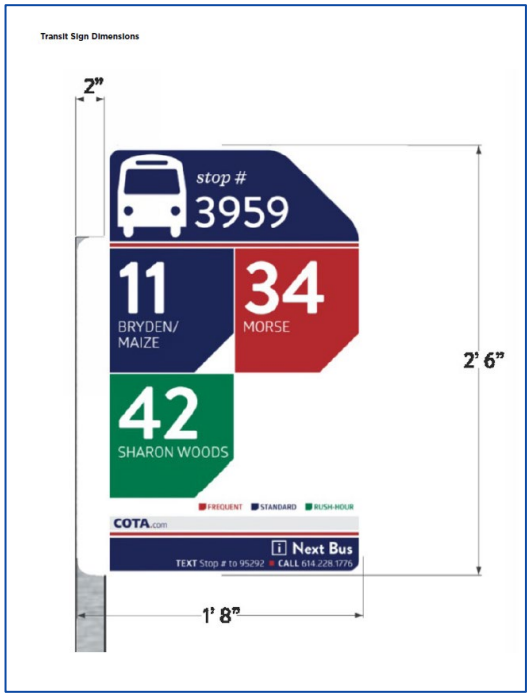


FIGURE 14: A THOROUGH APPENDIX INCLUDES SPECIFICATIONS FOR SIGNS AND SHELTERS

COMMUNITY COLLABORATION GUIDANCE

While the guide does not outline a *process* for engaging the community, it does discuss two engagement programs in Section 6: the *COTA Loves Art Program* allows communities to contribute to the beautification of stops and shelters, and the *Transit Amenity Contribution Program* allows communities to contribute funds toward stop amenities.

APPLICABLE LESSONS FOR SORTA

- It is difficult to determine how/where the amenities in Sections 3 and 4 should be applied in a logical way. For SORTA, establishing a clearer decision tree for amenities would clarify what is and isn't possible depending on context.
- As COTA did, it will be important for SORTA to define space for micromobility (scooters and e-bikes) at bus stops.
- COTA's signs (there also are some supplemental toppers) accommodate frequency-coded square decals containing route destinations, which are replaced for service changes as needed. SORTA may find a modular decal similarly useful.

METRO TRANSIT (MINNEAPOLIS, MN)

Bus Stop Design and Bus Stop Information Guidelines

Metro Transit separates guidelines into two documents, one covering stop design and the other covering stop information. A helpful website provides an overview.

ROADWAY AND TRANSIT VEHICLE CONSIDERATIONS

Clear diagrams of nearside, farside, midblock, and other bus stop configurations are paired with discussions on the advantages and disadvantages of each configuration, which is not typically included in design guides.

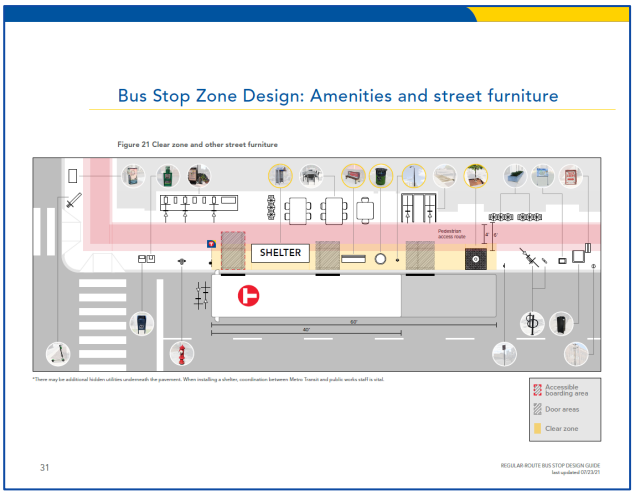


FIGURE 15: METRO TRANSIT CLEARLY DEFINES THE CLEAR ZONE (IN RED) FOR OTHER SIDEWALK USES AND STREET FURNITURE

ESSENTIAL AND ENHANCED FACILITY CONSIDERATIONS

While the guide illustrates where amenities can be positioned on the sidewalk relative to the position of the boarding/alighting spaces and shelter (see above) there is no detailed amenity prioritization for different bus stops as there is for signage below, save for bus shelters.

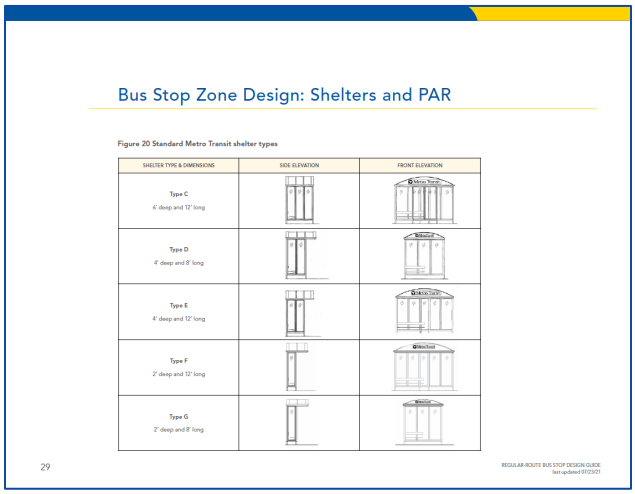


FIGURE 16: METRO TRANSIT USES SHELTERS OF VARYING WIDTH DEPENDING ON AVAILABLE SIDEWALK SPACE

SIGNAGE AND WAYFINDING CONSIDERATIONS

As shown on page 27 in the second link above, Metro Transit has five tiers of signage at bus stops, ranging from a single-piece, decal-based, single-sided sign with route numbers (no destinations or frequency coding) to full arrays with system maps and schedules at transit centers.

COMMUNITY COLLABORATION GUIDANCE

While Metro Transit undertook a *Better Bus Stops* community engagement campaign to develop the recommendations in these guides, the guides themselves do not provide guidance on continuing engagement.

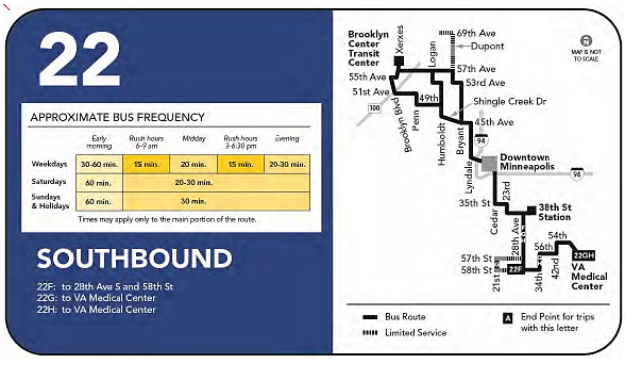


FIGURE 17: TIER 2 BUS STOPS RECEIVE MORE DETAILED ROUTE INFORMATION PLATES IN ADDITION TO STANDARD SIGNS

APPLICABLE LESSONS FOR SORTA

- As Metro Transit did, establishing a clear hierarchy of shelter widths will be critical given the variability in Cincinnati's sidewalk space. It will be less important to pick a certain style/appearance per se than it will be to develop a flexible design that can scale to different sizes while maintaining a uniform appearance.
- Metro Transit introduces service-change-sensitive route information (see right) at a surprisingly low tier of bus stop (Tier 2), which may be difficult to scale up and maintain. However, this does eliminate the need to update the primary bus stop signs since route-specific plates can be removed and replaced independently.

TRANSLINK (VANCOUVER, BC)

Bus Infrastructure Design Guidelines, Transit Passenger Facility Design Guidelines, and Wayfinding Standards Manual

TransLink outlines design recommendations for bus facilities, general transit facilities, and wayfinding across three documents.

ROADWAY AND TRANSIT VEHICLE CONSIDERATIONS

TransLink's bus infrastructure design guide is unusually thorough in that, in addition to illustrating common bus stop placements, it addresses bus bays, island bus stops, clusters of bus stops comprising transfer points, other specialized stop configurations, and clearance requirements for both diesel buses and trolleybuses.

ESSENTIAL AND ENHANCED FACILITY CONSIDERATIONS

While Section 3.5 in the bus infrastructure design guidelines describes passenger amenities, it does not sort these specifications or amenities into a clear typology hierarchy to establish a minimum and tiered level of accommodations. For example, shelters are recommended 'wherever possible' and criteria such as 'major transfer points' remain generalized.

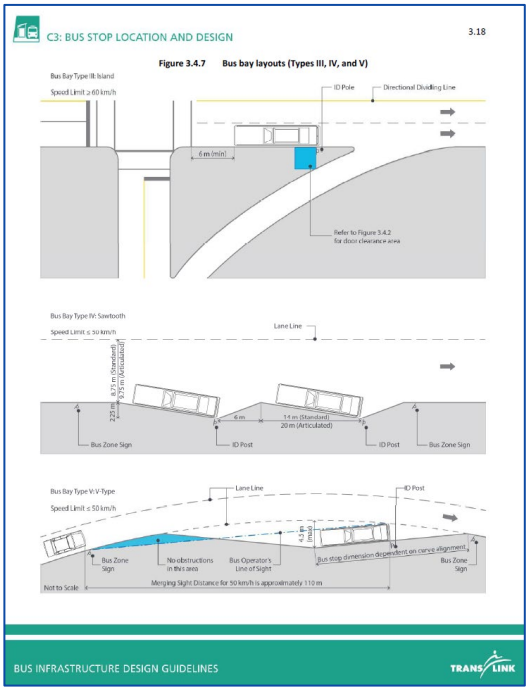


FIGURE 18: TRANSLINK PROVIDES DESIGN RECOMMENDATIONS FOR VARIOUS ON-ROAD AND OFF-ROAD STOP CONFIGURATIONS

SIGNAGE AND WAYFINDING CONSIDERATIONS

TransLink uses a uniform sign design at all bus stops, but the offset, double-sided sign provides destination and frequency information that needs to be updated for each service change.

COMMUNITY COLLABORATION GUIDANCE

The *Passenger Facility Design Guidelines* (second link above) integrates engagement throughout the design process, as seen in Sections 2.2. The guidelines are driven by an evaluation framework (Section 4.2) with points such as "Have local community and stakeholder needs been considered and understood?"

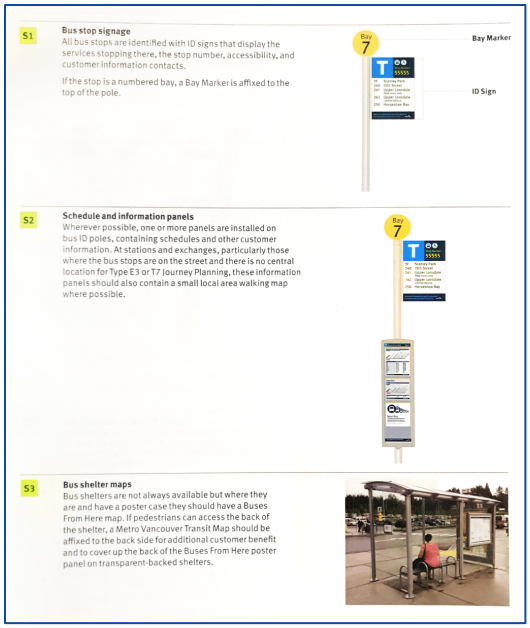


FIGURE 19: A UNIFORM SIGN DESIGN IS USED FOR ALL STOPS, BUT TRANSFER STOPS CONTAIN ADDITIONAL "INFO BOXES" AND TRANSIT CENTERS CONTAIN COMPLEX "ROUTES FROM HERE" MAPS

APPLICABLE LESSONS FOR SORTA

- While SORTA likely has a narrower range of specialty bus stop configurations than TransLink, it may be worthwhile prototyping some of these, as well as showing a prototypical *Reinventing Metro* transit center configuration.
- If SORTA desires a level of detail similar to that provided on TransLink's bus stop signs, info boxes, and shelter maps, a dedicated long-term wayfinding team would need to be established to handle *design updates* and *maintenance.*
- TransLink's transit passenger facility design guidelines offer a very public-friendly, high-level introduction to good facility design, while the bus infrastructure design guidelines are more difficult to understand. SORTA could explore a middle-of-the-road approach by describing technical details in simpler, straightforward language.

SUMMARY OF FINDINGS

Synthesis of Applicable Lessons for SORTA

While there is considerable variability in the content and technical detail in the case studies researched above, they offer similar lessons for SORTA:

ROADWAY AND TRANSIT VEHICLE CONSIDERATIONS

- Any design guide should discuss roadway and transit vehicle clearances and limitations at the beginning, since these constraints will all dictate bus stop configurations, passenger amenities, and signage and wayfinding.
- The NACTO Transit Street Design Guide provides a comprehensive accounting of most (if not all) types of roadway and operational contexts that SORTA may need to use, including graphic depictions of each. This guide may be used as the basis for bus stop design recommendations including bus stop layout and amenity considerations for all stops.

ESSENTIAL FACILITY CONSIDERATIONS

- As Metro Transit did, establishing a clear hierarchy of shelter widths will be critical given the variability in Cincinnati's sidewalk space. It will be less important to pick a certain style/appearance per se than it will be to develop a flexible design that can scale to different sizes while maintaining a uniform appearance.
- The NACTO Transit Street Design Guide and TRB TCRP 152 both provide important considerations for ensuring ADA accessibility of bus stops and facilities that can be incorporated into SORTA's bus stop design guidelines.

ENHANCED FACILITY CONSIDERATIONS

- Most of the case study agencies (with the exception of MDOT MTA) were surprisingly vague in identifying which passenger amenities to provide at bus stops, though the necessary clearances and dimensions were usually provided. When establishing bus stop typologies and hierarchies, SORTA can be more rigorous in defining which amenities should be provided at different bus stops. TRB TCRP 152 includes useful information about factors surveyed agencies have included for prioritizing improvements in their bus stop improvement programs.
    - Most of the case study agencies did, however, acknowledge the need to accommodate new micromobility options (scooters and e-bikes) at bus stops. When establishing its own bus stop typologies and hierarchies, SORTA should include micromobility accommodations.

COMMUNITY COLLABORATION GUIDANCE

- TransLink's *Passenger Facility Design Guidelines* offer the most thorough integration of community engagement into the design process, using an evaluation framework to ensure community input at several stages in the design process. This framework is worth adapting for SORTA's design guidelines, perhaps with some simplification.
- TRB TCRP 152 report includes some useful general descriptions of outreach strategies used by other transit agencies surrounding bus stop improvement programs, including ideas of ways to reach key stakeholders throughout the process.

SIGNAGE AND WAYFINDING CONSIDERATIONS

- The basic level of information provided at each bus stop varies widely among case studies, reflecting the challenges many agencies face in keeping bus stop information up-to-date.
    - Some case study agencies, such as Metro Transit, provide detailed route information at lower-level stop typologies, which may be challenging to maintain. TransLink is likewise ambitious in the amount of information it provides at bus stops. Any desire to provide a similar level of information would need to be accompanied by a discussion on *who* would design the information and *how* it would be updated and maintained.
- The NACTO Transit Street Design Guide includes some discussion of how to keep signage and wayfinding elements ADA accessible that can be incorporated into SORTA's bus stop design standards.

- Notably, three case study agencies (MDOT MTA, COTA, and Metro Transit) use decals to update their primary bus stop signs, while TransLink does not appear to do so. SORTA may need to employ a similar approach to update its bus stop signs for service changes, so it may be worth exploring a flexible, modular decal design.

The considerations and best practices summarized above will serve as discussion starting points for the bus stop workshop (Task 1.3) as well as guide Tasks 1.4 (developing amenity hierarchy, classification methodology, and typologies) and 1.5 (classifying bus stops and assigning typologies).

Appendix B: Bus Stop Classification, Improvement, and Prioritization

SORTA Bus Stop Evaluation and Design

March 2023

Prepared for:

go•METRO

Prepared by:

FOURSQUARE ITP

CONTENTS

FIGURES

TABLES

1. INTRODUCTION

The Southwest Ohio Regional Transit Authority (SORTA) provides public transit services for Cincinnati and its surrounding Ohio suburbs. SORTA offers fixed-route services through METRO and demand-responsive services to a population of over 700,000. As of the end of 2021, METRO had operated for over 50 million passenger miles with over 9 million trips. SORTA currently operates 47 bus routes, with 3,747 active bus stops and 1,052 inactive bus stops.

SORTA recognizes the importance of bus stops as a customer's first impression of the transit system. The purpose of this study is to create a plan for improving bus stop in the system by gathering existing bus stop data, analyzing existing conditions, classifying bus stops into tiers and typologies based on their operational features, setting expectations for amenities by tiers, making recommendations, and prioritizing amenity recommendations.

The step in this study involves generating a comprehensive bus stop database by collecting multiple data sources available within the agencies or in public records. This memo covers the following topics to provide background information on the bus stop database:

- Bus Stop Tier Classification Methodology
- Amenity Improvement Summary
- Improvement Prioritization Methodology
- Appendix – Data Sources

2. BUS STOP TIER CLASSIFICATION METHODOLOGY

Data Sources & Weighting

To create the initial database, the project team combined existing bus stop data provided by SORTA with service data extracted from SORTA's December 2022 GTFS feed and demographic data about the areas surrounding each stop calculated from American Community Survey (ACS) 5-year Estimate tables for 2017-2021 and Longitudinal Employer-Household Dynamics (LEHD) data for 2018 from the US Census.

The study team divided the database into two types of data: **driving data**, which is data used to define a bus stop's tier and typology, and **descriptive data**, which represents a characteristic associated with the bus stop. For example, the number of routes served by a stop will define if a stop is active, so it's a driving data; however, how many shelters available at a stop would only describe what a stop look like, but not contributing to defining if this bus stop has high demand, so it's a descriptive data.

For the purposes of this study, six key driving data points were selected to define the tier of a stop. The categories name, descriptions, and the weighting of each category are shown in Table 1.

TABLE 1 TIER CALCULATION FIELDS AND WEIGHTING

Category Name	Description	Weighting
Avg_Wkdy_Ridership_On	**Average Weekday Ridership** (in boardings) for each bus stop, based on the maximum between monthly ridership data for September 2022 and January 2023, provided by SORTA.	30%
No_Rt_Served	**Number of Routes Served**. The number of routes serving the stop, calculated from December 2022 GTFS data.	10%
No.of Trips Per Peak Hour Served	**Number of Route Served**. The peak number of trips per hour serving the stop during the AM Peak period, calculated from December 2022 GTFS data.	25%
Overall Population + Job per Acre	**Overall Population per Acre + Jobs per Acre.** The total number of jobs and residents per acre within ½-mile of each bus stop, calculated from ACS and LEHD data.	15%
PovAcre	**Poverty Population per Acre**. The number of residents per acre living below 150% of the federal poverty line within ½-mile of each bus stop, calculated from ACS demographic data.	10%
DisabiAcre	**Disability Population per Acre**. The number of disabled residents per acre within ½-mile of each bus stop, calculated from ACS demographic data.	10%
Total		**100%**

Initial thresholds for each tier by category were determined using the natural break (Jenks) method and were subsequently modified using professional judgement. Selected thresholds are shown below in Table 2.

TABLE 2 BREAKDOWN OF EACH CATEGORY – ACTIVE STOPS ONLY

Average Weekday Boardings				
Low End	High End	**Tier Type**	**Value Breakdown**	**% Breakdown**
0	5	T5	2,428	65%
5	25	T4	912	24%
25	150	T3	371	10%
150		T1/T2	36	1%
25	150	T PnR /T BRT		
Number of Bus Routes Serving the Stop				
Low End	High End	**Tier Type**	**Value Breakdown**	**% Breakdown**
0	1	T5	2,496	67%
1	3	T4	1,145	31%
3	6	T3	89	2%
6		T1/T2	17	0%
Peak Number of Trips per Hour Serving the Stop				
Low End	High End	**Tier Type**	**Value Breakdown**	**% Breakdown**
0	4	T5	2,833	78%
4	8	T4/T5	659	18%
8	12	T3/T4	122	3%
12		T1/T2	28	1%
Population + Jobs per Acre				
Low End	High End	**Tier Type**	**Value Breakdown**	**% Breakdown**
0	10	T5	2,170	58%
10	20	T4/T5	1,107	30%
20	60	T4	327	9%
60		T1/T2/T3	143	4%
Poverty per Acre				
Low End	High End	**Tier Type**	**Value Breakdown**	**% Breakdown**
0	1	T5	1,632	44%
1		T1/T2/T3/T4	2,115	56%
Disability per Acre				
Low End	High End	**Tier Type**	**Value Breakdown**	**% Breakdown**
0	0.5	T5	1,620	43%
0.5		T1/T2/T3/T4	2,127	57%

Tier Classification Methodology

The tier classification is made for each bus stop using a two-step process. An initial round of tier classification is made based on how many times it was categorized under one specific tier and the relative weight of each category, and a secondary round of reclassification is performed based on a stop's overall ridership and whether it is located at a Park and Ride or served by a BRT route. No BRT routes were yet in service at the time of this study, however the category is included within this methodology in anticipation of future BRT implementation.

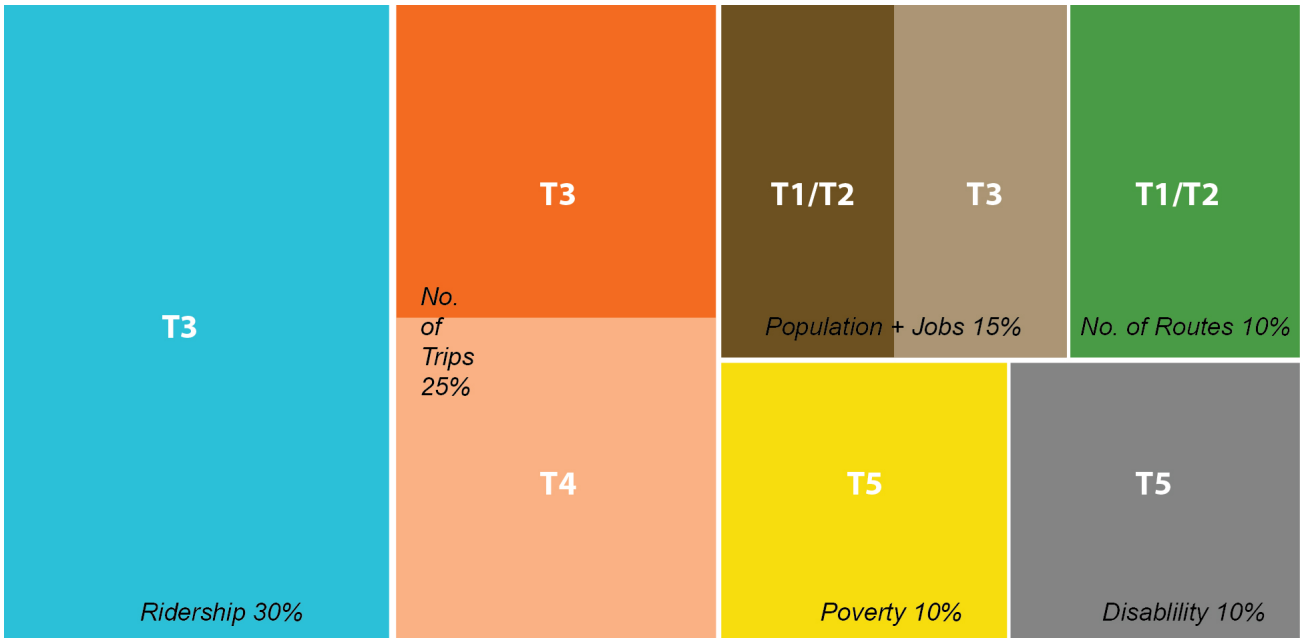
For the initial classification, all stops are classified into one or multiple tiers for each of the six key categories based on the selected thresholds. The stop is assigned a tier value for each category depending on where it falls in relationship to the selected thresholds and the category's assigned weight. The weights for each possible tier assignment are added up, and the stop is assigned to the tier with the highest overall weight.

Classification for an example bus stop is shown below in Table 3, based on category breakdowns shown in Table 2. In the below example, the stop is assigned to an initial classification of Tier 3. The initial categorization for the same example stop is shown graphically in Figure 1.

TABLE 3 EXAMPLE TIER CACLUALATION – STEP 1

Category	Value (Tier)	Weight	T1/T2	T3	T4	T5
Avg_Wkdy_Ridership_On Only	100 (T3)	30%		30%		
No_Rt_Served	6 (T1/T2)	10%	10%			
No.of Trips Per Peak Hour Served	9 (T3/T4)	25%		12.5%	12.5%	
Overall Population + Job per Acre	75 (T1/T2/T3)	15%	7.5%	7.5%		
PovAcre	0.56 (T5)	10%				10%
DisabiAcre	0.21 (T5)	10%				10%
Overall Score			17.5%	50%	12.5%	20%

FIGURE 1 EXAMPLE TIER CACLUALATION – STEP 1 IN GRAPHICAL



In the secondary classification step, stops are reassigned to higher tiers if they meet certain criteria based on ridership and service characteristics. This step ensures that particularly high ridership stops and stops with park and ride lots or BRT service are assigned into the proper categories.

- All stops with an average daily weekday ridership greater than 300 are automatically assigned Tier 1/2 status.
- If a stop is located at a park and ride location and has an average daily weekday ridership greater than 30 (but less than 300), it is automatically assigned to Tier PnR.
- If a stop is served by a BRT route then it is automatically classified as Tier BRT.[1]

Results

The total number and percentage of stops assigned to each tier based on this methodology is shown in Table 4.

TABLE 4 TIER CALCUALTION SUMMARY

Tiers	Count of Tier	%	Active	Inactive
Tier 1/2	44	1%	43	1
Tier 3	161	3%	161	0
Tier 4	945	20%	935	10
Tier 5	3,641	76%	2,600	1,041
Tier PnR	8	0%	8	0
Tier BRT	0	0%	0	0
	4,799	100%	3,747	1,052
Total	44	1%	43	1

[1] The BRT category does not include stops currently served by MetroPlus routes. No stops are currently classified in the BRT tier under this methodology as BRT service has not yet been implemented. This category was included in preparation for future BRT implementation.

3. AMENITY IMPROVEMENT SUMMARY

Each bus stop has a recommended set of amenities based on its assigned tier in the amenity hierarchy. The expected amenities for bus stops of each tier are shown below in Table 5.

TABLE 5 EXPECTED AMENITIES FOR EACH TIER

Tier	211_ Stop_ Boarding Sign	212_ Stop_ Boarding Sign_ Pole	213_ Stop_ Front_ Sign	221_ Realtime Sign	310 ADA	311_ Concrete Bus_ Pad	312_Ped _ Pad	321_ Continuous _ Sidewalk	410_ Trash_ Container	420_ Bench	430_ Shelters	510_ Bikeshare Stations	520_ Bike racks
Tier 1/2	Yes	Yes	TRUE	Yes	ADA	TRUE	TRUE	Continuous	Yes	Yes	Yes	Yes	Yes
Tier 3	Yes	Yes	TRUE	Context-Dependent	ADA	TRUE	TRUE	Continuous	Yes	Yes	Yes	Yes	Context-Dependent
Tier 4	Yes	Yes	TRUE	No	ADA	TRUE	TRUE	Continuous	Yes	Yes	Context-Dependent	Context-Dependent	No
Tier 5	Yes	Yes	TRUE	No	ADA	TRUE	TRUE	Continuous	Context-Dependent	Context-Dependent	No	Context-Dependent	No
Tier PnR	Yes	Yes	TRUE	Context-Dependent	ADA	TRUE	TRUE	Continuous	Yes	Yes	Yes	Yes	Context-Dependent
Tier BRT	Yes	Yes	TRUE	Yes	ADA	TRUE	TRUE	Continuous	Yes	Yes	Yes	Yes	Context-Dependent

The gap between expected and existing amenities is calculated by comparing existing amenities (as identified in the database) with the expected amenities for its assigned tier. If the existing amenities at the bus stop meet or exceed the established standard for the stop's tier it is labeled as "Good", and if it does not meet the standard established for its tier it is labeled as "Needs Improvement". If the expected amenity is considered "Context-Dependent", the amenity is optional at this bus stop tier and is considered "Good" for purposes of this analysis. The summary is presented as Table 6.

TABLE 6 RATE OF BUS STOPS NEEDS IMPROVEMENT BY TIER – ACTIVE STOPS ONLY

Tier	211_ Stop_ Boarding Sign	212_ Stop_ Boarding Sign_ Pole	213_ Stop_ Front_ Sign	221_ Realtime Sign	310 ADA	311_ Concrete Bus_ Pad	312_Ped_ Pad	321_ Continuous_ Sidewalk	410_ Trash_ Container	420_ Bench	430_ Shelters	510_ Bikeshare Stations	520_ Bike racks
Tier 1/2 Needs Improvement Rate	**0%**	**0%**	**11%**	**75%**	**8%**	**78%**	**3%**	**0%**	**25%**	**31%**	**39%**	**30%**	**53%**
Good	36	36	32	9	33	8	35	36	27	25	22	30	20
Needs Improvement	0	0	4	27	3	28	1	0	9	11	14	13	23
Tier 3 Needs Improvement Rate	**1%**	**0%**	**14%**	**0%**	**23%**	**73%**	**5%**	**1%**	**35%**	**54%**	**80%**	**66%**	**0%**
Good	158	159	137	161	123	43	151	157	103	73	32	54	161
Needs Improvement	1	0	22	0	36	116	8	2	56	86	127	107	0
Tier 4 Needs Improvement Rate	**1%**	**1%**	**20%**	**0%**	**46%**	**87%**	**5%**	**3%**	**58%**	**78%**	**0%**	**0%**	**0%**
Good	903	906	735	935	499	118	869	887	388	202	935	935	935
Needs Improvement	13	10	181	0	417	798	47	29	528	714	0	0	0
Tier 5 Needs Improvement Rate	**4%**	**3%**	**47%**	**0%**	**73%**	**96%**	**21%**	**15%**	**0%**	**0%**	**0%**	**0%**	**0%**
Good	2,263	2,278	1,258	2,600	627	105	1,857	1,997	2,600	2,600	2,600	2,600	2,600
Needs Improvement	90	75	1,095	0	1,726	2,248	496	356	0	0	0	0	0
Tier PnR Needs Improvement Rate	**13%**	**13%**	**38%**	**0%**	**50%**	**88%**	**25%**	**13%**	**63%**	**50%**	**50%**	**100%**	**0%**
Good	7	7	5	8	4	1	6	7	3	4	4	0	8
Needs Improvement	1	1	3	0	4	7	2	1	5	4	4	8	0
Good Total	**3,367**	**3,386**	**2,167**	**3,713**	**1,286**	**275**	**2,918**	**3,084**	**3,121**	**2,904**	**3,593**	**3,619**	**3,724**
Needs Improvement Total	**105**	**86**	**1,305**	**27**	**2,186**	**3,197**	**554**	**388**	**598**	**815**	**145**	**128**	**23**
Overall Needs Improvement Rate	**3%**	**2%**	**38%**	**1%**	**63%**	**92%**	**16%**	**11%**	**16%**	**22%**	**4%**	**3%**	**1%**

Based on the overall summary, the amenities that most commonly fail to meet amenity tier standards are concrete bus pads, ADA compliance, and Stop Front Sign. Concrete bus pads are intended to protect against wear and tear on the street at bus stops and do not contribute significantly to a rider's experience – thus they are not considered a critical amenity. The ADA compliance field utilized historical record from a previous SORTA bus stop database, which may be outdated and not reflect current ADA accessibility at bus stops.

By ruling out the non-critical amenities, the amenities could contribute to the passenger experience that were found by this analysis to be commonly lacking at bus stops include stop front signs, bike racks, benches, trash containers, and concrete pedestrian pad.

4. IMPROVEMENT PRIORIZITATION METHODLOGY

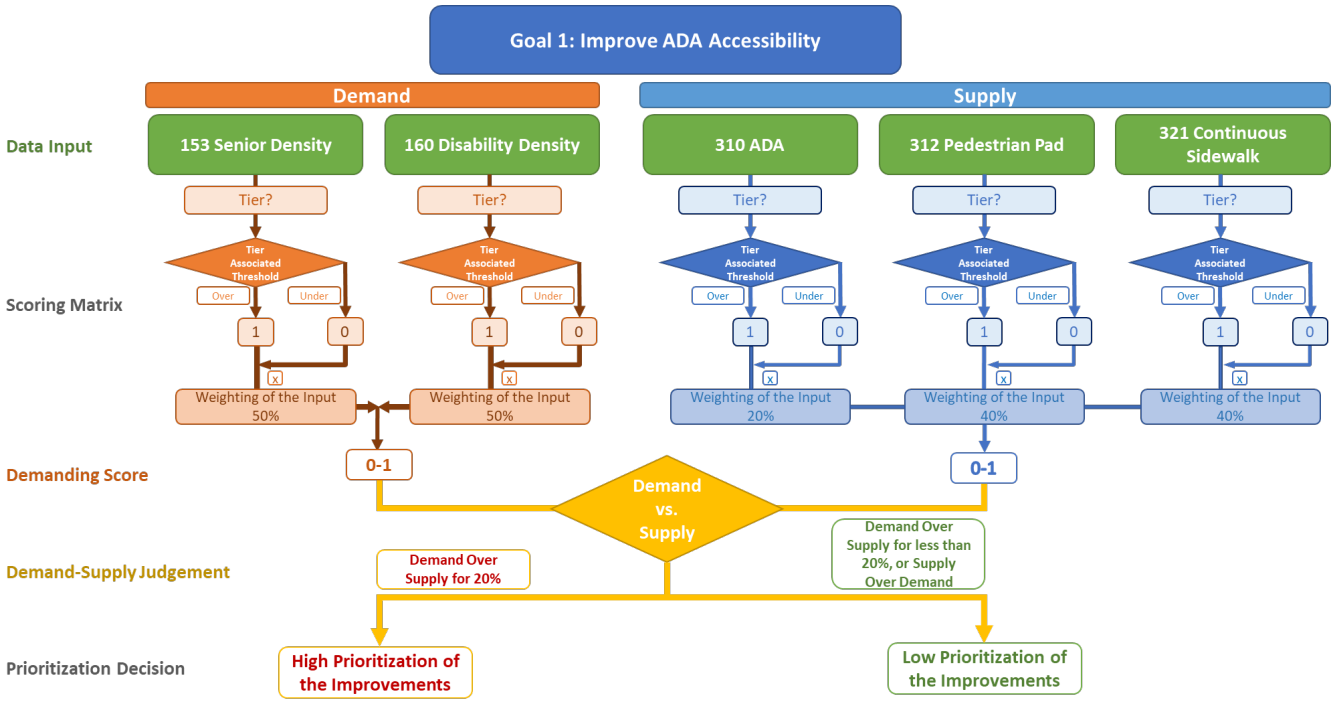
The purpose of this prioritization methodology is to provide SORTA and associated localities with a list of stops to be improved when funding for additional amenities becomes available, allowing the agency and its affiliates to direct funding for the most important amenities to stops serving areas demonstrating the highest need.

The prioritization strategy provides four separate prioritized lists based on different goals of the agency, each of which may be associated with separate funding streams. Four primary goals for prioritization of bus stop improvements in the SORTA region include:

- Improve ADA Accessibility
- Improve Equity
- Improve Bus Transfer Experience
- Improve Bike Accessibility

This study uses a demand-supply model to make the data-driven judgement of whether a bus stop improvement should be prioritized (modeled in Figure 2). Demographic characteristics of communities surround each bus stop are used to assess "demand" for amenities, representing the transit users' profiles and their potential need when using the bus network. The assessment of existing amenities for each stop as compared to recommended amenities is used to represent the "supply" of amenities. Prioritization is based on the difference between the score assigned to each stop for demand for amenities and the score assigned for supply of amenities associated within each goal. Stops with the greatest gap between demand and supply are considered high-priority for improvements related to that goal.

FIGURE 2 PRIORIRIZAITON DECISION MAKING DEMADN-SUPPLY METHODOLOGY – GOAL 1 EXAMPLE



The data used to calculate supply and demand and associated weights are summarized in Table 7.

TABLE 7 DEMAND-SUPPLY MODEL INPUTS AND WEIGHTING

	Demand		Supply						
Goal 1: Improve ADA Accessibility	153_SeniorAcre	160_DisabiAcre	310_ADA	312_Ped_Pad	321_Continuous_Sidewalk				
Weighting	*50%*	*50%*	*20%*	*40%*	*40%*				
Tier 1/2	0.8	0.8	Good	Good	Good				
Tier 3	0.9	0.9	Good	Good	Good				
Tier 4	1	1	Good	Good	Good				
Tier 5	1.2	1.2	Good	Good	Good				
Goal 2: Improve Equity	151_PovAcre	155_MinAcre	211_Stop_Boarding_Sign	212_Stop_Boarding_Sign_Pole	213_Stop_Front_Sign	221_Realtime_Sign	410_Trash_Container	420_Bench	430_Shelters
Weighting	*50%*	*50%*	*10%*	*10%*	*10%*	*20%*	*10%*	*20%*	*20%*
Tier 1/2	2.5	4	Good	Good	Good	Good	Good	Good	Good
Tier 3	2.5	4	Good	Good	Good	Good	Good	Good	Good
Tier 4	2.5	4	Good	Good	Good	Good	Good	Good	Good
Tier 5	2.5	4	Good	Good	Good	Good	Good	Good	Good
Goal 3: Improve Bus Transfer Experience	120_No._Routes_Served	130_No._Trips_per_Peakhour	211_Stop_Boarding_Sign	212_Stop_Boarding_Sign_Pole	213_Stop_Front_Sign	221_Realtime_Sign	410_Trash_Container	420_Bench	430_Shelters
Weighting	*70%*	*30%*	*10%*	*10%*	*10%*	*20%*	*10%*	*20%*	*20%*
Tier 1/2	3	8	Good	Good	Good	Good	Good	Good	Good
Tier 3	2	8	Good	Good	Good	Good	Good	Good	Good
Tier 4	2	4	Good	Good	Good	Good	Good	Good	Good
Tier 5	2	4	Good	Good	Good	Good	Good	Good	Good
Goal 4: Improve Bike Accessibility	152_NoCarAcre	154_YouthAcre	510_Bikeshare Stations	520_Bikeracks					
Weighting	*70%*	*30%*	*50%*	*50%*					
Tier 1/2	1.2	1.2	Good	Good					
Tier 3	1.2	1.2	Good	Good					
Tier 4	1	1	Good	Good					
Tier 5	1	1	Good	Good					

The count of stops identified for prioritization under each goal is presented in Table 8.

TABLE 8 COUNT OF BUS STOPS HAVE PRIORITIZATION OF IMPROVEMENTS – ACTIVE STOPS ONLY

	No	Yes	Prioritize Rate	Total Stops
Goal 1: Improve ADA Accessibility	**3,457**	**290**	**8%**	**3,747**
Tier 1/2	39	4	9%	43
Tier 3	153	8	5%	161
Tier 4	840	95	10%	935
Tier 5	2,418	182	7%	2,600
Goal 2: Improve Equity	**3,429**	**318**	**8%**	**3,747**
Tier 1/2	34	9	21%	43
Tier 3	121	40	25%	161
Tier 4	718	217	23%	935
Tier 5	2,549	51	2%	2,600
Goal 3: Improve Bus Transfer Experience	**3,413**	**334**	**9%**	**3,747**
Tier 1/2	41	2	5%	43
Tier 3	133	28	17%	161
Tier 4	687	248	27%	935
Tier 5	2,545	55	2%	2,600
Goal 4: Improve Bike Accessibility	**3,715**	**32**	**1%**	**3,747**
Tier 1/2	35	8	19%	43
Tier 3	138	23	14%	161
Tier 4	935	0	0%	935
Tier 5	2,600	0	0%	2,600

5. APPENDIX - DATA SOURCES

The data was collected primarily from the public available feed and the agency's inventory. A series of post-processing was performed by FITP to provide a more direct picture of each bus stop as summarized in Table 9.

TABLE 9 DATA SOURCE SUMMARY

Database Attribute Name	Data Description	Source	Analysis Performed
stop_code	Bus Stop Code	GTFS Feed November 28, 2022	NA
stop_id	Bus Stop ID	GTFS Feed November 28, 2022	NA
Stop_Name	Bus Stop Name	SORTA November 7, 2022 (all stops 2022.xlsx)	NA
Latitude	Bus Stop Location - Latitude	SORTA November 7, 2022 (all stops 2022.xlsx)	NA
Longitude	Bus Stop Location - Longitude	SORTA November 7, 2022 (all stops 2022.xlsx)	NA
Inactive?	Activate Status as of November 2022. False: It's Active. True: It's Inactive	GTFS Feed November 28, 2022; SORTA November 7, 2022 (all stops 2022.xlsx)	NA
New_Stop	If it's a new stop since November 2022. 0: It's an existing stop; 1: It's a new stop.	GTFS Feed November 28, 2022; GTFS Feed December, 2022; SORTA November 09, 2022 (December 2022 New Stops with Crossroads v2.xlsx)	The study team compared bus stops as of November 2022 to bus stops in December 2022 using GTFS feeds provided by SORTA. Stops appearing only in the December 2022 GTFS feed are considered new stops.
On_Street_Name	The street that the stop is on.	SORTA November 15, 2022 (InventoryWRidership_Shelters.xlsx)	NA
At_Street_Name	The nearest cross street to the stop	SORTA November 15, 2022 (InventoryWRidership_Shelters.xlsx)	NA
Side_of_Street	The side of the street that the bus stop is located	SORTA November 15, 2022 (InventoryWRidership_Shelters.xlsx)	NA
Routes_Served	List of routes that stop at the bus stop.	GTFS Feed November 28, 2022; GTFS Feed December, 2022	NA
Route_Type	The types of routes served by the stop. Six types in total: Local; Commuter, Core, Standard, Express, Shuttle.	SORTA February 6, 2023 (RouteClassification_v5.xlsx)	NA
Transfer Activity	Binary representing whether riders can access more than one route at	GTFS Feed November 28, 2022; GTFS Feed December, 2022	The bus stop is considered a transfer stop if it serve more than two routes

	the stop and potentially transfer between them.		
Park_and_Ride	Binary representing whether the stop is adjacent to a Park-and-Ride facility.	SORTA November 10, 2023 (Approved Planned Projects_v1.1.docx)	Stops within a ½-mile buffer of existing and proposed park-and-ride facilities are considered to be near a park-and-ride facility.
Is_BRT	Binary representing whether the stop is served by a BRT route.	NA	No BRT routes are yet in operation, but this field is included in anticipation of future BRT plans. Should be updated once BRT service is implemented.
Prop_Tier	Proposed Bus Stop Tier	NA	Calculated as shown in the Section 2 Bus Stop Tier Calculation portion of this memo.
100_Avg_Wkdy_Ridership	The boardings on a typical weekday.	SORTA September 2022 (Sept22_Ridership_v3.xlsx); SORTA January 2023 (Jan23Ridership.xlsx)	The maximum of average weekday boardings between data for September 2022 and January 2023 was used to ensure ridership data was present for all active stops while avoiding using lower January ridership (primarily due to seasonal factors) for all stops. Only boardings were considered for ridership, as riders alighting at a stop do not tend to make use of bus stop amenities.
111_Local_Routes_Served	Number of Local Routes served by the stop	GTFS Feed November 28, 2022; GTFS Feed December, 2022	NA
112_Metro_Plus_Routes_Served	Number of Metro+ routes served by the stop	GTFS Feed November 28, 2022; GTFS Feed December, 2022	NA
113_X_Series_Routes_Served	Number of X Series routes served by the stop	GTFS Feed November 28, 2022; GTFS Feed December, 2022	NA
120_No._Routes_Served	Number of all types of routes served by the stop	GTFS Feed November 28, 2022; GTFS Feed December, 2022	NA
130_No._Trips_per_Peakhour	During the AM Peak Period (7-10am), the number of buses stopping at the stop.	GTFS Feed November 28, 2022; GTFS Feed December, 2022	Generated using December 2022 GTFS from SORTA. 7-10am is considered as the AM Peak Period.
140_Population+Jbs	Population per acre plus jobs per acre within half mile of the stop to indicate the neighborhood transit attractivity and activity level.	American Community Survey (ACS) 2016-2020 5-Year Estimate, Longitudinal Employer-Household Dynamics (LEHD) 2018.	Calculated using ACS 5-year estimate data and LEHD data at the block group level. Each stop's service area is considered areas within ½-mile of the bus stop. Demographics for areas not fully within the stop's buffer were assigned proportionally to the stop based on the percentage of the block group's area falling within the buffered area.
151_PovAcre	Population in Households with Income Less than 150 Percent of Poverty Line per acre	American Community Survey (ACS) 2016-2020 5-Year Estimate,	See description for *140_Population+Jbs*

152_NoCarAcre	Zero-Car Households per acre	American Community Survey (ACS) 2016-2020 5-Year Estimate,	See description for *140_Population+Jbs*
153_SeniorAcre	Population 65 and older per acre	American Community Survey (ACS) 2016-2020 5-Year Estimate,	See description for *140_Population+Jbs*
154_YouthAcre	Population under 18 per acre	American Community Survey (ACS) 2016-2020 5-Year Estimate,	See description for *140_Population+Jbs*
155_MinAcre	Minority (non-white or Hispanic) population per acre	American Community Survey (ACS) 2016-2020 5-Year Estimate,	See description for *140_Population+Jbs*
160_DisabiAcre	Population with a disability per acre	American Community Survey (ACS) 2016-2020 5-Year Estimate,	See description for *140_Population+Jbs*
211_Stop_Boarding_Sign	If the bus stop contains a boarding sign	SORTA November 15, 2022 (InventoryWRidership_Shelters.xlsx)	NA
212_Stop_Boarding_Sign_Pole	If/whether the bus stop's boarding sign has its own pole, or shared with the others amenities.	SORTA November 15, 2022 (InventoryWRidership_Shelters.xlsx)	NA
213_Stop_Front_Sign	If the bus stop contains a front sign	SORTA November 15, 2022 (InventoryWRidership_Shelters.xlsx)	NA
221_Realtime_Sign	If the bus stop has a real-time digital board	SORTA November 15, 2022 (InventoryWRidership_Shelters.xlsx)	NA
310_ADA	If the stop is ADA compliance	SORTA November 15, 2022 (InventoryWRidership_Shelters.xlsx)	NA
311_Concrete_Bus_Pad	If the bus stop has a concrete bus landing pad embedded into the asphalt pavement.	SORTA November 15, 2022 (InventoryWRidership_Shelters.xlsx)	NA
312_Ped_Pad	If the bus stop has a concrete pedestrian boarding pad	SORTA November 15, 2022 (InventoryWRidership_Shelters.xlsx)	NA
321_Continuous_Sidewalk	If the bus stop located on a continuous sidewalk	SORTA November 15, 2022 (InventoryWRidership_Shelters.xlsx)	NA
410_Trash_Container	Number of trash containers adjacent to the bus stop	SORTA November 15, 2022 (InventoryWRidership_Shelters.xlsx)	NA
420_Bench	Number of benches adjacent to the bus stop	SORTA November 15, 2022 (InventoryWRidership_Shelters.xlsx)	NA
430_Shelters	Number of shelters adjacent to the bus stop: No Shelter, Single Shelter, Double Shelter	SORTA November 15, 2022 (InventoryWRidership_Shelters.xlsx)	NA
510_Bikeshare Stations	Number of bikeshare stations adjacent to the bus stop	SORTA November 7, 2022 (RedBikeStations_2020_Export)	NA
520_Bikeracks	Number of bike racks adjacent to the bus stop	SORTA November 7, 2022 (HamiltonCountyTrails&BikeLanes)	NA
Public Art	Public Art adjacent to the bus stop. NA for now.	NA	NA
Entrance Pylon	Public Art adjacent to the bus stop. Data NA for now.	NA	NA

Ticket Vending Machine	Public Art adjacent to the bus stop. Data NA for now.	NA	NA
Regulatory sign	Public Art adjacent to the bus stop. Data NA for now.	NA	NA
QR code sign	Public Art adjacent to the bus stop. Data NA for now.	NA	NA
Level Boarding Platform	Public Art adjacent to the bus stop. Data NA for now.	NA	NA
Lighting	Public Art adjacent to the bus stop. Data NA for now.	NA	NA
Emergency Call Box	Public Art adjacent to the bus stop. Data NA for now.	NA	NA
Video Surveillance	Public Art adjacent to the bus stop. Data NA for now.	NA	NA
Scooter Corral	Public Art adjacent to the bus stop. Data NA for now.	NA	NA
Carshare Parking (e.g. Zipcar)	Public Art adjacent to the bus stop. Data NA for now.	NA	NA
Taxi/Microtransit Pickup/Dropoff	Public Art adjacent to the bus stop. Data NA for now.	NA	NA
Kiss-and-Ride (general pickup/dropoff)	Public Art adjacent to the bus stop. Data NA for now.	NA	NA
Park-and-Ride (commuter parking)	Public Art adjacent to the bus stop. Data NA for now.	NA	NA
Concrete Bus Layover Strip	Public Art adjacent to the bus stop. Data NA for now.	NA	NA
Operator Restroom	Public Art adjacent to the bus stop. Data NA for now.	NA	NA
Stop_Type	Which side of the stop is located along the block: Far side, Near Side, or Mid-Block	SORTA November 15, 2022 (InventoryWRidership_Shelters.xlsx)	NA
Sidewalk_Median	If sidewalk median strip available of the bus stop.	SORTA November 15, 2022 (InventoryWRidership_Shelters.xlsx)	NA
Maximum_Total_Bus	The maximum number of buses scheduled to be at the stop at the same time during a normally scheduled weekday.	GTFS Feed November 28, 2022; GTFS Feed December 2022.	Calculated using December 2022 GTFS feed from SORTA

WITT INDUSTRIES
4600 N. MASON MONTGOMERY ROAD, MASON, OH 45040
PHONE 513-923-5800 • FAX 513-923-5801
Sales@Witt.com • www.Witt.com

Oakley Bench New Design

New Design Changes

1. In the current design, each slat is an individual piece of metal and is a continuous piece of metal from the top tube to the bottom tube of the body of the bench. In the new design, the body of the bench is one piece of metal and the slats are laser cut into the sheet of metal. The slats will have a break in them to create the durability in the body of the bench.
2. In the current design, the slats roll over the frame at the top and bottom of the body. In the new design, there is no roll over.

Product Features

- Arms and legs are constructed of 1 ¼" square steel tubing
- Legs have drilled tabs for anchoring
- Includes anchor kit to secure to ground
- Powder Coat outdoor finish
- Material is chemically prepared and zinc rich primed prior to paint

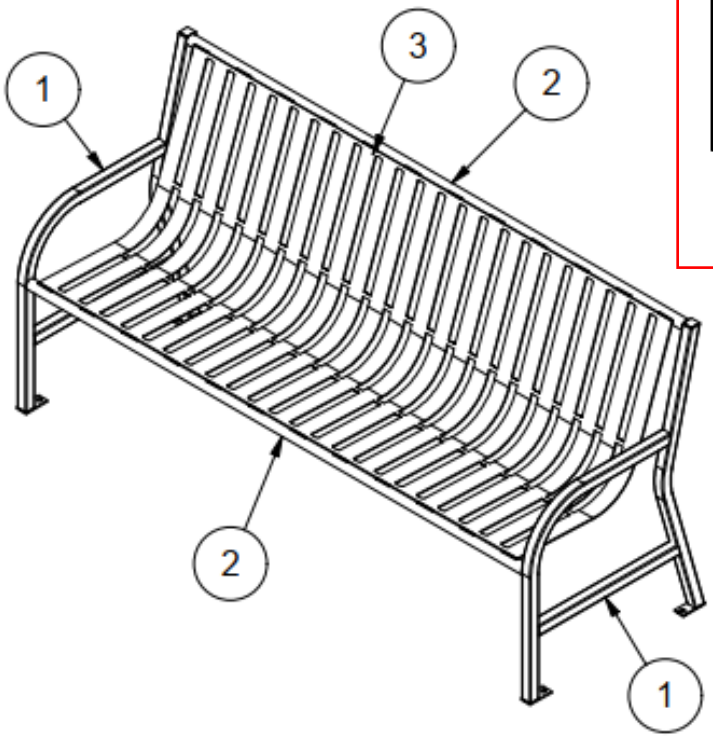
Dimensions	Weight
34 ¼" high x 72" wide	115 lbs.

10/13/22

Owner's Approval

Date:

☐ Approved As Submitted
☐ Approved As Noted
☐ Correct As Noted/ Return for Approval

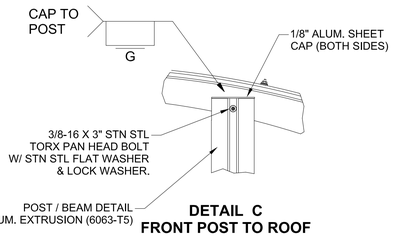


THIS DRAWING HAS BEEN GENERATED AND IS MAINTAINED BY A CAD SYSTEM. CHANGES SHALL ONLY BE INCORPORATED AS DIRECTED BY TOLAR MANUFACTURING CO., INC'S ENGINEERING DEPT.

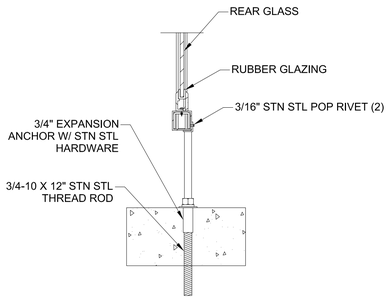
REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED

GENERAL NOTES:

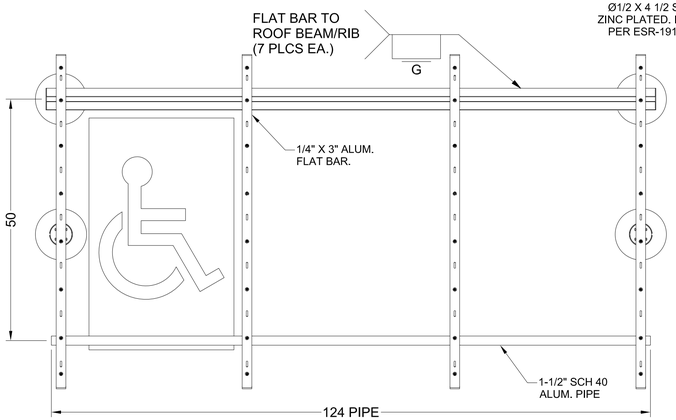
1. ALL STRUCTURAL STEEL, UNLESS OTHERWISE NOTED, SHALL BE ASTM A-36, MINIMUM YIELD STRENGTH 36,000 PSI.
2. ALL STRUCTURAL ALUMINUM MEMBERS, UNLESS OTHERWISE NOTED, SHALL BE OF ALLOY 6063-T5 OR GREATER.
3. ALL HOLES TO BE DRILLED OR PUNCHED.
4. STEEL WELDING SHALL CONFORM TO AMERICAN WELDING SOCIETY STANDARD D1. 1-10. ELECTRODES SHALL CONFORM TO AWS 5.1, CLASS E70S-5.
5. ALUMINUM WELDING SHALL CONFORM TO AMERICAN WELDING SOCIETY STANDARD D1. 2-08. ELECTRODES SHALL CONFORM TO AWS/SFA 5.10 CLASS ER4043.
6. ALL WELDING TO BE DONE AT TOLAR MANUFACTURING COMPANY, INC. FACILITY.
7. ALL CORPORATE PROCEDURES, INCLUDING FABRICATION, MUST BE IN COMPLIANCE WITH TOLAR MANUFACTURING CO. INC'S QUALITY CONTROL MANUAL.
8. MINIMUM 240 HOURS SLAB CURE TIME PRIOR TO ANCHOR INSTALLATION.



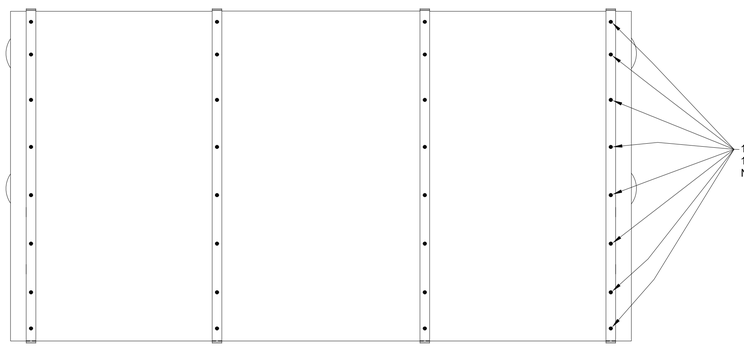
DETAIL C
FRONT POST TO ROOF CONNECTION DETAIL (2 PLCS)



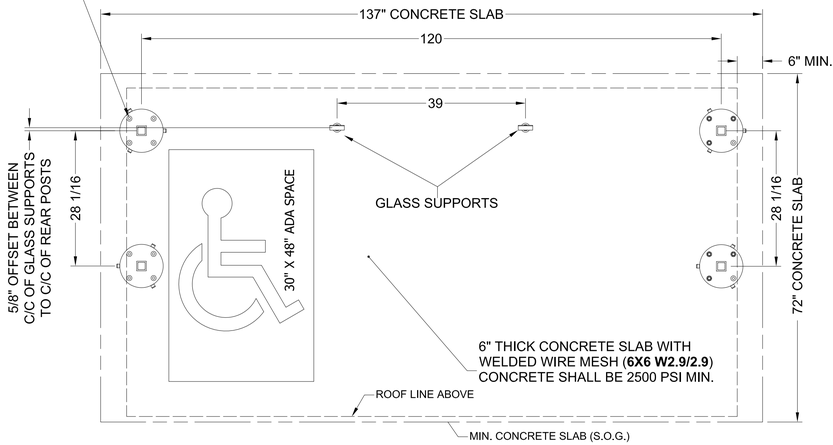
SECTION D-D
GLASS SUPPORT DETAIL



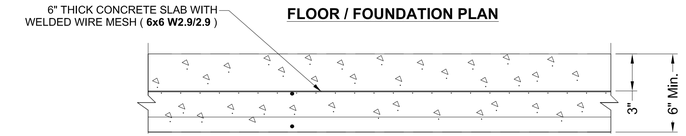
TOP VIEW
(SHOWN WITHOUT ROOF PANELS)



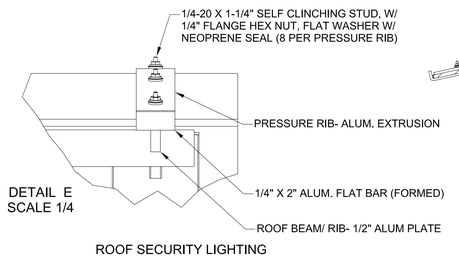
TOP ELEVATION



FLOOR / FOUNDATION PLAN

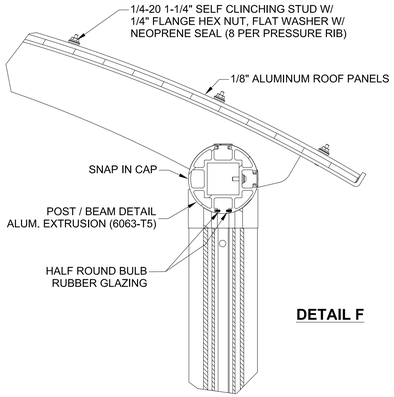


TYPICAL SLAB SECTION

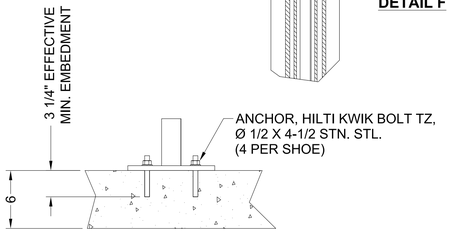


DETAIL E
SCALE 1/4

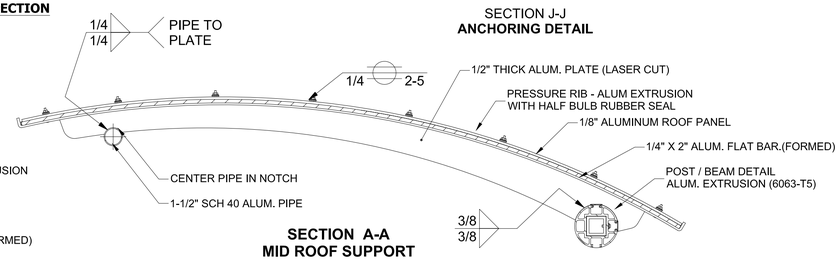
ROOF SECURITY LIGHTING



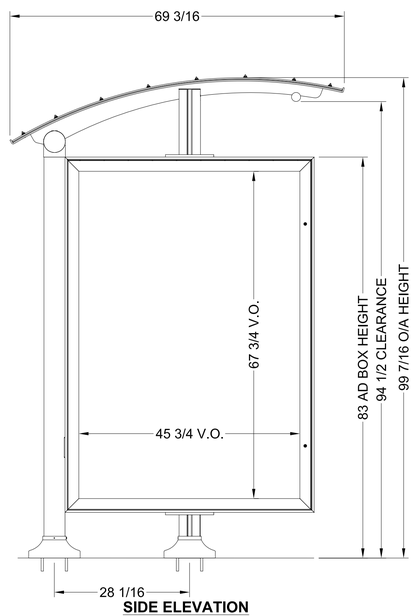
DETAIL F



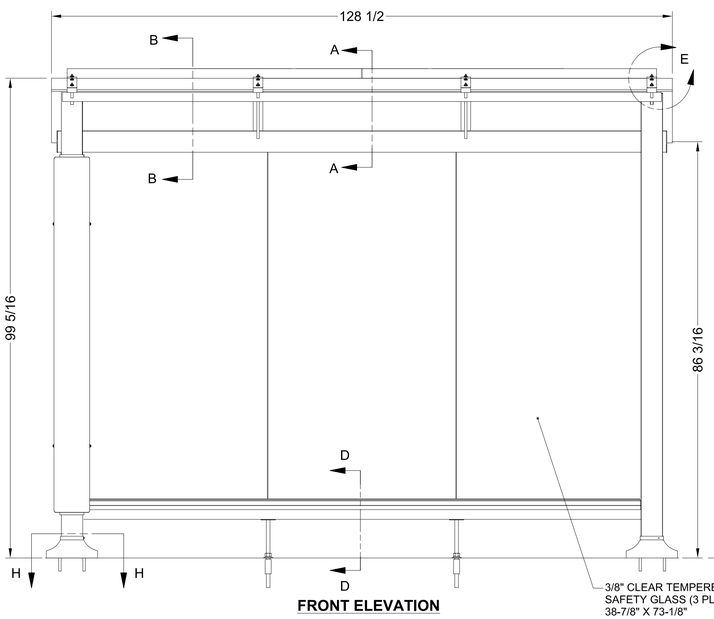
SECTION J-J
ANCHORING DETAIL



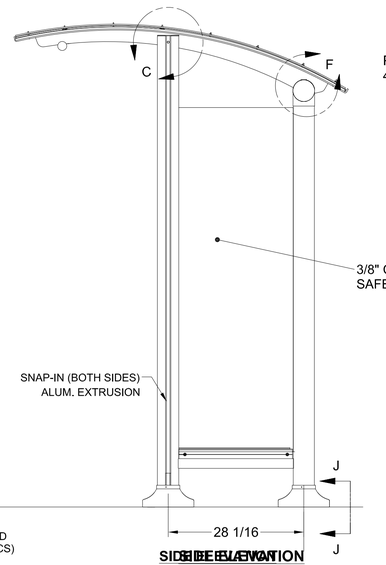
SECTION A-A
MID ROOF SUPPORT WELDMENT DETAIL (X2)



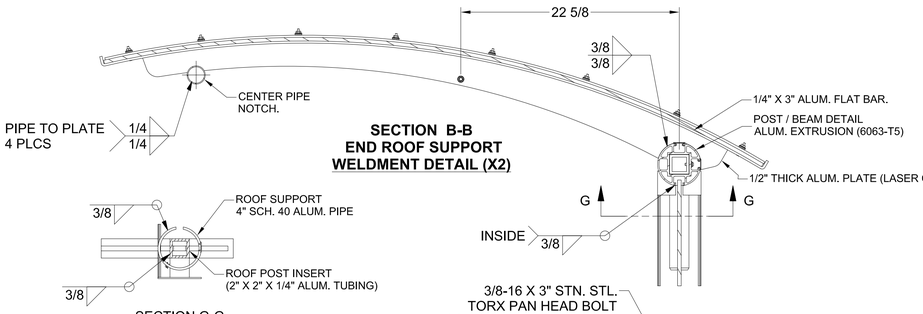
SIDE ELEVATION



FRONT ELEVATION

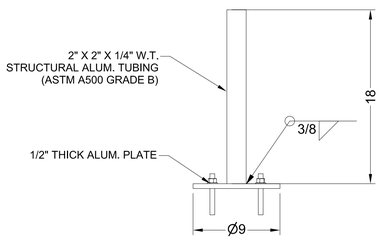


SIDE ELEVATION

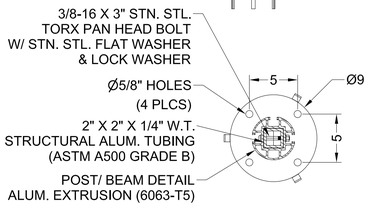


SECTION B-B
END ROOF SUPPORT WELDMENT DETAIL (X2)

SECTION G-G



SHOE WELDMENT DETAIL
(4 PLCS)



SECTION H-H
POST TO SHOE CONNECTION DETAIL

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES

TOLERANCES:
HOLES SIZE: ±1/32
X < 6": ±1/32
X > 6": ±1/16
ANGLES: ±1/2°

REMOVE ALL BURRS AND BREAK SHARP EDGES 1/64 MAX.

THIRD ANGLE PROJECTION

TOLAR — DURABILITY WITH DISTINCTION

Tolar Manufacturing Company, Inc
258 Mariah Circle, Corona, CA 92879

DESCRIPTION: 10' AD SUNSET SHELTER W/ GLASS WALLS

CUSTOMER/VENDOR: TOLAR STD.

SIZE	MATL.	DWG NO.	REV
D		29187-01	—

SCALE 1/16 | DATE 4/22/2020 | DRAWN BY: E. ROMERO

Public Right-of-Way Outdoor Furniture Design Guidelines
Authorized under C.M.C. Section 723-13, "Transit Stop Structures"
Approved by City Planning Commission on January 17, 2020

Street Furniture Included:

1. Transit Stop Benches
2. Transit Stop Shelters
3. Ticket Vending Machines
4. Streetcar Transit Stop Kiosks

Purpose of Design Guidelines

The purpose of these guidelines is to provide approved standards for the design of benches and bus/transit shelters in the public right of way. The guidelines provide description of general design characteristics including required physical dimensions, material, color, and style. The goal of these standards is to provide outdoor furniture throughout the city that is safe, consistent, and coordinated in its appearance and design, and that affords some flexibility for transit agencies to advertise at transit stops for additional operational revenue. Variance from these guidelines must be approved by the City's Director of Transportation and Engineering.

A. Transit Stop Bench Design Guidelines

Benches must meet the following guidelines:

1. Benches shall be constructed of painted or powder-coated metal, or other corrosion-resistant metal or composites. Benches may not be constructed in whole or in part of wood, non-metal composites, or other materials not indicated herein. Paint shall be applied in a manner that meets the manufacturer's standard for coating thickness and material type, and also for heavy wear. Vinyl coatings may not be applied in lieu of paint or powder-coatings.
2. Metal benches shall be black in color unless otherwise approved by the Director of Transportation and Engineering, which permission shall be requested through the Office of Architecture and Urban Design within the City's Department of Transportation and Engineering (DOTE).
3. Temporary benches may be accepted by the Director of Transportation and Engineering provided a Revocable Street Privilege (RSP) is applied for and approved which includes a fixed expiration date for temporary benches. The expiration date shall be no more than one year. After such time, or in the event temporary benches are deemed unsafe to the public or complaints from the public are made, the applicant is responsible to remove the temporary structure and repair or replace any damaged public right of way sidewalk.
4. Benches may be divided into individual seats through the use of armrest/divider assemblies, where the applicant demonstrates or the City has identified a need to deter sleeping and loitering, or may consist of a singular bench seat.
5. Benches may be as short as two (2) feet, but shall be no longer than eight (8) feet, no deeper than thirty (30) inches, and no higher than thirty-six (36) inches.
6. Benches shall be anchored to the pavement.
7. Benches shall generally have a backrest, although a two-sided bench can be appropriate for certain installations, depending on the design intent.
8. Benches shall be designed with horizontal or vertical slats, no less than one (1) inch and no greater than two (2) inches in width, on all seat and backrest surfaces.

9. Benches shall be at least twenty percent (20%) open on all seat and backrest surfaces (for example: two (2) inch slats with a one-half (½) inch space).
10. No bench shall be placed in the public right of way without an RSP from DOTE providing approval for the bench itself and its location, in accordance with all RSP requirements.
11. Any conflicts in number and placement that arise between existing legally obtained benches and proposed new transit stop benches shall be resolved by DOTE through the RSP process.
12. All proposed benches in the public right of way shall conform to ADA and PROWAG (Public Right of Way Accessibility Guidelines) requirements for accessibility in the public right of way.

B. Transit Stop Bench Advertising Design Guidelines

1. No advertising is authorized on any benches in the right-of-way except for benches located at transit stops applied for, installed, and maintained by a public transit agency.
2. An existing bench that does not contain advertising shall not be replaced with a bench containing advertising, as long as the bench conforms to Section A, "Transit Stop Bench Design Guidelines," and is in a safe condition.
3. Only a public transit agency is authorized to obtain an RSP for benches at transit stops that include advertising.
4. All benches at transit stops must conform to Section A, "Transit Stop Bench Design Guidelines," regardless of whether they include advertising. One minor exception is in paragraph 6(c) of this section.
5. The advertising panel shall in no way inhibit the use of the bench for sitting or extend in size beyond the actual bench backrest. No advertising panels are permitted on/within internal arms or dividers.
6. Advertising on benches at transit stops is authorized as follows:
    a. Advertising panels may be affixed to or incorporated within the bench arms or end panels. Individually, these panels shall not exceed 324 square inches (2.25 square feet) and are only permitted on the legs or arms on the bench ends. No advertising panels are permitted on/within internal arms or dividers.
    b. Although integrated advertising panels are preferred, advertising panels may be affixed to or incorporated within the bench back. The advertising panel or panels on the bench back shall not exceed 2,520 square inches (17.5 square feet). No single panel shall be larger than 30 inches by 84 inches.
    c. For benches at transit stops where advertising is allowed, advertising on the bench back may cover it such that less than twenty percent (20%) of the surface area is open.

C. Transit Shelter Design Guidelines

Transit Shelters must be designed and constructed to meet the following guidelines:

1. Transit Shelters shall be constructed of structural steel or finished aluminum with stainless steel fasteners. Aluminum roof panels and extrusions for the canopy are acceptable. Polycarbonate roof panels are not acceptable.
2. All metal shall be factory finished with manufacturer's standard black or silver paint or polyester powder coat finish process. The shelter structure members shall be the same color. Other colors may be considered but must be approved by the Director of Transportation and Engineering.
3. Shelters shall be of a modular design with each module no more than ten (10) feet tall, twelve (12) feet wide/long and seven and a half feet (7.5) deep, unless otherwise approved by the Director of Transportation and Engineering.

4. The shelters shall be straight, 2-post or 4-post single-bay or 3-post or 6-post double-bay (etc.) structure. 4-post shelters shall have the posts configured to reduce the shelter's encroachment into the sidewalk to the greatest degree practical.
5. The posts must be anchored to an engineered concrete foundation per manufacturer's recommendations. No surface mounted shelters shall be permitted, unless the applicant can demonstrate an engineered thickened slab/sidewalk is sufficient to meet all structural requirements of the installation.
6. Shelters shall have rear and/or side walls. Where right of way space is limited, the walls may be eliminated.
7. There shall be a minimum of 48" from face of shelter (i.e., a shelter support or walls within 12" of grade) to back of curb to permit wheelchair access.
8. The shelter roof shall be a curved or shed canopy design.
9. Shelters shall have a thirty (30) inch by four (4) feet area of open floor space to accommodate one person in a wheelchair. The area surrounding the shelter must be ADA compliant and provide an accessible route to the bus boarding area and to the sidewalk.
10. Internal shelter lighting is desirable but not required. When lighting is included, shelters should have the option of integral solar-powered LED fixtures that are mounted unobtrusively within the canopy. Automatic light control and battery back-up are required.
11. Any (non-solar) electrical or telecommunications wiring required for the operation of bus shelters, including lighting and informational screens, should be run in underground conduit from the nearest utility pole or other service point. No aerial service is permitted. No new utility poles may be added to provide service to a transit stop shelter.
12. Advertising panels may be affixed to or incorporated within the design of the shelter. These panels shall not exceed 3856 square inches (24 square feet) per side and are only permissible on the shelter end or rear walls. Panels may be doubled-faced.
13. Internally illuminated and/or electronic advertising displays are permitted subject to review and approval by the Director of Transportation and Engineering for compatibility with the transit stop context and impacts on traffic safety. These panels shall not exceed 3856 square inches (24 square feet) per side and are only permitted on the shelter end or rear walls. Panels may not be doubled-faced. Illuminated/electronic advertising displays are prohibited in historic districts or zoning districts that are solely residential.

D. Ticket Vending Machines Design Guidelines

Ticket Vending Machines must be designed and constructed to meet the following guidelines:

1. Ticket Vending Machines (TVM) shall be constructed of structural steel, stainless steel, or finished aluminum with stainless steel fasteners. All exterior metal shall be factory finished with manufacturer's standard black or silver paint or polyester powder coat finish process. Structural members shall be the same color or internal to the TVM. Other colors may be considered but must be approved by the Director of Transportation and Engineering.
2. TVMs shall be of a modular design with each module no more than eight (8) feet tall, three and a half (3.5) feet wide/long and two and a half (2.5) feet deep, unless otherwise approved by the Director of Transportation and Engineering.
3. TVMs must be anchored to an engineered concrete foundation per manufacturer's recommendations. No surface mounted shelters shall be permitted, unless the applicant can demonstrate an engineered thickened slab/sidewalk is sufficient to meet all structural requirements of the installation.

4. There shall be open space around every TVM unit to facilitate its use by persons with disabilities. The area surrounding a TVM must be ADA compliant and provide an accessible route to the transit boarding area and to the sidewalk.
5. Any (non-solar) electrical or telecommunications wiring required for the operation of the TVM shall be run in underground conduit from the nearest utility pole or other service point. No aerial service is permitted. No new utility poles may be added to provide service to a TVM.
6. Advertising panels may be affixed to, applied to, or incorporated within the design of the TVM. These advertising areas are permitted on the TVM side walls (1 or 2 sides) and shall not exceed 2070 square inches (14.5 square feet) per side, and on the TVM rear wall (1 side) and shall not exceed 3725 square inches (26.0 square feet).
7. The aggregate advertising area for all permitted sides of the TVM shall not exceed 7865 square inches (55 square feet).

E. Streetcar Transit Stop Informational Kiosks

As authorized in C.M.C. Section 723-13(d), informational kiosks with advertising elements ("Streetcar Transit Stop Kiosks") may be authorized at streetcar stops. This section E. governs only such standalone kiosks at streetcar stops, which are authorized at streetcar stops in addition to and separate from the TVMs governed by section D. above. Streetcar Transit Stop Kiosks must be designed and constructed to meet the following guidelines:

Materials, Physical Characteristics:

1. Streetcar Transit Stop Kiosks shall be constructed of structural steel, stainless steel, or finished aluminum with stainless steel fasteners.
2. All exterior metal shall be factory finished with manufacturer's standard paint or polyester powder coat finish process.
3. Streetcar Transit Stop Kiosks shall be black in color. Structural members shall be the same color or internal to the kiosk. Other colors may be considered but must be approved by the Director of Transportation and Engineering.
4. Streetcar Transit Stop Kiosks shall be of a modular design with each module no more than 102" H x 39" W x 18" D (8.5' H x 3.25' W x 1.5' D), unless otherwise approved by the Director of Transportation and Engineering.

Location, Placement:

5. Streetcar Transit Stop Kiosks must be located on a paved surface and anchored to an engineered concrete foundation per manufacturer's recommendations. Streetcar Transit Stop Kiosks may be located on the stop platform or immediately adjacent to the stop platform, location dependent. Stop platforms that are also structural slabs will require additional DOTE review.
6. Each Streetcar Transit Stop Kiosk shall be placed so that its image display is either parallel or perpendicular to the flow of vehicular travel. Modular units shall not be angled to face vehicular traffic to reduce distraction to drivers. Kiosks parallel to the curb shall be one-sided unless specific locations allow for a minimum of five (5) feet clear pedestrian space adjacent to the curb. Kiosks perpendicular to the curb can be double-sided.
7. Kiosks shall be ADA Compliant. There shall be open space around every kiosk unit to facilitate its use by persons with disabilities. The area surrounding a kiosk must meet *ADA Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way* and provide an accessible route to the transit boarding area and to the sidewalk. Kiosks shall be located so that there is a clear zone of five (5) feet around all sides of each kiosk, except for any side which faces the street. There must be a clear zone of two (2) feet from any curb, measured from the face of the curb.
8. Locations shall not impede access to adjacent businesses or residential properties nor obstruct views of existing business signage or display windows.

9. Each Streetcar Transit Stop Kiosk location must be reviewed and approved by the Director of Transportation and Engineering.

Power Source:

10. Kiosks shall have an independent power source or, if they use a City power source, the owner or vendor must pay a fee to the City for the usage.
11. All service lines shall be run in underground conduit from the nearest utility pole or other service point and shall be concrete encased. No aerial service is permitted. No new utility poles may be added to provide service to a kiosk.
12. Kiosks shall not be located on any existing utility chase, utility boxes or other utility equipment.

Installation:

13. No surface mounted kiosks shall be permitted, unless the applicant can demonstrate that an engineered thickened slab/sidewalk is sufficient to meet all structural requirements of the installation.
14. Kiosk structures, foundations, attachments, etc. shall be designed to withstand a wind load according to the latest version of the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals*, assuming a recurrence interval of 50 years. An analysis of wind load must be submitted as part of the permit application.
15. In the installation of a Streetcar Transit Stop Kiosk, the owner or vendor, or its contractor, shall adhere to the *City of Cincinnati Streetcar Right-of-Way Manual*, shall obtain required Trackway Access Authorization from the Streetcar Operator prior to performing any work in the public right-of-way, and shall be responsible for any damage to existing streetcar infrastructure/facilities.

Display and Sound:

16. The active image size for each permitted side of the Streetcar Transit Stop Kiosk shall not exceed 1,800 square inches (12.5 square feet).
17. Brightness levels shall be dimmable with ambient light sensors and additional brightness restrictions may be required in residential neighborhoods.
18. Moving images are authorized on Streetcar Transit Stop Kiosks. However, for Streetcar Transit Stop Kiosks in any historic district, including all streetcar transit stop locations in Over-the-Rhine, only static images may be displayed. Displays in historic districts may be digital but may change no more frequently than every thirty (30) seconds.
19. Sound levels generated by the kiosk unit shall not exceed 80 db.

F. Advertising Policy

1. Each public transit agency that advertises in the public right-of-way pursuant to the Cincinnati Municipal Code and these guidelines must maintain a current copy of its advertising policy on file with the DOTE, which policy must be updated with the department within five business days of any changes in the policy.
2. The City's maintenance of public transit agencies' advertising policies in its records shall in no way be construed as an endorsement or validation by the City of a policy's effectiveness, legal validity, or constitutionality. Public transit agencies retain sole responsibility for assessing the effectiveness, legal validity, and constitutionality of their advertising policies.
3. The City reserves the absolute right and discretion to revoke a transit agency's privilege to advertise in the right-of-way if the City determines that the agency's policy is likely to violate legal or constitutional requirements or if it determines that the maintenance or enforcement of the agency's policy poses substantial legal risk or liability to the City.